

Petition for *Inter Partes* Review of
U.S. Patent No. 10,248,298 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.,
Petitioner

v.

IMMERSION CORPORATION,
Patent Owner

Case IPR2023-00947
U.S. Patent No. 10,248,298 B2
Issue Date: April 2, 2019

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 10,248,298 B2**

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List of Exhibits

Exhibit No.	Description of Document
1001	U.S. Patent No. 10,248,298 B2 to David M. Birnbaum, Danny A. Grant, and Robert W. Heubel (filed August 13, 2018 and issued April 2, 2019) (“ ’298 ” or “ ’298 patent ”)
1002	Declaration of Jeremy Cooperstock, Ph.D. (“ Cooperstock ”)
1003	U.S. Patent Application Publication No. 2009/0066725 A1 to Atsushi Nogami and Naoki Nishimura (filed Sep. 9, 2008 and published March 12, 2009) (“ Nogami ”)
1004	U.S. Patent No. 7,084,884 B1 to Donald Nelson and Christopher J. Ulrich (filed July 24, 2001 and issued August 1, 2006) (“ Nelson ”)
1005	U.S. Patent No. 6,691,074 B1 to Netzer Moriya et al. (filed February 8, 2001 and issued February 10, 2004) (“ Moriya ”)
1006	Excerpts from <i>Microsoft Computer Dictionary</i> (5th ed. 2002)
1007	Joint Claim Construction Statement filed in <i>Immersion Corp. v. Meta Platforms, Inc.</i> , No. 6:22-cv-00541-ADA (filed January 21, 2023)
1008	Prosecution history of the ’298 patent
1009	Affidavit of Service, ECF No. 6, dated June, 2, 2002, filed in <i>Immersion Corp. v. Meta Platforms, Inc.</i> , No. 6:22-cv-00541-ADA (W.D. Tex.)

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I. MANDATORY NOTICES UNDER §42.8(A)(1)

A. Real Party-In-Interest Under §42.8(b)(1)

Meta Platforms, Inc. is the real party-in-interest to this IPR petition.

B. Related Matters Under §42.8(b)(2)

The '298 patent is the subject of the following pending litigation involving
Petitioner: *Immersion Corp. v. Meta Platforms, Inc.*, No. 6:22-cv-00541-ADA
(W.D. Tex.). Petitioner was served with the Complaint in that action on May 27,
2022. (EX1009, p.001.)

C. Lead and Back-Up Counsel under §42.8(b)(3)

Petitioner provides the following designation of counsel.

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D. Service Information

This Petition is being served by Federal Express to the attorneys of record for the '298 patent, 34300 - Immersion / Kilpatrick Townsend and Stockton, Mailstop: IP Docketing – 22, 1100 Peachtree Street, Suite 2800, Atlanta, GA 30309. This Petition is also being served on litigation counsel identified in the Certificate of Service. Petitioner consents to electronic service at the addresses provided above for lead and back-up counsel.

E. Power of Attorney

Filed concurrently per 37 C.F.R. § 42.10(b).

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II. FEE PAYMENT

Petitioner requests review of eighteen claims, with a \$41,500 payment.

III. REQUIREMENTS UNDER §§ 42.104 AND 42.108 AND CONSIDERATIONS UNDER §§ 314(A) AND 325(D)

A. Standing

Petitioner certifies that the '298 patent is available for IPR and that Petitioner is not barred or otherwise estopped.

B. Identification of Challenge

Petitioner requests institution of IPR based on the following grounds:

Ground	Claims	Basis under §103
1	1-3, 6, 9-11, 14, 17-19, 22	Nogami
2	5, 13, 21	Nogami in view of Nelson
3	8, 16, 24	Nogami in view of Moriya

Submitted herewith is a Declaration of Jeremy Cooperstock, Ph.D. (EX1002) (“Cooperstock”), a qualified technical expert. (Cooperstock, ¶¶1-7, Ex. A.)

C. §§314(a) and 325(d)

Petitioner respectfully submits that no basis exists under either §314(a) or §325(d) for discretionary denial of this Petition. Petitioner reserves its right to respond to any discretionary denial arguments later presented by Patent Owner.

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§ 314(a): Petitioner has not previously filed an IPR petition against the '298 patent, and is unaware of any other prior IPR petition filed against the '298 patent by any party. In the pending litigation, the district court has continued the claim construction hearing several times, and as of the filing of this Petition, no claim construction or other substantive rulings have issued. A trial date has been set for February 20, 2024, but Petitioner has filed a motion to transfer the case to the Northern District of California (which remains pending). In the event of IPR institution, moreover, Petitioner intends to file a motion to stay the litigation pending the outcome of the IPR. In order to address any concerns regarding duplication of efforts, Petitioner hereby provides a *Sotera* stipulation that, in the event of IPR institution, Petitioner will not pursue in the district court any grounds of invalidity against the challenged claims that were raised or reasonably could have been raised in IPR.

§ 325(d): None of the prior art cited in the grounds identified in **Part III.B** above was previously presented during prosecution of the '298 patent.

IV. OVERVIEW OF THE '298 PATENT

A. Level of Ordinary Skill in the Art

A person of ordinary skill in the art would have possessed a bachelor's degree in electrical engineering or computer science (or an equivalent degree), and two years of practical or industry experience in the field of human computer interaction,

including implementation of computer-based systems and software for providing haptic feedback effects to a user and determining the position and/or orientation of a device used by a user (such as a device worn on the human body). (Cooperstock, ¶¶12-13.) A person could also have qualified as an ordinarily skilled artisan with more formal education and less practical or industry experience, or vice versa. (*Id.*)

B. Specification Overview

The '298 patent states that it “relates to haptically enhanced interactivity with interactive content being conveyed to a user by a content output appliance, wherein the content output appliance is under control of one or more processors that control the output of the interactive content based on one or more position parameters of a peripheral being manipulated by the user.” ('298, 1:22-28.)

The “Background” of the '298 patent acknowledges the existence of systems in the prior art in which “[u]sers may interact with virtual objects within a virtual environment in a number of manners,” in which users can also “manipulate a physical object in the real world in order to interact with a virtual object.” ('298, 1:32-35.) The '298 patent states that such interactions “may involve augmented reality technology” and that “visual and/or audio feedback may provide a sense of interaction with virtual objects to users.” ('298, 1:35-42.)

The patent goes on to describe “a system configured to present interactive

content to a user that is manipulating a peripheral.” (’298, 1:51-53.) The disclosed system may include a “haptics module” that may be “configured to determine haptic feedback to be provided to the user,” where the haptic feedback may be determined based on an “identification of the peripheral” and “one or more position parameters” that are “related to the position of the peripheral.” (’298, 1:56-2:2.) The ’298 patent explains that “[h]aptics may include tactile and/or kinesthetic (force) feedback technology that takes advantage of a user’s sense of touch by applying forces, vibrations, motions, and/or other touch feedback to the user.” (’298, 3:6-9.)

V. CLAIM CONSTRUCTION

No claim construction rulings have issued in the pending litigation. Claim constructions have been proposed by Petitioner and/or Patent Owner for the term “**free space**.” (EX1007, pp.002-003.) Petitioner nevertheless does not believe any term of the ’298 patent requires express construction at this time because, as shown below, the claims are obvious under the constructions proposed by both parties in the pending litigation, or any other reasonable construction. Petitioner reserves its right to respond to any new claim construction arguments Patent Owner may make.

VI. THE CHALLENGED CLAIMS ARE UNPATENTABLE.

A. Overview of the Grounds of Unpatentability

The challenged claims attempt to lay claim to well-known virtual reality techniques for providing haptic feedback to a user based on the position and

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identification of a peripheral in space. The challenged claims are disclosed and rendered obvious by **Nogami** (EX1003). As discussed in detail below, Nogami describes a system remarkably similar to the one later described in the '298 patent, in which a user wearing a head-mounted display can interact with virtual objects in a virtual space, and receive haptic feedback based on the position of the head-mounted display and the virtual objects with which the user is interacting.

Petitioner has cited two additional references for ancillary and minor features. **Nelson** (EX1004) is cited only in **Ground 2** for dependent claims 5, 13, and 21, for the unremarkable feature recited in these claims that “**the peripheral is a consumer product.**” **Moriya** (EX1005) is cited only in **Ground 3** for dependent claims 8, 16, and 24, for the similarly unremarkable claimed feature that “**the peripheral comprises a wearable computer.**”

All of the prior art references cited in the proposed grounds qualify as prior art to the '298 patent under at least 35 U.S.C. § 102(b) (pre-AIA) because they were published more than one year before the application filing date for the '298 patent. Nogami is an analogous reference in the same field as the '298 patent and would have been reasonably pertinent to a number of problems facing the '298 patent inventors. (Cooperstock, ¶39.) Nogami's teachings involve known image processing and computer graphics techniques that could have been implemented

using conventional programming techniques, with at least a reasonable expectation of success. (*Id.*) Nogami also describes several numbered “exemplary embodiments” with respect to its system. (Nogami, *e.g.*, ¶¶0046, 0202, 0214, 0233, 0240, 0252, 0262, 0268, 0275, 0278, 0284.) Nogami’s separately-numbered “embodiments” merely describe additional features that could have been incorporated into Nogami’s system rather than separate systems. (Cooperstock, ¶40.) Nogami states that each of his embodiments “can be used in combination with each other where appropriate.” (Nogami, ¶0283.) It would have been obvious to include and/or combine the features described in Nogami’s variously numbered embodiments. (Cooperstock, ¶40.) *See also Boston Scientific Scimed, Inc. v. Cordis Corp.*, 554 F.3d 982, 991 (Fed. Cir. 2009) (“Combining two embodiments disclosed adjacent to each other in a prior art patent does not require a leap of inventiveness.”).

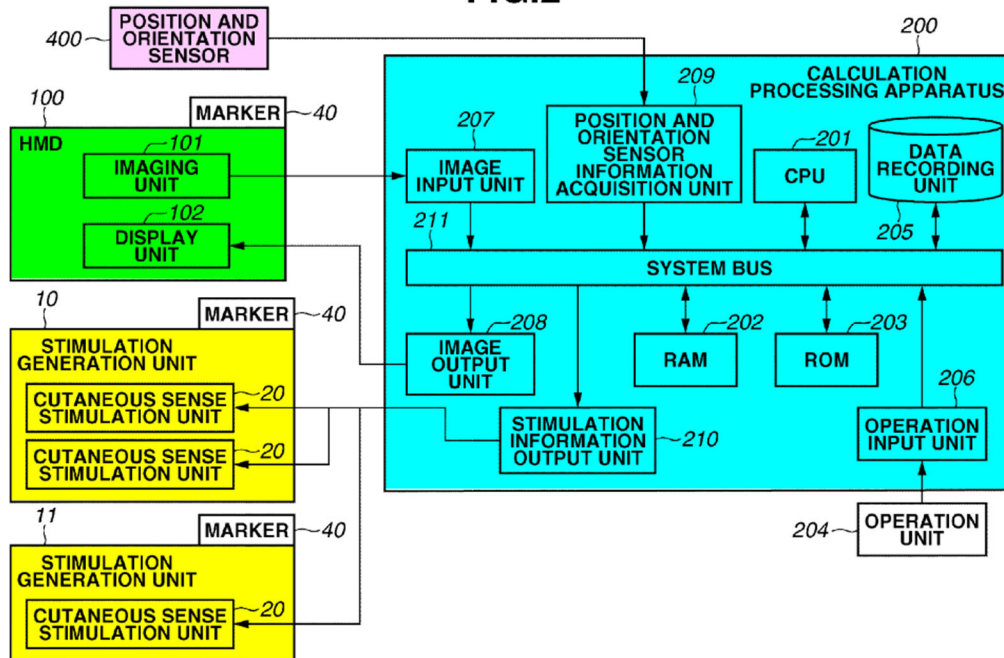
B. Ground 1: Claims 1-3, 6, 9-11, 14, 17-19, and 22 Are Obvious Over Nogami.

1. Independent Claim 1

The preamble of claim 1 simply recites, “[a] **system comprising...**”

Nogami discloses a “**system**” that comprises various components shown in Figures 1 and 2 (reproduced below). Figure 2 of Nogami provides a block diagram of the system and these components (and respective subcomponents):

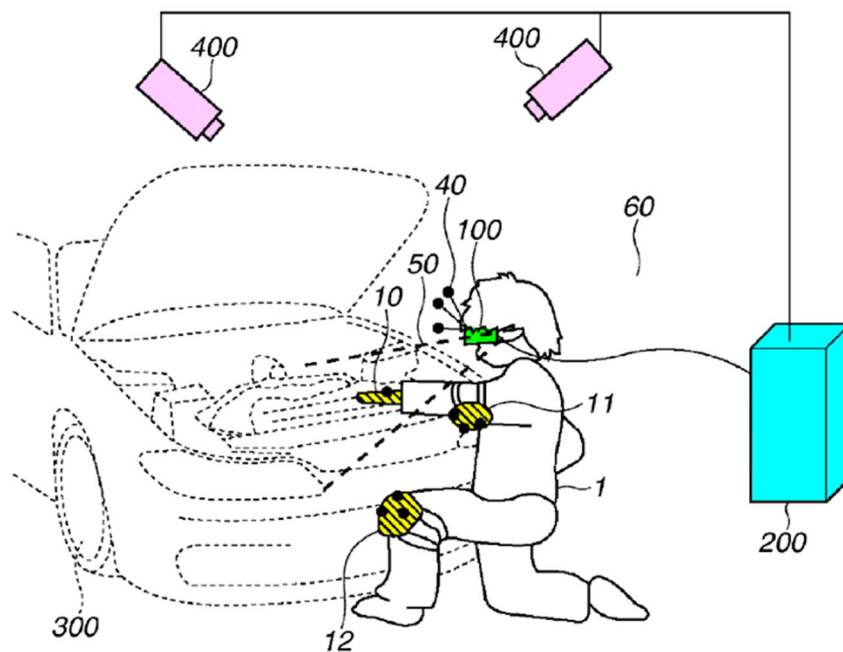
FIG.2



(Nogami, Fig. 2 (highlighting added).) Figure 2 above shows **stimulation generation units 10 and 11** mounted on the body of the user and **head-mounted display (HMD) 100** mounted on the user's head. (Nogami, ¶0049.) Figure 2 also shows **position and orientation sensor 400**, and **calculation processing apparatus 200**.

Figure 1 of Nogami shows an exemplary embodiment of the system including these components in use by a user:

FIG.1



(Nogami, Fig. 1 (highlighting added); *see also id.*, ¶¶0046-0059 (describing components of Figure 1).) Figure 1 shows stimulation generation units 10, 11, and 12 worn on the user's hand, elbow and knee, respectively, and HMD 100 worn on the user's head. (Nogami, ¶¶0049, 0051.)

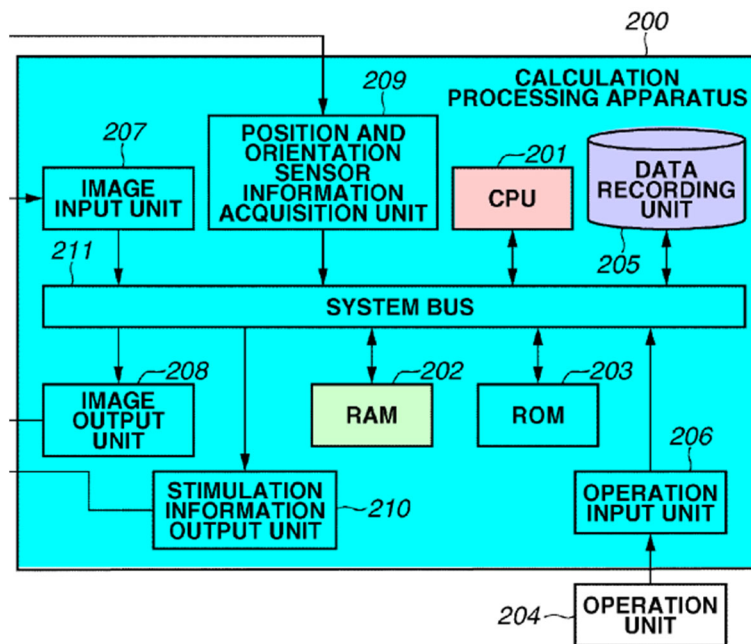
Figure 1 also depicts position and orientation sensor 400, in this case in the form of a camera physically apart from HMD 100. (*See, e.g.*, Nogami, ¶0074.) In this example, sensor 400 acquires position and orientation information for HMD 100 by identifying a physical marker 40 attached to HMD 100. (*Id.*) Nogami discloses an alternative embodiment in which the position and orientation sensor takes the

form of a magnetic sensor included as part of **HMD 100**. (Nogami, ¶0077.)

Finally, Figures 1 and 2 show **calculation processing apparatus 200**. As shown in Figure 2 above, it includes a number of components including CPU **201**, RAM **202** and ROM **203**, data recording unit **205**, among others. (Nogami, ¶¶83-86.) “The calculation processing apparatus **200** includes a general-purpose personal computer (PC), for example.” (Nogami, ¶0082.) As explained below, Nogami’s system, which includes the components described above, discloses and renders obvious each claim limitation.

- (a) **“a processor; and” (Limitation 1[a])**
- (b) **“a memory device comprising program code that is executable by the processor to cause the processor to:” (Limitation 1[b])**

Because these two limitations are closely-related, Petitioner will address them together. The claimed **“processor”** and **“memory device”** are included within **calculation processing apparatus 200** of Nogami, as shown in Figure 2:



(Nogami, Fig. 2 (excerpt; highlighting added); *see also id.*, ¶¶0088-0090.)

Figure 2 confirms that Nogami discloses “a processor,” *i.e.*, central processing unit (CPU) 201, and “a memory device,” which can correspond to either data recording unit 205 and random access memory (RAM) 202, or both. (Cooperstock, ¶56.) Nogami explains that data recording unit 205 is “a mass storage device, such as a hard disk drive (HDD).” (Nogami, ¶0088.)

CPU 201, as discussed below, uses the program and data loaded on data recording unit 205 and/or RAM 202 in order to perform the processing tasks described in Nogami. Nogami therefore discloses “program code that is executable by the processor [*i.e.*, CPU 201] to cause the processor to” perform various operations, including the steps recited in the limitations described below.

For example, Nogami explains that its methods can be “achieved by providing a system or a device with a storage medium (or a recording medium) which stores program code of software implementing the functions of the embodiments and by reading and executing the program code stored in the storage medium with a computer of the system or the device (a CPU or an MPU).” (Nogami, ¶0284; *see also id.*, ¶¶0285-0287.) In one embodiment, data recording unit 205 stores “an operating system (OS) and a program and data” used by the CPU 201, which includes “a program for executing each processing according to a flow of processing to be executed by the CPU 201.” (Nogami, ¶¶0088-0089.)

Nogami further explains that “[t]he program and the data stored in the data recording unit 205 are loaded therefrom to the RAM 202 under the control of the CPU 201.” (Nogami, ¶0090.) “The CPU 201 uses the program and data loaded on the RAM 202 to perform each [sic] processing.” (Nogami, ¶0091; *see also id.*, ¶0083 (“[E]ach of the following processing operations performed by the calculation processing apparatus 200 is performed with the CPU 201 as the main unit of performing the processing.”).) It would thus have been obvious that Nogami’s “processor” (CPU 201) executes “program code” to cause the processor to perform each of the functions in Nogami that correspond to the functions in claim 1 discussion below. (Cooperstock, ¶¶65-67, 73, 83, 102, 107.)

(c) **“display a virtual environment via an electronic display;” (Limitation 1[c])**

Nogami discloses **“an electronic display”** in the form of HMD **100**, which includes a display unit **102**. (Nogami, ¶0053 (“HMD **100** includes an imaging unit **101** and a display unit **102**.”).) Display unit **102** “includes a liquid crystal display (LCD) screen,” which “is mounted on the HMD **100** at a position thereof at which the display unit **102** is positioned just in front of the viewpoint of the user **1**, who wears the HMD **100** on his head.” (Nogami, ¶0056; *see also id.*, Fig. 1 (excerpted at right, showing user wearing HMD **100** (highlighted in green) on their head), ¶¶0049, 0093.) As explained below, the **“electronic display”** in Nogami is configured to **“display a virtual environment.”**



The **“virtual environment”** displayed in Nogami is an environment presented on HMD **100** that includes images of a user’s real-world surroundings combined with one or more virtual objects. (Cooperstock, ¶¶68, 71.)

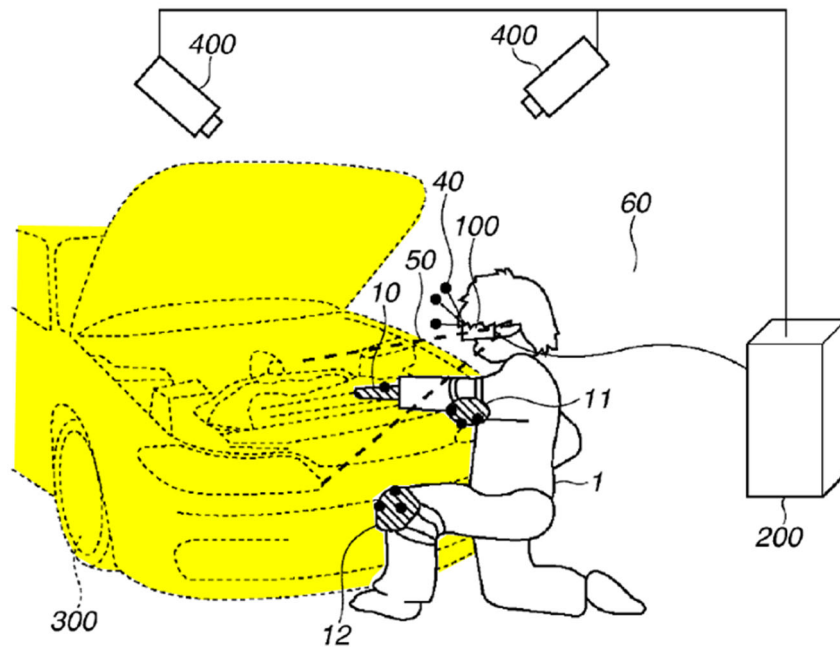
By way of background, the system in Nogami includes two types of “virtual objects”: (1) “region virtual objects” and (2) “background virtual objects.” (Nogami, *e.g.*, ¶0111-0114.) Nogami describes a “region virtual object” as a virtual representation of a stimulation generation unit – for example, a user’s glove-shaped stimulation generation unit could have a corresponding glove-shaped “region virtual

object.” (Nogami, *e.g.*, ¶0268 (“[T]he region virtual object has a shape similar to that of the stimulation generation unit in the real space. However, the shape is not limited to this.”); *see also id.*, ¶¶0269-0270, 0141 (“[R]egion virtual objects **311** and **312** is a virtual object generated by imitating a shape of the stimulation generation units **10** and **11** corresponding thereto.”).) In one embodiment, as discussed below, a region virtual object can be displayed to the user as a virtual work tool such as a screwdriver or wrench. (Nogami, ¶¶0270, 0272-0273.)

A “background virtual object” in Nogami, on the other hand, corresponds to a virtual representation of another object with which the user can interact in virtual space. (Nogami, *e.g.*, ¶0114.) As explained below, one or more background virtual objects as disclosed in Nogami, combined with images of a user’s real-world surroundings, disclose the claimed “**virtual environment**.”

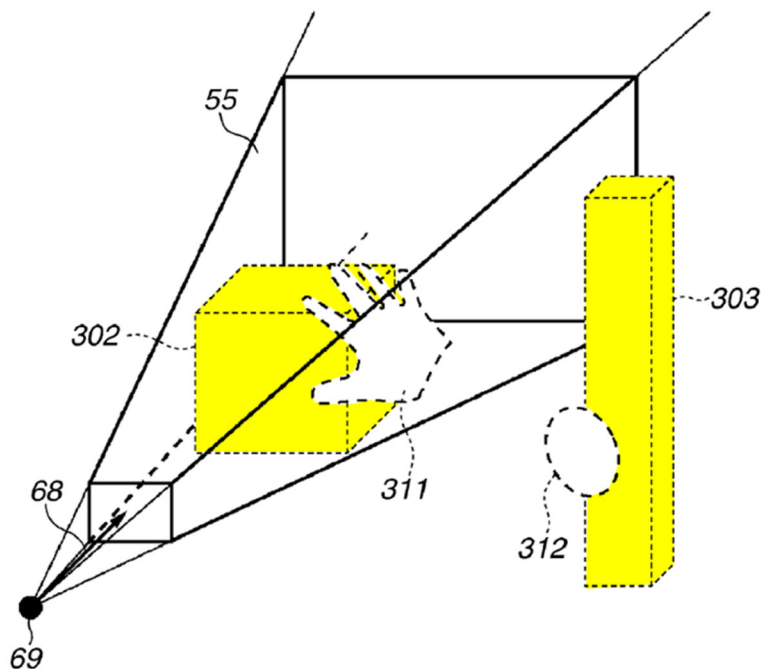
Figure 1 of Nogami illustrates an example of a virtual space including a background virtual object **300** in the form of “a virtually expressed imitation image of an automobile in an actual size” (Nogami, ¶50), highlighted in yellow below:

FIG.1



(Nogami, Fig. 1 (highlighting added).) Figure 6 of Nogami provides another example of background virtual objects, shapes **302** and **303** (highlighted below):

FIG.6



(Nogami, Fig. 6 (highlighting added); *see also id.*, ¶¶0140 (“[B]ackground virtual objects **302** and **303** are disposed in the virtual space.”), 0137 (“FIG. 6 illustrates an example of a virtual space when the state of the real space is in the state illustrated [in] FIG. 5. Accordingly, the state that is a combination of the real space (FIG. 5) and the virtual space (FIG. 6) is presented to the user **1** who wears the HMD **100**.”).)

Images of the virtual objects may also be combined with images of the user’s real-world surroundings (captured by, for example, imaging unit **101** of HMD **100**) for display to the user:

[A] real space image obtained via the HMD **100** [is] input to a calculation processing apparatus (information-processing apparatus)

200.

Then, the calculation processing apparatus 200 outputs a combined image including a virtual space image and a real space image to the HMD 100 by performing various types of processing... In the example illustrated in FIG. 2, the HMD 100 includes an imaging unit 101 and a display unit 102.

(Nogami, ¶¶0052-0053;¹ *see also id.*, ¶¶0056 (“The display unit 102 displays the combined image sent from the calculation processing apparatus 200.”), 0092-0093 (“Data of a real space image sent from the imaging unit 101 of the HMD 100 is stored on the RAM 202 or the data recording unit 205 via the image input unit 207. Furthermore, a combined image generated by the calculation processing apparatus 200 is output to the display unit 102 of the HMD 100...”), 0097.)

Nogami therefore discloses display via “**an electronic display**,” *i.e.*, display unit 102 of HMD 100, of “**a virtual environment**,” *i.e.*, an environment that includes the user’s real-world surroundings combined with one or more virtual objects. (Cooperstock, ¶71; Nogami, *e.g.*, ¶0114 (“That is, the virtual space includes the background virtual object...”).) Nogami explains that this combination of real-world imagery and background virtual objects provides an immersive, interactive

¹ Except as otherwise noted, all underlining and other emphasis added to quotations was added by Petitioner.

virtual scene or virtual surroundings for the user. (*E.g.*, Nogami, ¶¶0005 (“In the case of using an HMD in such a conventional system, a user can feel a greater sense of immersion into a virtual space because the virtual space is displayed according to a viewpoint of the user and a direction of a line of sight (visual axis) of the user.”), 0008.) “Accordingly, the user **1** can experience a virtual space including a virtual object **300** with both a visual sense and a tactile sense.” (Nogami, ¶0049.) For example, virtual object **300** shown in Figure 1 above depicts “a virtually expressed imitation image of an automobile in an actual size.” (Nogami, ¶0050.)

Petitioner notes that nothing in the claim requires that the output “**virtual environment**” be purely “virtual” or computer-generated. Dependent claim 3 addressed below, for example, recites that the claimed “**virtual environment**” “**is an augmented reality environment.**” (’298, Claim 3.) Augmented reality, as the ’298 patent states, involves “integrat[ing] 2D and/or 3D virtual objects into live video that is digitally processed and ‘augmented’ with the 2D and/or 3D virtual objects. In other words, this digital processing can mix real and virtual real worlds together...” (’298, 1:35-40.) The claimed “**virtual environment**” can thus include images based on surroundings from the real world. (Cooperstock, ¶72.)

As explained above, it also would have been obvious that the display of the virtual environment is accomplished in Nogami by a processor. (Cooperstock, ¶73.)

Nogami explains, for example, that the calculation processing apparatus **200** – which includes CPU **201** – “outputs a combined image including a virtual space image and a real space image to the HMD **100** by performing various types of processing.” (Nogami, ¶0053; *see also id.*, ¶0053 (“HMD 100 includes an imaging unit **101** and a display unit **102**.”), 0056, 0093 (“[A] combined image generated by the calculation processing apparatus 200 is output to the display unit **102** of the HMD **100** via the image output unit **208**.”).) And as explained in the discussion accompanying limitations 1[a]-[b] above, CPU **201** would have performed this step by executing program code for generating combined images including the one or more background virtual objects and outputting them to HMD **100**. (Cooperstock, ¶¶65-66, 73; Nogami, *e.g.*, ¶¶0091, 0083 (“[E]ach of the following processing operations performed by the calculation processing apparatus **200** is performed with the CPU **201** as the main unit of performing the processing.”), 0284-0287.)

- (d) “**detect an interaction with a virtual object in the virtual environment based on a peripheral being at a particular position in free space with respect to the virtual object; and**” (Limitation 1[d])

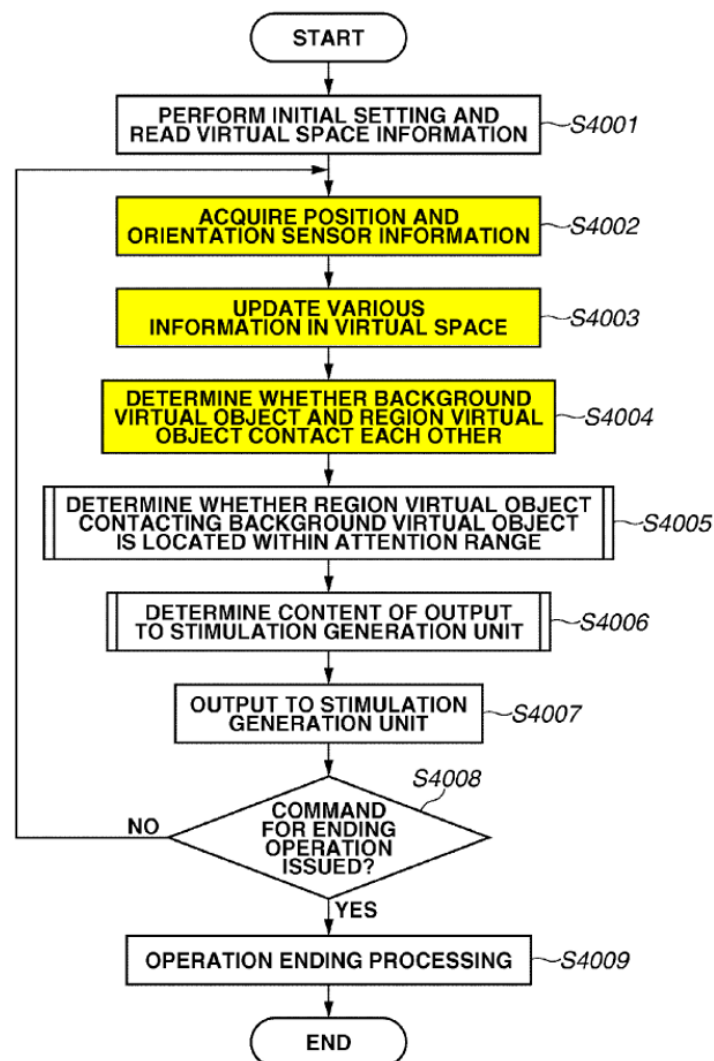
Nogami discloses limitation 1[d] through a process, described in detail below, in which CPU **201** detects that a stimulation generation unit (“**a peripheral**”) worn by a user has made “virtual” contact (“**an interaction**”) with a background virtual object (“**a virtual object in the virtual environment**”). (Nogami, *e.g.*, ¶¶0102-

0103 (“Referring to FIG. 1, in the attention range **50**, a virtual contact occurs between the region (hand) of the user, on which the stimulation generation unit **10** is mounted, and the virtual object **300**. On the other hand, in the non-attention range **60**, a virtual contact occurs between the region (knee) on which the stimulation generation unit **12** is mounted and the virtual object **300**.”).) This process discloses each aspect of limitation 1[d], as demonstrated below.

A stimulation generation unit in Nogami, in one embodiment, can be a glove-like unit worn on the user’s hand. (Nogami, ¶¶0058-0059, 0061.) The ’298 patent does not expressly define “**peripheral**” but describes it as “generally...anything manipulatable or able to be interacted with by a user,” including “a computing/interactive digital media device... on the user’s body.” (’298, 3:40-50.) This description tracks Nogami’s description of a stimulation generation unit, with which the user can interact by wearing and manipulating (moving) it. (Nogami, *e.g.*, ¶¶0120-0123, Fig. 4, Cooperstock, ¶75.) A stimulation generation unit in Nogami therefore qualifies as a “**peripheral**” as claimed.

Figure 4 of Nogami illustrates the process of detecting virtual contact between a virtual object and a stimulation generation unit (“**peripheral**”):

FIG.4



(Nogami, Fig. 4 (highlighting added); *see generally id.*, ¶¶0108-0117 (further describing Steps S4002-S4004).) The process shown in Figure 4 discloses the claimed “**detect[ing] an interaction with a virtual object,**” as discussed below.

Starting with Steps S4002 and S4003 in Figure 4, Nogami explains that each stimulation generation unit is associated with a region virtual object whose position corresponds to the stimulation generation unit’s position in real space:

In step S4002, the CPU 201 acquires position and orientation information about the HMD 100 and position and orientation information about the stimulation generation units 10, 11, and 12 sent from the position and orientation sensor 400 via the position and orientation sensor information acquisition unit 209 and stores the acquired information on the RAM 202.

In step S4003, the CPU 201 sets the position and orientation information about the HMD 100 acquired in step S4002 as the position and orientation information about the current viewpoint of the user 1. Furthermore, the CPU 201 sets the position and orientation information about each of the stimulation generation units 10, 11, and 12 acquired in step S4002 as position and orientation information about a virtual object (hereinafter simply referred to as a “region virtual object”) disposed according to the position and orientation of each of the stimulation generation units 10, 11, and 12. That is, the CPU 201 sets the region virtual object corresponding to each stimulation generation unit according to the position and orientation of each of the stimulation generation units 10, 11, and 12.

(Nogami, ¶¶0108-0109; *see also id.*, ¶¶0078 (“[T]he method acquires the position and orientation information in a sensor coordinate system of each of the receivers based on a signal indicating a result of the detection by the receiver. Here, the sensor coordinate system has an origin point that denotes a position of the transmitter and an x-axis, a y-axis, and a z-axis orthogonal to one another at the origin point.”), 0111 (“[T]he region virtual object corresponding to the stimulation generation unit 10 is

disposed in the virtual space according to the position and orientation of the stimulation generation unit **10**.”.) As noted previously, in one embodiment, a “region virtual object” in Nogami can take the form of a virtual work tool such as a screwdriver or wrench. (Nogami, ¶¶0270, 0272-0273.)

Figure 4 continues with Step **S4004** in which the positions of region virtual objects and background virtual objects are compared to determine whether there has been any virtual contact between them:

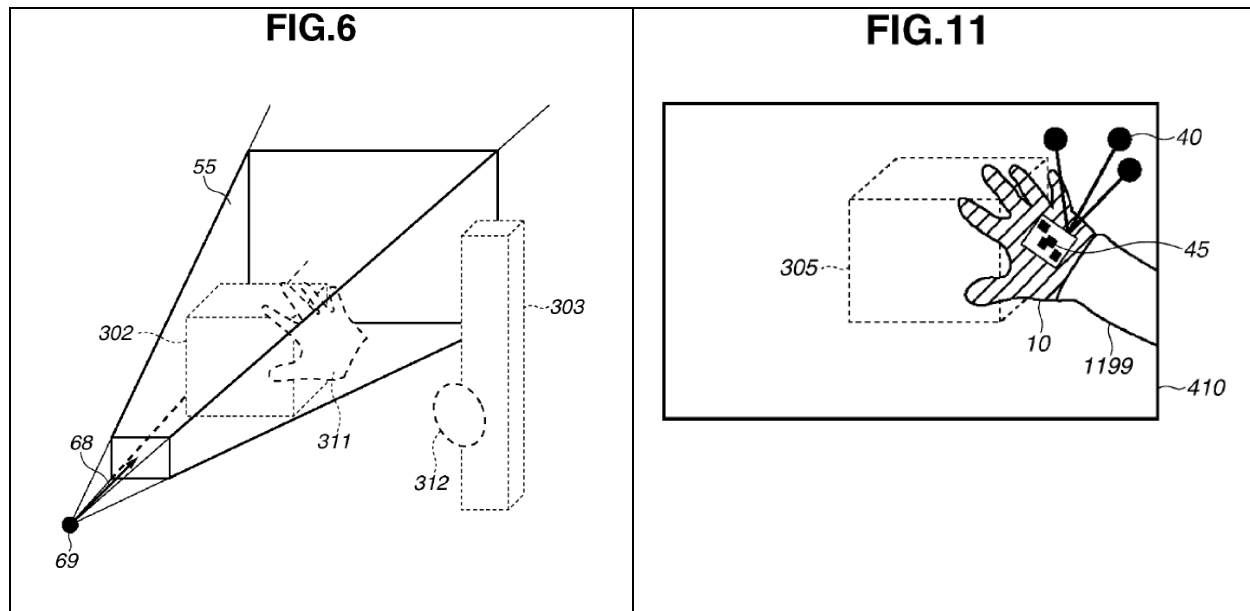
Accordingly, the position and orientation of each of the stimulation generation units **10**, **11**, and **12** is reflected in the virtual space. The interaction between each of the stimulation generation units **10**, **11**, and **12** and the virtual space is available in this manner....

Thus, in step **S4004**, the CPU **201** determines whether each of the background virtual objects disposed by the above-described processing in the virtual space and each of the region virtual objects disposed in the virtual space in step **S4003** interfere with each other. That is, the CPU **201** determines whether any background virtual object and any region virtual object contact each other. The determination as to whether the virtual objects interfere with each other can be performed according to a publicly known method.

(Nogami, ¶¶0113-0117.) For example, Figure 1 discussed in connection with the preamble shows “virtual contact occur[ring] between the region (hand) of the user, on which the stimulation generation unit **10** is mounted, and the virtual object **300**”

(Nogami, ¶0102), with virtual object **300** in that example being “a virtually expressed imitation image of an automobile in an actual size.” (Nogami, ¶0050.) Nogami therefore discloses that CPU **201** “**detects an interaction with a virtual object in the virtual environment,**” because it can detect if a stimulation generation unit (worn by the user) has made virtual contact with a virtual object within the virtual environment. (Cooperstock, ¶78.)

Nogami further discloses that the detected interaction with the virtual object is “**based on a peripheral,**” *i.e.*, stimulation generation unit, “**being at a particular position in free space with respect to the virtual object.**” This is because the position of the region virtual object making virtual contact is based on the real-world position of the stimulation generation unit. (Cooperstock, ¶78.) This is further confirmed in Figures 6 and 11, which show further examples of virtual contact occurring between region and background virtual objects:



(Nogami, Figs. 6 & 11; *see also id.*, ¶¶0148 (“In the example illustrated in FIG. 6, the region virtual object **311** and the background virtual object **302** contact each other. In addition, the region virtual object **312** and the background virtual object **303** contact each other.”), 0205-0206 (“Referring to FIG. 11, a background virtual object **305**, the arm **1199** of the user **1**, and the stimulation generation unit **10** are included in the real space image **410**.... In the example illustrated in FIG. 11, the region virtual object corresponding to the stimulation generation unit **10** contacts the background virtual object **305**.”).)

As these figures illustrate, whether contact has occurred depends on the position of the stimulation generation unit in the free space with respect to the virtual object with which contact is made. (*See also* Nogami, *e.g.*, ¶¶0078 (“[T]he method acquires the position and orientation information in a sensor coordinate system of

each of the receivers based on a signal indicating a result of the detection by the receiver. Here, the sensor coordinate system has an origin point that denotes a position of the transmitter and an x-axis, a y-axis, and a z-axis orthogonal to one another at the origin point.”), 0111 (“[T]he region virtual object corresponding to the stimulation generation unit **10** is disposed in the virtual space according to the position and orientation of the stimulation generation unit **10**.”).)

The figures from Nogami discussed above involve virtual contact being made with a background virtual object that is currently within the view of the user, which Nogami refers to as the “view volume” or “attention range.” (Nogami, ¶¶0101, 0147 (“Here the view volume **55** is used as the attention range.”), 0159.) Petitioner notes that this is not a requirement of Nogami; virtual contact can also be made when the background virtual object and the stimulation generation unit are currently outside the view volume or attention range. (Cooperstock, ¶82.) This is shown by Step **S4005** in Figure 4 above, in which “the CPU **201** determines whether the region virtual object contacting the background virtual object is located within the attention range (corresponding to the attention range **50** in FIG. 1) (attention determination processing).” (Nogami, ¶0118; *see also id.*, ¶0135.) The process in Figure 4 continues to subsequent steps – including providing haptic feedback to the user – regardless of the result of this determination. (Nogami, Fig. 4 (Steps **S4006**,

S4007).) But as explained in the discussion of limitations 1[f]-[g] below, whether or not virtual contact was made inside the view volume or attention range can impact the characteristics of the haptic feedback provided to the user.

As explained in **Part V**, the parties in the pending litigation have proposed competing constructions of “**free space**,” but Nogami satisfies either construction. Petitioner has asserted that “**free space**” means “*a three-dimensional area in the real world*,” while Patent Owner asserts that the term should be given its “plain and ordinary meaning,” but “[t]o the extent that the Court believes that any further construction is necessary, the plain and ordinary meaning includes ‘the three-dimensional real world user surroundings.’” (EX1007, pp.002-003.) Nogami clearly satisfies these constructions because, as explained, the position information obtained from the magnetic sensor specifies a position of HMD **100** in the real and three-dimensional world surroundings of the user. (Cooperstock, ¶¶80-81.)

(e) “based on detecting the interaction:” (Limitation 1[e])

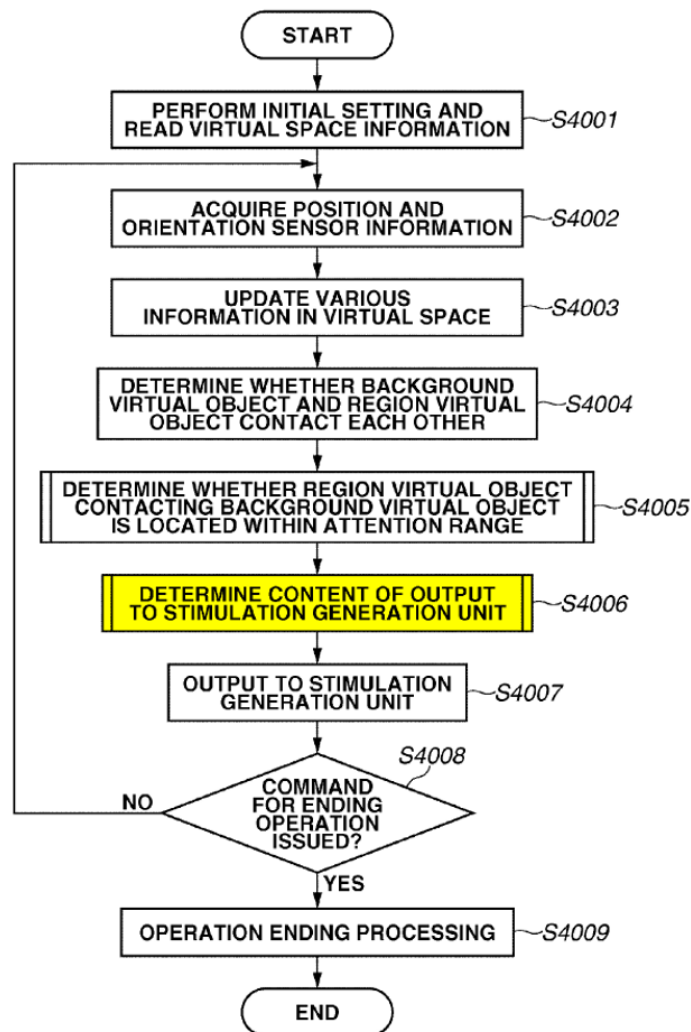
As shown below, limitations 1[f] and 1[g] below are carried out “**based on detecting the interaction**,” as claimed. This is because the antecedent step of detecting the interaction is a prerequisite to the functions in Nogami that disclose the limitations below. (See, e.g., Nogami, Figs. 4 (steps S4003-S4007), 7 & 9.)

(f) “determine a first feedback parameter that depends on an identifier of the peripheral and a second feedback

parameter that depends on the particular position of the peripheral in free space; and” (Limitation 1[f])

After detecting the contact with a virtual object as described for limitation 1[d], CPU **201** determines information that is used to control the haptic feedback provided by the stimulation unit(s) of a stimulation generation unit to a user. Nogami refers to this information as “operation setting information.” (Nogami, *e.g.*, ¶¶0053 (“[T]he calculation processing apparatus **200** outputs operation setting information for controlling an operation of each of the stimulation generation units **10**, **11**, and **12**.”), 0123 (“After receiving the operation setting information, the stimulation generation unit operates to generate a stimulation of the intensity indicated by the operation setting information.”).) This is shown in Step S**4006** in Figure 4:

FIG.4



(Nogami, ¶0120, Fig. 4 (highlighting added).)

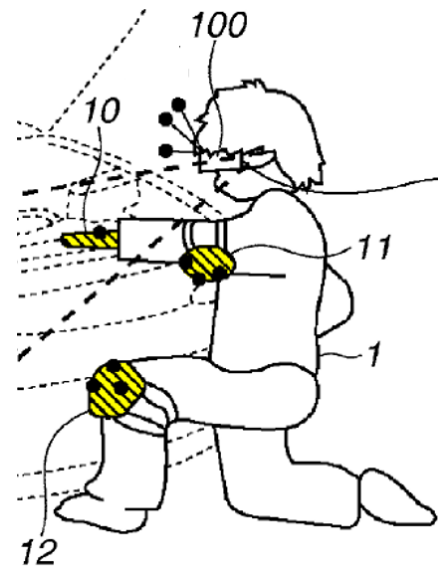
Nogami explains that in Step S4006, “CPU 201 generates operation setting information for controlling an operation of the stimulation generation unit corresponding to the region virtual object contacting the background virtual object.” (Nogami, ¶0120.) As explained below, it would have been apparent and obvious that the process of generating operation setting information in Nogami includes

determining at least the claimed “**first feedback parameter**” and “**second feedback parameter**.” Petitioner will address these in two separate sections below.

(1) “**determine a first feedback parameter that depends on an identifier of the peripheral....**”

Starting with the “**first feedback parameter**,” this corresponds in Nogami to the intensity of the haptic feedback, and as explained below, it would have been obvious that the intensity **depends on an identifier** of the stimulation generation unit (“**peripheral**”) making virtual contact with a virtual object.

For example, Nogami discloses that stimulation generation units can be worn on various regions of a user’s body, such as the user’s hand, elbow, and knee. (Nogami, ¶0051.) But Nogami identifies an issue when multiple stimulation generation units are worn by a user: the intensity of haptic feedback felt by different regions of the user’s body may be different. (Nogami, ¶0279.) “For example, the finger of a human can sensitively react to the stimulation but the knee or the elbow of a human cannot react to the stimulation as sensitive as the finger can do.” (Nogami, ¶0280.)



To address the varying sensitivities of different body regions, a different intensity (referred to in Nogami as a “reference intensity”) can be applied based on

the location of the stimulation generation unit on the body. (Nogami, ¶¶0280-0281.)

Nogami explains that “in the case of mounting a cutaneous sense stimulation unit on different regions of the body of a user, it is useful if each region is previously caused to contact the virtual object and a value at which the user feels the intensity of the stimulation as the same is set as a reference intensity for each region.” (Nogami, ¶0280.) In other words, a different “reference intensity” can be provided for each region on the body where a stimulation generation unit is mounted. (Nogami, ¶¶0280-0281.) This “reference intensity” is then used to determine the haptic feedback intensity when virtual contact occurs. (Nogami, ¶0281.)

Nogami does not provide implementation details about how a “reference intensity” value for a region is associated with stimulation generation units worn by the user at that region. But an ordinarily skilled artisan would have found this omission immaterial because this would have been considered nothing more than a trivial implementation detail. (Cooperstock, ¶89.) It would have been obvious to use an “**identifier**” associated with the stimulation generation unit in order to identify the appropriate “reference intensity” for the contacted body region. This would have predictably resulted in “**determin[ing] a first feedback parameter [haptic feedback intensity] that depends on an identifier of the peripheral [stimulation generation unit],**” as claimed. (*Id.*)

For instance, suppose Nogami provides two different “reference intensity” values for two stimulation generation units worn at two different regions of the user’s body. It would have been obvious to implement Nogami to provide an identifier for each stimulation generation unit in order to allow CPU **201** to distinguish and associate it with the region of the body on which it is worn. Without such an identifier, in fact, the system in Nogami would have been unable to distinguish one stimulation generation unit from another (regardless of region), thus entirely defeating the purpose of Nogami’s region-specific “reference intensity” values. (Cooperstock, ¶89.)²

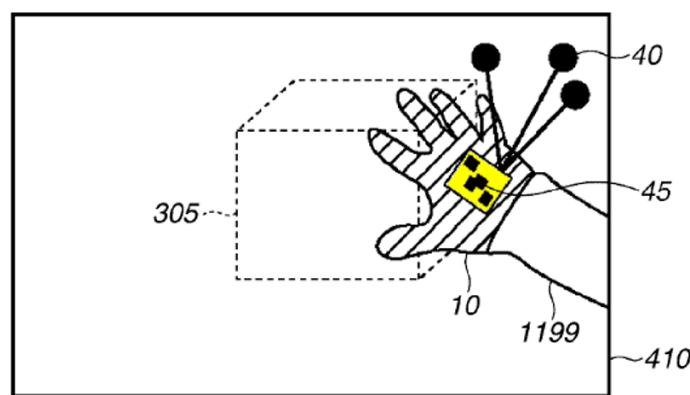
It therefore would have been obvious to implement Nogami such that the “**first haptic parameter**” would have depended on at least an “**identifier of the peripheral**,” as claimed. Petitioner notes that limitation 1[f] does not require that the claimed “**identifier**” take any particular form or be implemented in any particular way. The concept of an “**identifier**” for a peripheral is a basic concept in computer

² In fact, if each stimulation generation unit did not have its own identifier, the system in Nogami could not even output specific operation setting information for a particular stimulation generation unit because it could not have distinguished that stimulation generation unit from others in the system. (Cooperstock, ¶89.)

science or engineering that provides nothing of patentable significance. (Cooperstock, ¶90.) It was elementary knowledge of skilled artisans that virtually all objects in a computer capable of being operated on or manipulated by a computer – such as a peripheral device, a computer file, and even a location within the computer’s memory – are associated with an identifier that allows the computer to identify the object and distinguish it from other objects in the computer. (*Id.*) Using an “**identifier**” for a stimulation generation unit in this manner would have involved the straightforward application of known techniques. (*Id.*)

Nogami itself discloses the ability to assign a unique identifier to each stimulation generation unit. For example, referring to Figure 11, Nogami describes **bar code 45** present on a stimulation generation unit that uniquely identifies the stimulation generation unit (and the unit’s corresponding region virtual object):

FIG.11



(Nogami, Fig. 11 (highlighting added).) As Nogami explains:

In the example illustrated in FIG. 11, the region virtual object corresponding to the stimulation generation unit **10** contacts the background virtual object **305**. The two-dimensional bar code **45** indicates ID information (e.g., an ID) unique to the stimulation generation unit **10**.

(Nogami, ¶0206.) **Bar code 45** is merely an example of an identifier. Nogami explains that “any information other than the two-dimensional bar code **45** can be used as the ID information unique to the stimulation generation unit **10** if the information can indicate the ID information unique to the stimulation generation unit **10**.” (Nogami, ¶0207.) Nogami therefore discloses a unique identifier for the stimulation generation unit (“**peripheral**”).

Although Nogami does not specifically disclose using the bar code identifier to assign the correct “reference intensity” to the stimulation generation unit, as explained extensively above, it would have been obvious to use an identifier to determine the “**first feedback parameter**.” It would therefore have been obvious to use any of the exemplary identifiers in Nogami, or some other identifier, on which to base the “**first feedback parameter**.” (Cooperstock, ¶91.)

The obviousness of determining a haptic parameter based on the claimed “**identifier**” is further underscored by Nogami’s disclosure of “correspondence relation information,” which is used to determine which region virtual object

corresponds to a stimulation generation unit for providing haptic feedback. This information enables the CPU to identify the stimulation generation unit:

Then, the CPU **201** generates (sets) operation setting information to be set for the stimulation generation unit corresponding to the identified region virtual object (operation setting information for the region virtual object outside the attention range).

In the example illustrated in FIG. 6, the CPU **201** sets the operation setting information for the region virtual object inside the attention range with respect to the stimulation generation unit **10**. On the other hand, the CPU **201** sets the operation setting information for the region virtual object outside the attention range with respect to the stimulation generation unit **11**.

The correspondence relation information as to which region virtual object is associated with which stimulation generation unit (which region virtual object is disposed on which position and orientation of the stimulation generation unit) is previously recorded on the data recording unit 205. Thus, the CPU **201** can **identify** the stimulation generation unit corresponding to the region virtual object.

(Nogami, ¶¶0174-0176.) A person of ordinary skill in the art would have understood and found it obvious based on the “correspondence relation information” to have included an identifier for a stimulation generation unit because, as explained in the excerpt above, CPU **201** can identify the stimulation generation unit that corresponds to a region virtual object. (Nogami, ¶0176 (“Thus, the CPU **201** can identify the

stimulation generation unit corresponding to the region virtual object.”).)

In light of the multiple disclosures in Nogami about the ability of CPU **201** to identify and distinguish individual stimulation generation units, it would have been obvious to use the identifier of a stimulation generation unit to identify its corresponding reference intensity. (Cooperstock, ¶92.) It therefore would have been obvious that the intensity of haptic feedback (“**first feedback parameter**”) would have depended on at least “**an identifier**” of the stimulation generation unit making virtual contact with a virtual object. (*Id.*)

(2) “... and a second feedback parameter that depends on the particular position of the peripheral in free space”

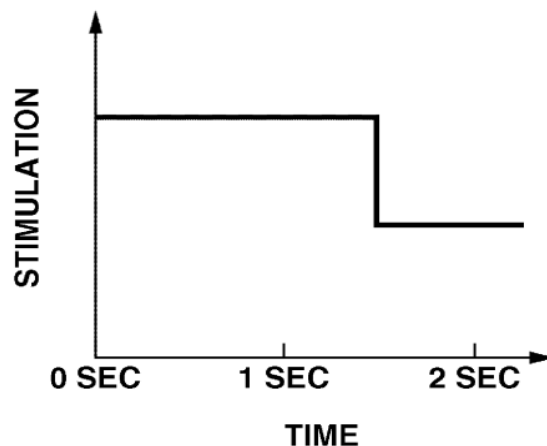
Moving to the “**second feedback parameter**,” Nogami provides two separate examples that independently satisfy this aspect of limitation **1[f]**.

In a first example, the “**second feedback parameter**” corresponds to a parameter that relates to the duration of the haptic feedback intensity. More specifically, Nogami explains that when virtual contact is made outside the user’s view volume/attention range, the intensity of the haptic feedback may be greater. (Nogami, ¶¶0254, 0278.) This feature accounts for the reality that a user may be unaware of virtual contact when it occurs outside the view volume or attention range, thus warranting haptic feedback of greater intensity to capture the user’s attention.

(Nogami, ¶0259 (“With this control, the present exemplary embodiment can achieve... an effect for causing the user to easily recognize the contact with the virtual object outside the attention range....”); Cooperstock, ¶94.) These intensities are nevertheless determined based on the “reference intensity,” discussed in detail above. (Nogami, ¶0281.)

But Nogami explains that continuously generating higher intensity haptic feedback for virtual contact outside the user’s view volume/attention range may be uncomfortable and inconvenient for the user. (Nogami, ¶¶0256 (“the user 1 may feel uncomfortable with the continuously provided stimulation if the user 1 is subjected to a continuous high stimulation on the knee”), 0259 (“inconvenience of the user of being subjected to a high continued stimulation”).) Nogami responds to this issue by decreasing the intensity after a period of time as shown in Figure 14:

FIG.14



(Nogami, Fig. 14.) Nogami explains, with reference to Figure 14, that “CPU 201 lowers the degree of the stimulation intensity from a first degree to a second degree after a predetermined length of time has elapsed from the start of the contact (in FIG. 14, 1.5 seconds after).” (Nogami, ¶0259.) This allows the system to provide an initial high intensity “causing the user to easily recognize the contact with the virtual object outside the attention range,” but then to lower the intensity so the user is not “subjected to a high continued stimulation.” (Nogami, ¶0259.)

This functionality discloses the claimed “**second haptic parameter.**” The functionality shown in Figure 14 has two distinct components: (1) a specific duration for which the initial (higher) intensity will be provided, followed by (2) a second (lower) intensity. There are thus at least two independent ways that the functionality of Figure 14 in Nogami provides a second haptic parameter.

First, the “**second haptic parameter**” could simply be mapped to the duration component that specifies how long haptic feedback of the initial intensity (the “**first haptic parameter**”) will be applied (*e.g.*, 1.5 seconds). (Cooperstock, ¶97.) This is consistent with the ’298 patent, which identifies “duration” as an exemplary haptic parameter. (’298, 8:20-26.) Although a second (reduced) intensity is then applied after that specified duration, claim 1 is a “**comprising**” claim that does not exclude additional haptic parameters that may come into play at later points in time.

Second, the “**second haptic parameter**” could be mapped to the full functionality shown in Figure 14, as a parameter that specifies a reduction in the intensity of haptic feedback after a certain period of time. (Cooperstock ¶96.) This is also consistent with the ’298 patent, which provides an expansive list of exemplary feedback parameters, including “intensity,” “duration,” “pattern,” and other “aspects” of haptic feedback. (’298, 8:20-26.) A reduction in the intensity after a certain duration qualifies as a second and distinct “**haptic parameter**” because it specifies an additional aspect of haptic feedback beyond just the intensity – it specifies a second and different intensity will be provided after a specified period of time (*e.g.* initial intensity provided for 1.5 seconds followed by second (reduced) intensity). (Cooperstock, ¶96.)

Nogami also discloses that the second haptic parameter “**depends on the particular position of the peripheral in free space,**” as claimed. This is because, as noted, the haptic feedback intensity duration and reduction in Figure 14 occurs when the virtual contact occurs outside the user’s view volume/attention range, which in turn is based on the position of the stimulation generation unit (“**peripheral**”) in free space. The second haptic parameter in Nogami, in other words, depends on the particular position of the stimulation generation unit in free space, *e.g.*, whether it is currently outside the view volume/attention range of the

user. (Cooperstock, ¶98.)

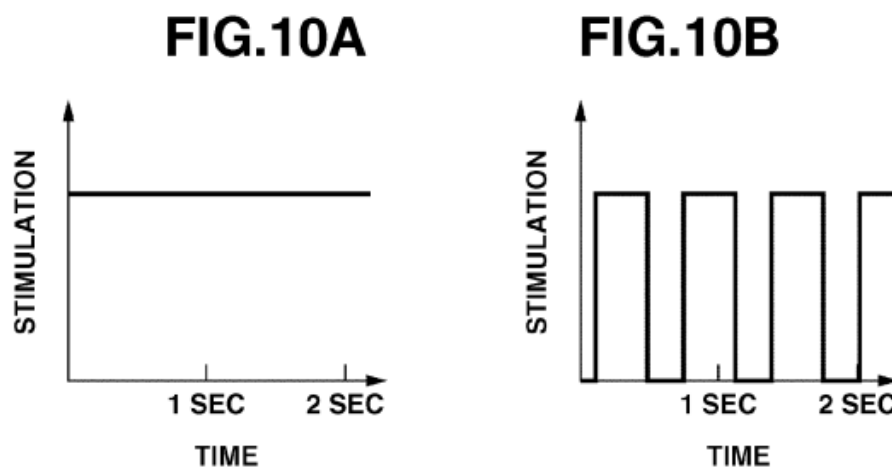
This is consistent with how the '298 patent describes the claimed “**position of the peripheral in free space.**” The '298 patent explains that the position of the peripheral can be defined in many different ways, including as a position relative to the user or some reference point. ('298, 6:44-51 (“The position module **124** may be configured to determine one or more position parameters that are related to the position of one or more peripherals (e.g., the peripheral **102**). Position parameters may include information related to the position of a peripheral relative to a user, the digital device **106**, and/or other point of reference; the orientation of the peripheral; the size of the peripheral; and/or other information.”).) In the case of Nogami, the second haptic parameter “**depends on the particular position of the peripheral in free space,**” because whether the reduction in intensity occurs depends on at least the position of the stimulation generation unit relative to HMD **100**, because this determines whether or not contact occurred in the view volume/attention range of the user. (Cooperstock, ¶99.)

Nogami discloses a second and independent example of the claimed “**second haptic parameter,**” which takes the form of haptic feedback patterns. (Nogami, ¶¶0195-196.) Like the example just discussed above, Nogami discloses a feature for selecting different haptic feedback patterns based on whether or not virtual contact

occurred inside the user's view volume/attention range. Referring to Figures 10A and 10B, Nogami explains:

The pattern of each stimulation can be assigned as the stimulation for the contact within the attention range and the stimulation for the contact outside the attention range. In this regard, it is useful to assign the stimulation pattern in FIG. 10A for the contact within the attention range and the stimulation pattern in FIG. 10B for the contact outside the attention range.

This is because the continuous contact within the attention range can be expressed by using the stimulation pattern in FIG. 10A and the stimulation for warning the user can be expressed by using the stimulation pattern in FIG. 10B.



(Nogami, ¶¶0195-0196, Figs. 10A & 10B.)

Nogami's haptic feedback pattern thus discloses a second independent example of functionality that discloses the claimed **“second haptic parameter,”**

which is distinct from the intensity (“**first haptic parameter**”) discussed above. (Cooperstock, ¶¶100-101.) This is consistent with the ’298 patent, which identifies “intensity” and “pattern” of haptic feedback as distinct parameters. (’298, 8:20-26.) And like the earlier example in which intensity is reduced after a particular duration, the haptic pattern parameter in Nogami “**depends on the particular position of the peripheral in free space,**” because it depends on at least the position of the stimulation generation unit relative to HMD 100. (Cooperstock, ¶¶99, 101.)

(g) “**transmit a haptic signal configured to cause a haptic output device to output haptic feedback in accordance with the first feedback parameter and the second feedback parameter.**” (Limitation 1[g])

After the two feedback parameters discussed above have been determined, CPU 201 in Nogami transmits a signal to the stimulation generation unit that causes it to deliver haptic feedback to the user:

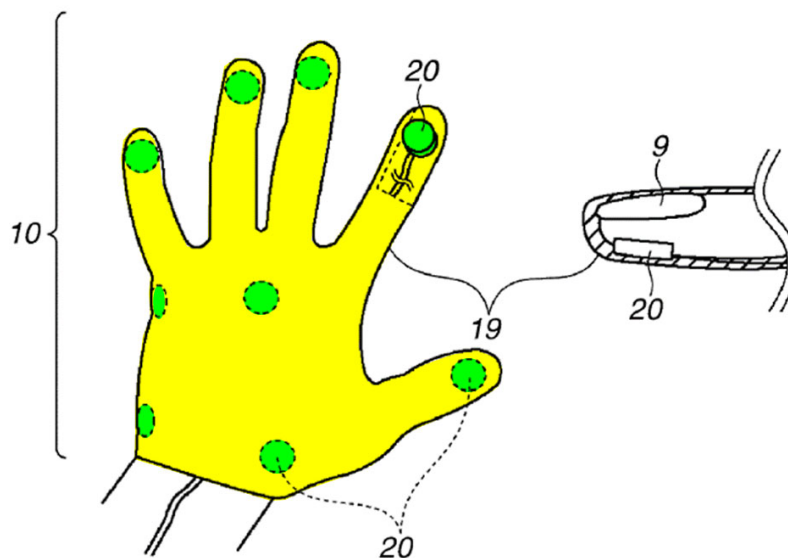
In step S4007, the CPU 201 outputs, via the stimulation information output unit 210, the operation setting information generated in step S4006 to the stimulation generation unit (in the present exemplary embodiment, the cutaneous sense stimulation unit 20) corresponding to the region virtual object contacting the background virtual object. After receiving the operation setting information, the stimulation generation unit operates to generate a stimulation of the intensity indicated by the operation setting information.

(Nogami, ¶0123; *see also id.*, ¶¶0177-0178.) For purposes of limitation 1[g], the

“**haptic signal**” is the signal that includes the operation setting information output by CPU **201**. It would have been obvious that this information would have been transmitted in the form of a haptic “**signal**.” (Cooperstock, ¶104.)

The “**haptic output device**” of limitation 1[g] corresponds in Nogami to one or more **cutaneous sense stimulation units 20**, which are included as a part of the stimulation generation unit. This is shown in Figure 3:

FIG.3



(Nogami, Fig. 3 (highlighting added); *see also id.*, ¶¶0061-0062 (describing cutaneous sense stimulation units).)

The one or more **cutaneous sense stimulation units 20** incorporated within stimulation generation unit **10** (and any associated electronics within a stimulation generation unit enabling its operation) thus discloses a “**haptic output device**.”

(Cooperstock, ¶105.) This is because cutaneous sense stimulation units **20** express tactile sense information to the user. (Nogami, ¶¶0013 (“A device that expresses tactile sense information is generally called a ‘haptic device’ or a ‘haptic display’. Such a ‘haptic device’ or a ‘haptic display’ includes a force feedback providing apparatus that expresses a reaction from a virtual object and a cutaneous sense providing apparatus (tactile display) that provides a stimulation to a cutaneous sense of a user.”), 0061-0071 (describing stimulation generation unit and cutaneous sense stimulation via vibration and other techniques).) This is consistent with the description of “haptics” in the ’298 patent and how that term was commonly understood. (Cooperstock, ¶105 (citing ’298, 3:6-9).) Moreover, the exemplary cutaneous sense stimulation units described in Nogami, including “vibration motor,” “voice-coil type device,” and other “actuators,” are consistent with examples of **“haptic output devices”** described in the ’298 patent. (Nogami, ¶¶0067-0069; *see also* ’298, 4:57-64 (“electronic sound transducer,” “actuator”), 7:66-8:7 (“electric motor with an unbalanced mass on its driveshaft”); Cooperstock, ¶105.)

The haptic signal in Nogami also causes the haptic output device **“to output haptic feedback in accordance with the first feedback parameter and the second feedback parameter.”** This is because the haptic feedback delivered to the user via the one or more cutaneous sense stimulation units (**“haptic output device”**) will

reflect the characteristics specified by both the first and second feedback parameters. (Nogami, *e.g.*, ¶¶0123 (“After receiving the operation setting information, the stimulation generation unit operates to generate a stimulation of the intensity indicated by the operation setting information.”), 0192 (“Furthermore, as different stimulations to be provided according to the present exemplary embodiment, stimulations of different patterns can be used.”); Cooperstock, ¶103.) For example, the operation setting information in Nogami will cause the one or more cutaneous sense stimulation units to output haptic feedback to the user with an intensity specified by the “**first parameter**,” but also with the duration of and reduction in intensity (Fig. 14), or pattern (Figs 10A-10B), specified by the “**second parameter**” as described in detail above.

Additionally, a skilled artisan would have been motivated to use both feedback parameters to output haptic feedback because the combination of the two parameters would have provided more informative haptic feedback than either parameter alone. This would have beneficially enabled the system of Nogami to output more complex haptic feedback reflecting the appropriate intensity based on the region of the body on which the stimulation generation unit is worn (based on the “**first feedback parameter**”), with further adjustments to the intensity duration and/or pattern based on whether virtual contact was made outside the user’s view

volume/attention range (based on the “**second feedback parameter**”), thus enabling delivery of haptic feedback that is better tailored to the user and the nature of the virtual contact. (Cooperstock, ¶103.)

2. Claim 2: “The system of claim 1, wherein the virtual object is a three-dimensional virtual object.”

As explained for claim 1, Nogami discloses various virtual objects that are “**three-dimensional**,” such as in Figure 1 (3D object **300**, a virtual automobile) and Figure 6 (3D objects **302** and **303**). (Nogami, Figs. 1 & 6; *see also id.*, ¶0249 (describing using a “cylindrical column” to determine virtual contact between region virtual object and background virtual object); Cooperstock, ¶108.)

3. Claim 3: “The system of claim 1, wherein the virtual environment is an augmented reality environment.”

As explained in the discussion of limitation 1[c], the claimed “**virtual environment**” corresponds in Nogami to images combining one or more virtual objects with a user’s real-world surroundings. (Cooperstock, ¶¶71-72.) The ’298 patent makes clear that this integration of virtual objects and real-world imagery is an “**augmented reality environment**.” (’298, 1:35-40 (“Augmented reality [may] integrate 2D and/or 3D virtual objects into live video that is digitally processed and ‘augmented’ with the 2D and/or 3D virtual objects. In other words, this digital processing can mix real and virtual real worlds together...”)).)

4. Claim 6: “The system of claim 1, wherein the peripheral is an electronic device that comprises the haptic output device.”

As explained for limitation 1[d], the “**peripheral**” in Nogami corresponds to a stimulation generation unit. As explained for limitation 1[g], the stimulation generation unit also “**comprises the haptic output device**,” because the one or more cutaneous sense stimulation units **20** (“**haptic output device**”) are included as a part of the stimulation generation unit. (Nogami, *e.g.*, Fig. 3, ¶¶0061, 0233 (cutaneous sense stimulation unit is mounted on stimulation generation unit), 0264 (same).)

The stimulation generation unit is also an “**electronic device**” because it can include a number of electronic components. For example, it can include vibration motors or other components for delivering haptic feedback. (Nogami, ¶¶0062-0072.) A stimulation generation unit can also include, in one embodiment, a magnetic receiver/sensor for detecting a magnetic field for use in acquiring position and orientation information. (Nogami, ¶0077.)

5. Independent Claim 9

Independent claim 9 is substantially identical to independent claim 1 except that it is written as a method claim. (Cooperstock, ¶111.) Claim 9 recites a method with five steps that are identical to the five functions recited in limitations 1[c] through 1[g] addressed above. Claim 9 is thus disclosed and rendered obvious for the same reasons as claim 1 above. Claim 9 further recites that each of these steps

is performed by a “**processor**,” and as explained for claim 1, Nogami discloses and renders obvious that each of these steps is performed by CPU **201** (“**processor**”). (Cooperstock, ¶¶63-67; Nogami, *e.g.*, ¶0083 (“[E]ach of the following processing operations performed by the calculation processing apparatus **200** is performed with the CPU **201** as the main unit of performing the processing.”), 0091 (“The CPU **201** uses the program and data loaded on the RAM **202** to perform each [sic] processing.”).) (Cooperstock, ¶¶95, 57-59, 68, 72, 74, 76, 84, 88.)

6. Claims 10, 11, and 14

The limitations added by dependent claims 10, 11, and 14 are identical to the limitations recited in dependent claims 2, 3, and 6, respectively. Therefore, for the same reasons discussed above for claims 2, 3, and 6, claims 10, 11, and 14 are disclosed by and obvious over Nogami.

7. Independent Claim 17

Independent claim 17 is substantially identical to independent claim 1 except that it is written as a non-transitory computer-readable medium rather than a system claim. (Cooperstock, ¶114.) As explained for limitation 1[b], the “**non-transitory computer-readable medium**” of claim 17 corresponds in Nogami to either data recording unit **205** or random access memory (RAM) **202**, or both. (Cooperstock, ¶¶64-65.) Claim 17 also states that the computer-readable medium “**compris[es] program code that is executable by a processor**,” that causes the processor to

perform the same functions recited in limitations 1[c]-1[g] addressed above. As explained for limitations 1[a]-[b], the computer-readable medium in Nogami includes “**program code that is executable by a processor,**” *i.e.*, program code executed by CPU 201 that causes the processor to perform the claim steps. (Cooperstock, ¶¶65-67.) Claim 17 is thus disclosed and rendered obvious for the same reasons as claim 1 above.

8. Claims 18, 19, and 22

The limitations added by dependent claims 18, 19, and 22 are identical to the limitations recited in dependent claims 2, 3, and 6, respectively. Therefore, for the same reasons discussed above for claims 2, 3, and 6, claims 18, 19, and 22 are disclosed by and obvious over Nogami.

C. Ground 2: Claims 5, 13, and 21 Are Obvious Over Nogami in View of Nelson.

Claim 5 depends from claim 1 and recites “**wherein the peripheral is a consumer product.**” Claims 13 and 21 are substantially identical to claim 5 but depend from claims 9 and 17, respectively. As explained for limitation 1[d] above, Nogami discloses a “**peripheral**” in the form of a stimulation generation unit, such as glove-like stimulation generation unit 10. (Cooperstock, ¶75.)

Nogami does not expressly state that the glove-like stimulation generation unit “**is a consumer product,**” but this limitation adds nothing of patentable

(Nelson, 1:19-26, 8:30-33.) Figure 9 of Nelson illustrates this device:



(Nogami, Fig. 9 (highlighting added).) Figure 9 shows instrumented glove **161** that, like the stimulation generation unit of Nogami, includes functionality for both detecting its manipulation and providing haptic feedback. (Nelson, 8:30-33, 9:42-45, 10:10-17; Cooperstock, ¶120.)

Nelson also recognizes that instrumented glove **161** can be used in consumer contexts such as playing video games. (Nelson, 1:25 (“games”), 3:16-23 (“character in a game”), 7:60-63 (“game”), 7:65 (“video game”).) For example, Nelson teaches that the instrumented glove can be used with well-known commercially available “home video game console systems” from Nintendo, Sega and Sony. (Nelson, 7:44-47.) Nelson’s instrumented glove **161** thus discloses a “**consumer product.**”

Manner, Rationale and Motivation to Combine (Nogami with Nelson). It would have been obvious to combine Nogami with Nelson, predictably resulting in Nogami’s stimulation generation unit (“**peripheral**”) being “a consumer product.” (Cooperstock, ¶122.) Nogami and Nelson are analogous references in the same field of the ’298 patent of devices that produce haptic effects. (’298, 1:22-28.) Both references disclose similar wearable devices for controlling and interacting with computer-generated graphical environments, and would also have been reasonably pertinent to a number of problems facing the inventors. (Cooperstock, ¶123.)

An ordinarily skilled artisan would have been motivated to combine. An

ordinarily skilled artisan would have regarded the difference between “consumer” and “non-consumer” products to be a marketing distinction immaterial to the system of Nogami. (Cooperstock, ¶124.) An ordinarily skilled artisan would also have recognized that a consumer context would potentially have increased the commercial success of the Nogami system by exposing it to a broader consumer market and the general public, enabling it to provide user experiences across a wider variety of use cases. (Cooperstock, ¶124.) Additionally, allowing stimulation generation unit in Nogami to be a consumer product would have increased the flexibility of the Nogami system by allowing it to be used with a broader range of units provided by third party manufacturers. (Cooperstock, ¶124.) This would have allowed a skilled artisan implementing Nogami to take advantage of specialization within the industry in the development and manufacturing of glove-like stimulation generation units, thus freeing the artisan from the burden of designing, implementing, and manufacturing its own stimulation generation units for use with the Nogami system. (Cooperstock, ¶124.) A person of ordinary skill in the art would have had at least a reasonable expectation that the combination would have been successful, considering that the combination here involves nothing more than Nogami’s existing stimulation generation units being used in a consumer context. (Cooperstock, ¶125.)

D. Ground 3: Claims 8, 16, and 24 Are Obvious Over Nogami in View of Moriya.

Claim 8 depends from claim 1 and recites “**wherein the peripheral comprises a wearable computer.**” Claims 16 and 24 are substantially identical to claim 8 but depend from claims 9 and 17, respectively. As explained for limitation 1[d] above, Nogami discloses a “**peripheral**” in the form of a stimulation generation unit, such as glove-like stimulation generation unit. (Cooperstock, ¶75.)

A stimulation generation unit can include one or more cutaneous sense stimulation units **20** and, in one embodiment, can also include a magnetic receiver/sensor for detecting a magnetic field for use in acquiring position and orientation information. (Nogami, ¶¶0061, 0077, Fig. 3.) In the magnetic receiver/sensor embodiment, calculation processing apparatus **200** acquires position and orientation sensor information from the stimulation generation unit. (Nogami, e.g., ¶¶0082, 0076.) Nogami also discloses that stimulation generation unit is “**wearable**,” as it can be worn on the user’s hand, for example. (Nogami, ¶¶0049, 0051, Fig. 1.) But Nogami does not expressly state that the peripheral is a wearable “**computer**,” but this would have been obvious. As explained below, it would have been obvious for a stimulation generation unit to include a processor for performing operations, such as computing position and orientation information and transmitting it to calculation processing apparatus **200**, predictably resulting in a stimulation

generation unit comprising a wearable “**computer.**”

Moriya picks up where Nogami leaves off and provides further details of how to implement wearable magnetic sensors for virtual reality (VR) applications. Moriya describes a wearable sensor – such as sensors **40** shown in Figure 1 below – that includes a magnetic field detector and a processor for computing the position and orientation coordinates of the sensor. (Moriya, *e.g.*, Figs. 1-3, 3:37-44, 4:42-5:4, 9:51-65 (describing Figs. 1-3), 11:50-43, 12:66-13:5, 14:4-14.)

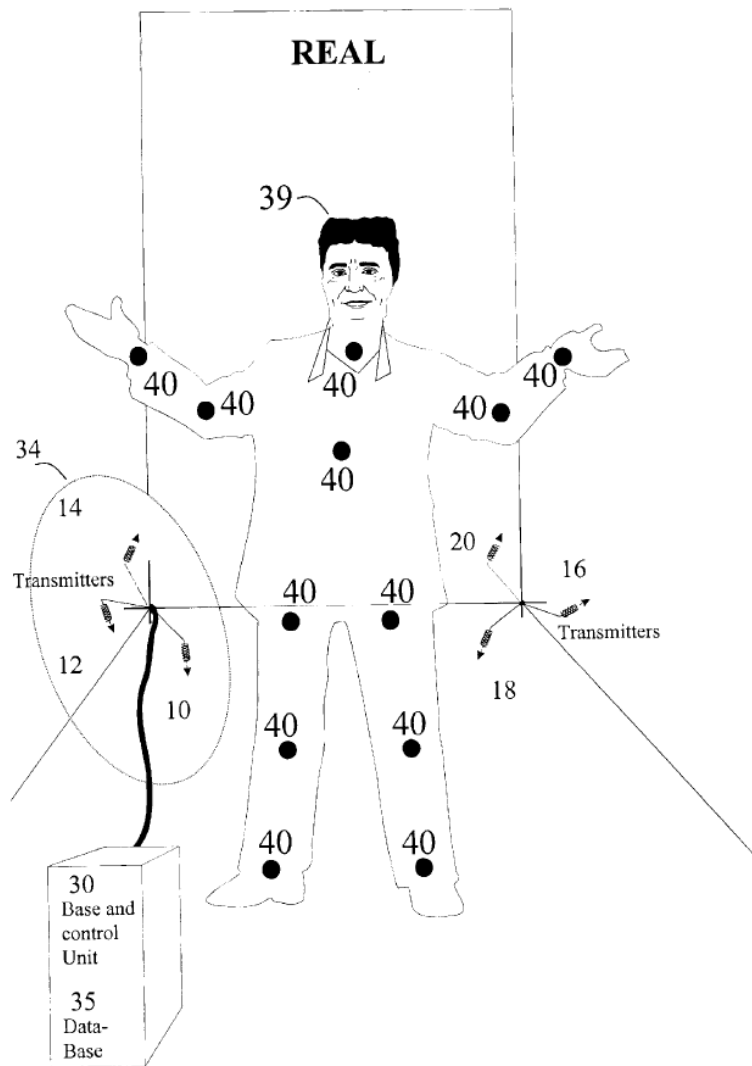


Fig. 1

(Moriya, Fig. 1.) Figure 2 of Moriya details the components of **sensor 40**, including **magnetic field detector 41** and **digital signal processor ("DSP") 62**:

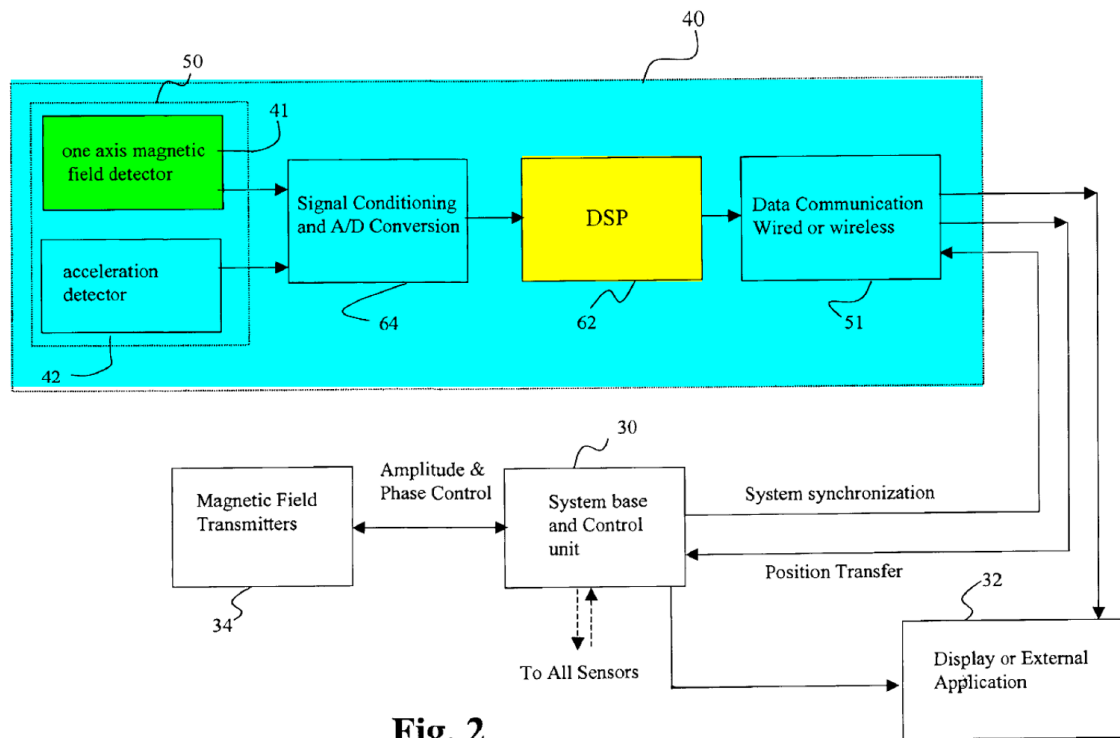


Fig. 2

(Moriya, Fig. 2 (highlighting added).) Sensor **40** receives, stores and processes input from the magnetic field detector **41** to compute position and orientation coordinates of the sensor, and outputs the results. (Moriya, 4:55-5:4, 12:66-13:5.) A skilled artisan would have understood sensor **40** in Moriya to comprise a “**computer**” because it is capable of processing information and producing a desired result by accepting and processing input to produce output. (Cooperstock, ¶130; *see also Microsoft Computer Dictionary* (5th ed. 2002) (EX1006), p.009 (“**computer n.** Any device capable of processing information to produce a desired result.”).)

Manner, Rationale and Motivation to Combine (Nogami with Moriya). It would have been obvious to combine Nogami with Moriya’s teachings regarding

magnetic-sensor-based position and orientation sensors. The combination would have predictably resulted in the Nogami stimulation generation unit including a processor for calculating position and orientation information, thus resulting in it being a wearable “**computer.**”

Nogami and Moriya are analogous references in the same field of the '298 patent of devices for computer-generated virtual environments. ('298, 1:22-47.) As noted, Nogami notes that magnetic sensors can be used for acquiring position and orientation information, and Moriya similarly teaches that its wearable magnetic sensors can be used for acquiring a user's position and orientation information in virtual reality contexts. (Nogami, ¶0077; Moriya, Figs. 1-3, 3:37-44, 4:42-5:4, 9:51-65 (describing Figs. 1-3), 11:50-43, 12:66-13:5, 14:4-14.) These references would also have been reasonably pertinent to a number of problems facing the inventors, such as how to acquire position and orientation information in order to interact with a graphical environment. (Cooperstock, ¶132.)

Because Nogami only briefly mentions that wearable magnetic sensors can be used in its stimulation generation units, a person of ordinary skill in the art, looking to implement or adapt Nogami's system, would have been motivated to look to Moriya for additional information about magnetic-based position and orientation sensors. As such, Moriya simply picks up where Nogami leaves off, and a person

of ordinary skill in the art would have readily appreciated the applicability of Moriya's teachings to Nogami. (Cooperstock, ¶133.)

An ordinarily skilled artisan would also have been motivated to implement the stimulation generation unit in Nogami to include a processor for performing operations, such as computing position and orientation information as disclosed in Moriya, in order to increase the efficiency of the system in at least two ways. First, this would have relieved Nogami's calculation processing apparatus **200** from the responsibility and burden of performing this task, thus freeing it to perform other operations. (Cooperstock, ¶134.) Second, this would have reduced the amount of data the stimulation generation unit would have transmitted to Nogami's calculation processing apparatus **200**, because the stimulation generation unit need only transmit the calculated values and not the potentially larger amount of raw sensor data that must be processed in order to calculate those values. (Cooperstock, ¶¶134-135.)

A person of ordinary skill in the art would have had at least a reasonable expectation that the combination would have been successful. As noted, the combination merely involves using Moriya's wearable position and orientation sensors in Nogami's stimulation generation units. Magnetic-sensor based position and orientation sensors were well known by 2010. (Cooperstock, ¶136.) A person of ordinary skill in the art would have found the disclosures of Nogami and Moriya

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more than adequate to implement the teachings relied upon above using conventional techniques and without undue experimentation. (*Id.*)

VII. CONCLUSION

Petitioner respectfully requests institution of review on the challenged claims.

Dated: May 26, 2023

Respectfully submitted,

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Petition for *Inter Partes* Review of
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CERTIFICATE OF COMPLIANCE WITH WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), I certify that this petition complies with the type-volume limits of 37 C.F.R. § 42.24(a)(1)(i) because it contains 10,421 words, according to the word-processing system used to prepare this petition, excluding the parts of this petition that are exempted by 37 C.F.R. § 42.24(a) (including the table of contents, a table of authorities, mandatory notices, a certificate of service or this certificate word count, appendix of exhibits, and claim listings).

DATED: May 26, 2023

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Petition for *Inter Partes* Review of
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CERTIFICATE OF SERVICE

I hereby certify, pursuant to 37 C.F.R. Sections 42.6 and 42.105, that a complete copy of the attached **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 10,248,298 B2**, including all exhibits (Nos. 1001-1009) and related documents, are being served via Federal Express on the 26th day of May, 2023, the same day as the filing of the above-identified document in the United States Patent and Trademark Office/Patent Trial and Appeal Board, upon Patent Owner by serving the correspondence address of record with the USPTO as follows:

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