

Petition for *Inter Partes* Review of  
U.S. Patent No. 10,664,143 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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META PLATFORMS, INC.,  
Petitioner

v.

IMMERSION CORPORATION,  
Patent Owner

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Case IPR2023-00945  
U.S. Patent No. 10,664,143 B2  
Issue Date: May 26, 2020

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**PETITION FOR *INTER PARTES* REVIEW  
OF U.S. PATENT NO. 10,664,143 B2**

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**List of Exhibits**

| <b>Exhibit No.</b> | <b>Description of Document</b>                                                                                                                                                        |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1001</b>        | U.S. Patent No. 10,664,143 B2 to David M. Birnbaum, Danny A. Grant, and Robert W. Heubel (filed February 2, 2019 and issued May 26, 2020) (“ <b>’143</b> ” or “ <b>’143 patent</b> ”) |
| <b>1002</b>        | Declaration of Jeremy Cooperstock, Ph.D. (“ <b>Cooperstock</b> ”)                                                                                                                     |
| <b>1003</b>        | U.S. Patent Application Publication No. 2009/0066725 A1 to Atsushi Nogami and Naoki Nishimura (filed Sep. 9, 2008 and published March 12, 2009) (“ <b>Nogami</b> ”)                   |
| <b>1004</b>        | Excerpts from <i>Microsoft Computer Dictionary</i> (5th ed. 2002)                                                                                                                     |
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| <b>1006</b>        | Joint Claim Construction Statement filed in <i>Immersion Corp. v. Meta Platforms, Inc.</i> , No. 6:22-cv-00541-ADA (filed January 21, 2023)                                           |
| <b>1007</b>        | Prosecution history of the ’143 patent                                                                                                                                                |
| <b>1008</b>        | 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 '143 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. (EX1008, p.001.)

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

Petitioner provides the following designation of counsel.

| LEAD COUNSEL                                                                                                                                                                                            | BACK-UP COUNSEL                                                                                                                                                                                              |
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**D. Service Information**

This Petition is being served by Federal Express to the attorneys of record for the '143 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 twelve (12) 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 '143 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, 7, 8-10, 14, 15-17, 20 | Nogami           |

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.

**§ 314(a):** Petitioner has not previously filed an IPR petition against the '143 patent, and is unaware of any other prior IPR petition filed against the '143 patent by any party. In the pending litigation, the district court has continued the claim

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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 as of the filing of this Petition). 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)**: The Board assesses §325(d) issues under the two-part *Advanced Bionics* framework: (1) whether the same or substantially the same art was previously presented to the Office and if so (2) whether Petitioner has demonstrated that the Examiner erred in a manner material to the patentability of challenged claims. In this case, none of the prior art cited in the grounds identified in **Part III.B** above was previously presented during prosecution of the '143 patent.

#### **IV. OVERVIEW OF THE '143 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, ¶¶8-9.) 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 '143 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.” ('143, 1:25-31.)

The “Background” of the '143 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.” ('143, 1:35-38.) The '143 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.” ('143, 1:38-45.)

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The patent goes on to describe “a system configured to present interactive content to a user that is manipulating a peripheral.” (’143, 1:54-56.) 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.” (’143, 1:59-2:5.) The ’143 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.” (’143, 3:9-12.)

**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 “**real space**” as recited in the challenged claims. (EX1006, p.002.) Petitioner does not believe any term 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. Nevertheless, Petitioner reserves its right to respond in the event of any new claim construction arguments Patent Owner may make in these proceedings.

**VI. THE CHALLENGED CLAIMS ARE UNPATENTABLE.**

**A. Overview of the Ground of Unpatentability**

The challenged claims attempt to lay claim to well-known interactive content techniques for providing haptic feedback to a user based on the position of a peripheral worn on the user's head. All of 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 '143 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.

Nogami qualifies as prior art to the '143 patent under at least 35 U.S.C. § 102(b) (pre-AIA) because it is a patent application published on March 12, 2009, which is more than one year before the application filing date for the '143 patent. (EX1001, EX1003.) Nogami is an analogous reference in the same field as the '143 patent of providing interactive content, including a virtual space that includes interactive content with which the user can interact, and in response to which, haptic stimulation can be provided. (Cooperstock, ¶39.) Nogami would also have been reasonably pertinent to a number of problems facing the '143 patent inventors. (*Id.*) 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.*)

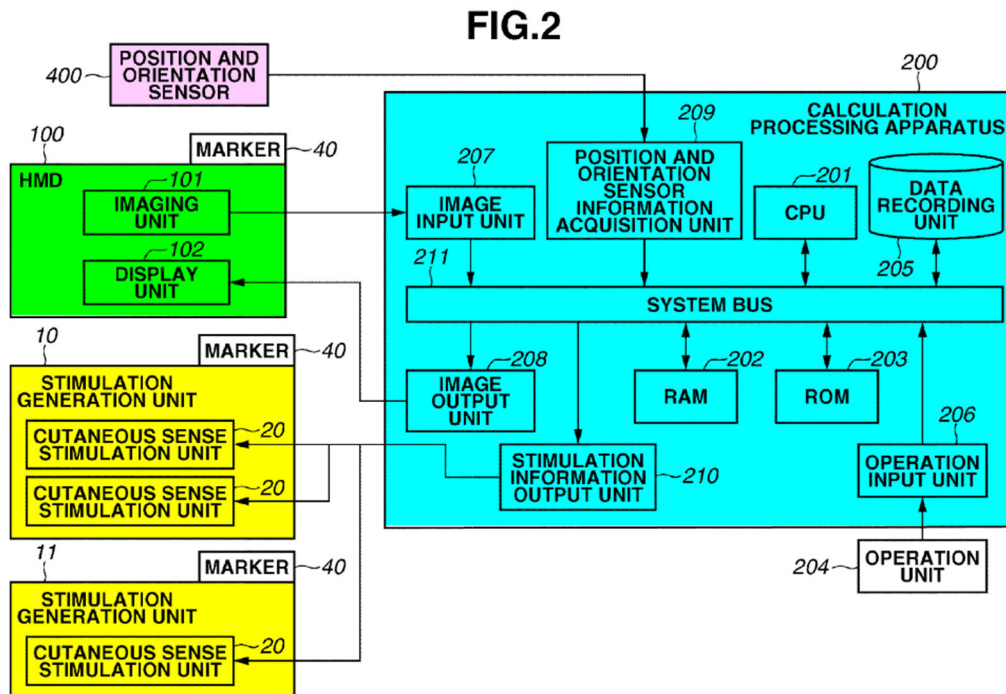
Nogami also describes at least 10 “exemplary embodiments” with respect to its system. (Nogami, *e.g.*, ¶¶0046, 0202, 0214, 0233, 0240, 0252, 0262, 0268, 0275, 0278, 0284.) But Nogami’s separately-numbered “embodiments” merely describe additional features that could have been incorporated into Nogami’s system rather than different or separate systems altogether. (Cooperstock, ¶40.) Nogami confirms as much by stating, after discussing the “Tenth Exemplary embodiment,” that “the above-described exemplary embodiments can be used in combination with each other where appropriate.” (Nogami, ¶0283.) It therefore would have been obvious to include and/or combine the additional 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.”). As explained below, each limitation of the challenged claims is disclosed by and rendered obvious over Nogami.

**B. Ground 1: Claims 1-3, 7, 8-10, 14, 15-17, and 20 Are Obvious Over Nogami.**

**1. Independent Claim 1**

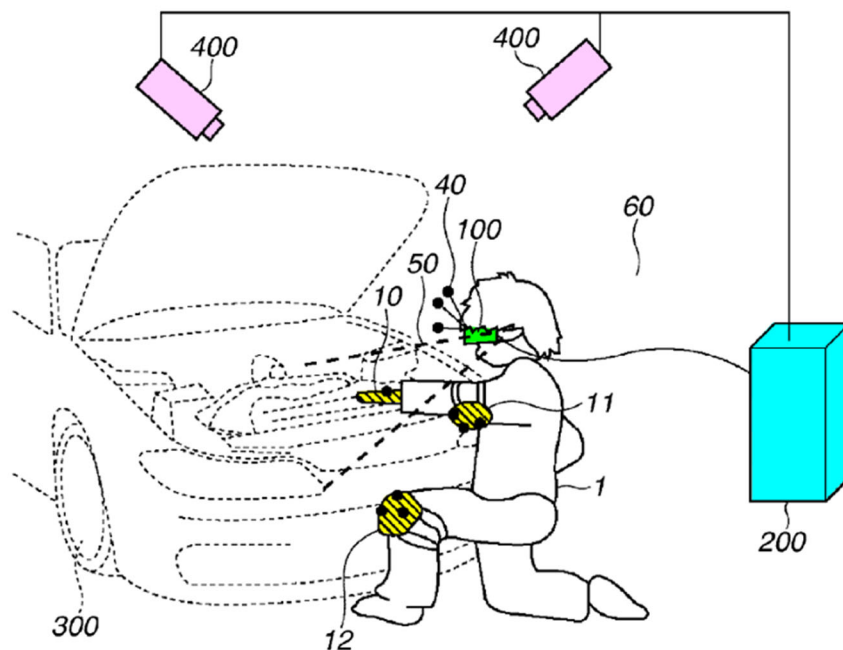
The preamble of claim 1 simply recites, “[a] **system comprising**....” Nogami discloses a “**system**” that comprises various components shown in Figures 1 and 2

(reproduced below). Figure 2 of Nogami provides a block diagram of the system and these components (and respective subcomponents):



(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, when in actual 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.*) But this is just one embodiment. As discussed in more detail below, 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.) Under this embodiment, “a transmitter for generating a magnetic field is provided in the real space, and the HMD 100... ha[s] a receiver for detecting a change in the magnetic field occurring accordingly as the HMD 100... change[s] [its] position and orientation within the magnetic field.” (Nogami, ¶0077.) As shown below, Petitioner has relied upon this magnetic sensor embodiment for the claimed “**position sensor**” of limitation 1[a] below.

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 comprises the components described above, discloses and renders obvious each claim limitation.

**(a) “a position sensor;” (Limitation 1[a])**

As just explained, Nogami discloses an embodiment for **position and orientation sensor 400** in which the sensor takes the form of a magnetic sensor included as part **HMD 100**. (Nogami, ¶¶0077-0078.) As Nogami explains:

For example, a method that uses a magnetic sensor can be used for acquiring the position and orientation information about the HMD 100 and the stimulation generation units 10, 11, and 12. In this method, a transmitter for generating a magnetic field is provided in the real space, and the HMD 100 and the stimulation generation units 10, 11, and 12 each have a receiver for detecting a change in the magnetic field occurring accordingly as the HMD 100 or the stimulation generation units 10, 11, and 12 change their position and orientation within the magnetic field.

In addition, the 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.

(Nogami, ¶¶0077-0078.)<sup>1</sup>

Nogami therefore discloses “**a position sensor**” in the form of a magnetic sensor that is part of **HMD 100**, *i.e.*, a receiver that senses a magnetic field generated

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

by a transmitter.<sup>2</sup> This magnetic sensor qualifies as a “**position sensor**” because it detects a change in the magnetic field as HMD **100** changes its position and orientation within the magnetic field. (Nogami, ¶0077 (noting that magnetic sensor “can be used for acquiring the position and orientation information about the HMD 100...”).) This is consistent with the ’143 patent, which similarly discloses a magnetic sensor (which the ’143 patent calls a “magnetometer”) as an example of a position sensor. (See ’143, 5:35-38; Cooperstock, ¶54.)

(b) “a processor; and” (Limitation 1[b])

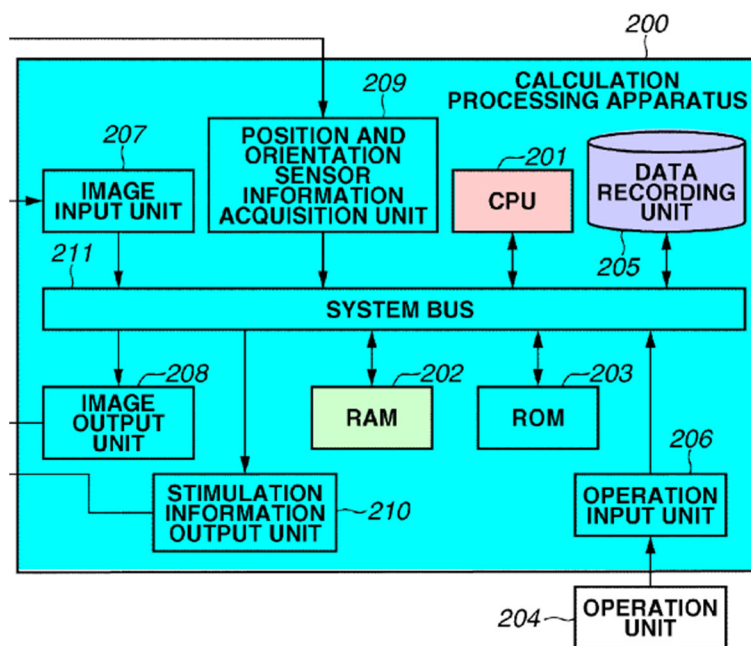
(c) “a non-transitory computer-readable medium comprising program code that is executable by the processor to cause the processor to:” (Limitation 1[c])

Because these two limitations are closely-related, Petitioner will address them together. The claimed “**processor**” and “**non-transitory computer-readable**

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<sup>2</sup> As noted above for the preamble, Nogami discloses an alternative embodiment in which position and orientation sensor **400** includes one or more cameras that are physically apart from HMD **100**. (Nogami, ¶0044, Fig. 1.) Petitioner has not relied upon that embodiment as the claimed “**position sensor**” for this Petition because of challenged dependent claim 2, discussed below, which recites that the position sensor must be “**positioned on the peripheral,**” which has been mapped to HMD **100** of Nogami as explained for limitation 1[f] below.

**medium”** are disclosed by **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 non-transitory computer-readable medium,” 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 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 steps of claim 1 addressed below. (Cooperstock, ¶¶59, 68, 70, 72, 74, 84, 88.)

**(d) “output first interactive content to a display, the first interactive content comprising a virtual environment;”  
(Limitation 1[d])**

Limitations 1[d] and 1[g] recite “**first interactive content**” and “**second interactive content**,” respectively. The ’143 patent does not appear to expressly define “**interactive content**” but identifies various examples including (among others) “a virtual object” that may be output visually and/or haptically to a user. (’143, 3:2-6 (“Interactive content may include a representation of the real world, a representation of a user, a representation of a real-world object, a virtual object, real and/or artificial sounds, other content, and/or combinations thereof.”), 4:51-52 (“Interactive content may be outputted visually, audibly and/or haptically.”).) As explained below, Nogami similarly discloses the claimed “**interactive content**.”

With respect to limitation 1[d], Nogami discloses “**first interactive content**” in the form of a collection of one or more “**background** virtual objects” combined with images of a user’s real-world surroundings, which are output for display to the user through HMD **100**. (Cooperstock, ¶¶61-64.)

By way of background, the system in Nogami includes two types of “virtual objects”: **(1)** “**region** virtual objects” and **(2)** “**background** virtual objects.”

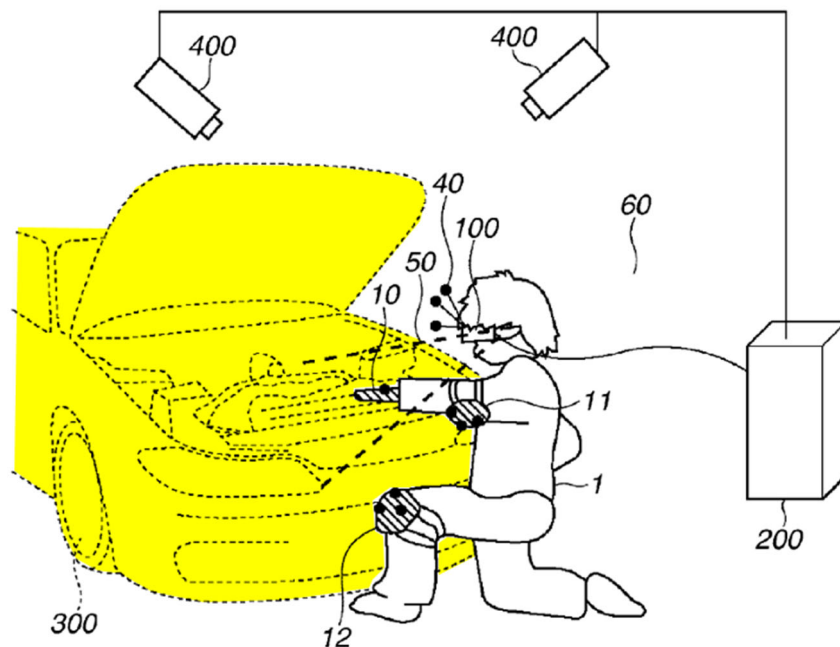
(Nogami, *e.g.*, ¶0111-0114.) Nogami describes a “region virtual object” as a virtual representation of a stimulation generation unit – for example, a user’s glove-shaped stimulation generation unit could have a corresponding glove-shaped “region virtual object.” (Nogami, *e.g.*, ¶0268 (“[T]he region 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.) Petitioner has mapped the region virtual object in Nogami the “second interactive content” of limitation 1[g], and as such, Petitioner will discuss it separately below.

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, background virtual objects in Nogami, combined with images of a user’s surroundings, provide an example of “**first interactive content**” comprising at least “**a 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

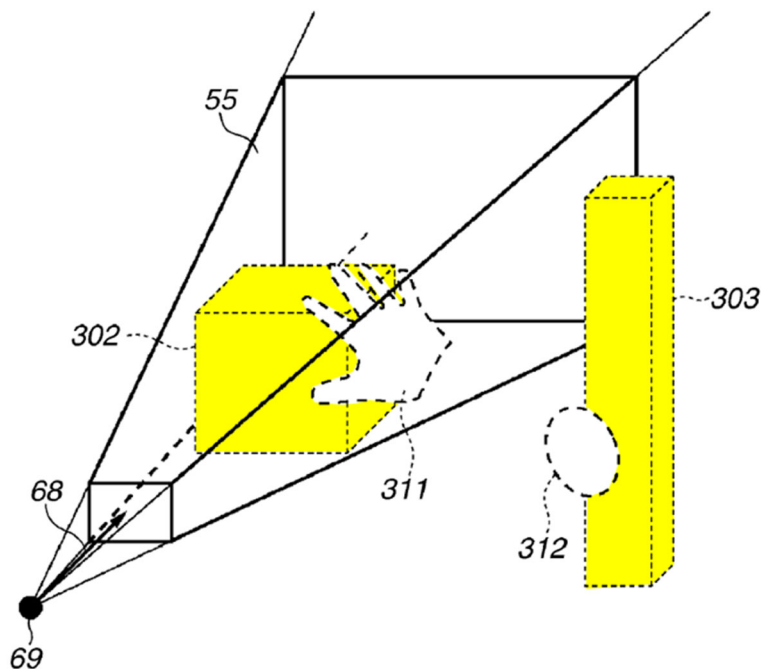
of an automobile in an actual size” (Nogami, ¶50), highlighted in yellow below:

**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**.”).)

Nogami makes clear that a background virtual object provides “**interactive content**” because “the user **1** can experience a virtual space including a virtual object **300** with both a visual sense and a tactile sense.” (Nogami, ¶0049.) The user can interact with a background virtual object in a number of ways. (Cooperstock, ¶64.)

For example, a user can visually interact with a background virtual object by changing their position relative to the object, thereby changing how the object is displayed. (Nogami, *e.g.*, ¶¶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.”), 0027 (“...generate an image in a virtual space including a virtual object based on position and orientation information about a viewpoint of a user...”), 0140-0147 & Fig. 6 (describing how virtual objects including background virtual objects are generated for display based in part on current position and orientation information).) Additionally, a user can also interact with a background virtual object by touch. For example, a stimulation generation unit (via its corresponding region virtual object) can make contact with the background virtual object. (Nogami, *e.g.*, ¶0097 (“[T]he calculation processing apparatus **200** detects whether the stimulation generation unit **10**, **11**, or **12** contacts a virtual object.”); *see also id.*, ¶¶0098-0103, Fig. 4 (*e.g.*, steps **S4004** – **S4007**), 0117-0123 (describing steps **S4004** – **S4007**).) This can in turn result in a haptic stimulation being generated for the user. (Nogami, ¶¶0122-0123, Fig. 4 (Step **S4006**, **4007**).) Both of these examples confirm that a background virtual object is an example of “**interactive content**,” as claimed.

Nogami discloses that the first interactive content also “**compris[es] a virtual environment,**” as claimed. This is because 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; *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** via the image output unit **208**.”), 0097.)

Nogami therefore discloses “**first interactive content comprising a virtual environment,**” which includes one or more interactive background virtual objects

combined with images of a user's real-world surroundings, which are output to the display of HMD 100 (“**output... to a display**”). The first interactive content in Nogami comprises “**a virtual environment**,” as noted, because the background virtual objects are combined with images of a user's surroundings. (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 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.) 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.) “Accordingly,” as Nogami explains, “the user 1 can experience a virtual space including a virtual object 300 with both a visual sense and a tactile sense.” (Nogami, ¶0049.)

Petitioner notes that nothing in the claim requires that the output “**virtual environment**” be purely “virtual” or computer-generated. Dependent claim 4, for example, recites that the claimed “**virtual environment**” “comprises an augmented reality environment.” (’143, 13:18-19 (claim 4).) “Augmented reality,” as the ’143

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...” (’143, 1:38-43.) The claimed “**virtual environment**” can thus include images based on surroundings from the real world. (Cooperstock, ¶67.)

As explained above, it also would have been obvious that the outputting step of limitation 1[d] is accomplished in Nogami by a processor. (Cooperstock, ¶68.) 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 limitation 1[c] 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, ¶¶55, 58, 68; 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.)

(e) “**receive one or more sensor signals from the position sensor;**” (Limitation 1[e])

As explained for limitation 1[a] above, the “**position sensor**” in Nogami corresponds to a magnetic sensor/receiver that is part of HMD **100**, which is used to obtain position and orientation information of HMD **100**. (Nogami, ¶¶0076-0078.) Nogami further explains that CPU **201** receives sensor information from the magnetic sensor via position and orientation sensor information acquisition unit **209** (and system bus **211**). (Nogami, ¶0108 (“In step S**4002**, the CPU **201** acquires position and orientation information about the HMD **100** ... 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**.”); *see also id.*, ¶¶0084, 0093-0094, 0105-0106, 0096 & Fig. 4 (components connected via system bus **211**); Cooperstock, ¶69.)

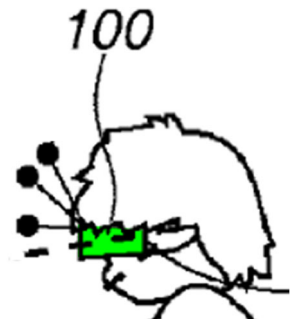
An ordinarily skilled artisan would have understood and found it obvious that the sensor information in Nogami would have been received by CPU **201** from the position sensor in the form of one or more sensor “**signals.**” (Cooperstock, ¶69.) And for substantially the same reasons as those discussed above, it would have been apparent and obvious that that CPU **201** would have executed program code to carry out this step. (Cooperstock, ¶70; Nogami, ¶0091 (“The CPU **201** uses the program

and data loaded on the RAM **202** to perform each processing.”); *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.”), 0284-0287.)

- (f) “**determine a position of a peripheral in real space based on the one or more sensor signals, the peripheral configured to be worn on a user’s head;**” (Limitation 1[f])

For limitation 1[f], “**a peripheral... configured to be worn on a user’s head**” corresponds in Nogami to HMD **100** (shown in green at right). (Nogami, ¶¶0049 (“an HMD **100** is mounted on the head of the user **1**”), 0056 (the user “wears the HMD **100** on his head”), Fig. 1 (excerpted at right, showing user wearing HMD **100** (highlighted in green) on their head).)

This is consistent with the ’143 patent, which describes a peripheral 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.” (’143, 3:43-53.) HMD **100** is a “**peripheral**” because a user can manipulate and interact with HMD **100** by performing the action of placing HMD **100** on their head and then moving their head, which changes the magnetic fields used to determine position and/or orientation. (Cooperstock, ¶71; Nogami, ¶¶0076-0077; *see also id.*, ¶0077 (“... HMD **100**... ha[s] a receiver for



detecting a change in the magnetic field occurring accordingly as the HMD **100**... change[s] [its] position and orientation within the magnetic field.”.) HMD **100** also qualifies as a “**peripheral**” as that term was commonly understood in the computing context, because HMD **100** is a device that provides input to (and receives output controlling its operation from) calculation processing apparatus **200**, which for example, “includes a general-purpose personal computer (PC).” (Nogami, ¶0082; *see also Microsoft Computer Dictionary* (5th ed. 2002) (EX1004), p.0024 (“**peripheral**. *n.* In computing, a device, such as a disk drive, printer, modem, or joystick, that is connected to a computer and is controlled by the computer’s microprocessor.”); Cooperstock, ¶71.)

An ordinarily skilled artisan would have understood and found it obvious that CPU **201** (“**processor**”) in Nogami “**determines a position of a peripheral**,” *i.e.*, HMD **100**, “**based on the one or more sensor signals**.” This is because, as explained for limitation 1[e] above, CPU **201** receives sensor signals reflecting position information from the magnetic sensor. (Nogami, ¶0108, Fig 4 (Step S4002); Cooperstock, ¶¶69-70, 72, 74.) CPU **201** in Nogami thus “**determine[s] a position**” of HMD **100**, “**based on the one or more sensor signals**,” because it obtains the sensor signals and associates position information with HMD **100** for use in subsequent processing. (Cooperstock, ¶72.) As Nogami explains:

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 S4002 as the position and orientation information about the current viewpoint of the user 1.

(Nogami, ¶¶0108-0109.)

Nogami further confirms that the determined position of HMD 100 represents its position “**in real space.**” This is because the position of HMD 100 is determined by detecting a magnetic field from a transmitter located “in real space:”

For example, a method that uses a magnetic sensor can be used for acquiring the position and orientation information about the HMD 100 and the stimulation generation units 10, 11, and 12. In this method, a transmitter for generating a magnetic field is presented in real space, and the HMD 100 and the stimulation generation units 10, 11, and 12 each have a receiver for detecting a change in the magnetic field occurring accordingly as the HMD 100 or the stimulation generation units 10, 11, and 12 change their position and orientation within the magnetic field.

In addition, the 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.

(Nogami, ¶¶0077-0078.) It would have been obvious that the determined position of HMD **100** in three-dimensional space (x, y, z) as disclosed in Nogami above discloses a position “**in real space based on the one or more sensor signals,**” as claimed. This is because, as discussed, the signals from the magnetic sensor provide information about the position of HMD **100** based on magnetic fields within the real/physical space within which the sensor operates. (Cooperstock, ¶73.)

As explained in **Part V**, the parties in the pending litigation have proposed competing constructions of “**real space,**” but Nogami satisfies either construction. Petitioner has asserted that “**real space**” means “*a three-dimensional area in the real world,*” while Patent Owner contends that the term should be given is “plain and ordinary meaning” but “*to 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.’*” (EX1006, p.002.) Nogami satisfies both 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. (Cooperstock, ¶73.)

(g) **“output second interactive content to the display based on the position of the peripheral in real space, the second interactive content being different from the first interactive content;” (Limitation 1[g])**

As explained above for limitation 1[d], Nogami discloses two types of “virtual objects”: (1) “region virtual objects” and (2) “background virtual objects.” (Nogami, e.g., ¶¶0111-0114; Cooperstock, ¶¶61-63.) And as also explained for limitation 1[d], the claimed “**first interactive content**” in Nogami includes one or more “background virtual objects.” (Cooperstock, ¶¶62-64.)

The “**second interactive content**” recited for limitation 1[g] here corresponds to a “region virtual object” within that virtual space – and in particular, a region virtual object that includes the shape of a virtual work tool, such as a screwdriver or wrench, that can be displayed to a user:

[A]s the region virtual object disposed according to the position and orientation of the glove-like shaped stimulation generation unit, a virtual object having a shape like a hand holding a work tool can be used. In this case, the virtual object can be actually displayed as well as used in the processing for determining the presence of an interference with the background virtual object and the processing for determining whether the contact has occurred within the attention range. Accordingly, the user can perform a work and a verification using a virtual work tool. . . .

[T]he CPU 201 sets a shape of a work tool such as a screwdriver or a

wrench as the shape of the region virtual object to set the shape different from that of the actual stimulation generation unit and displays the same.

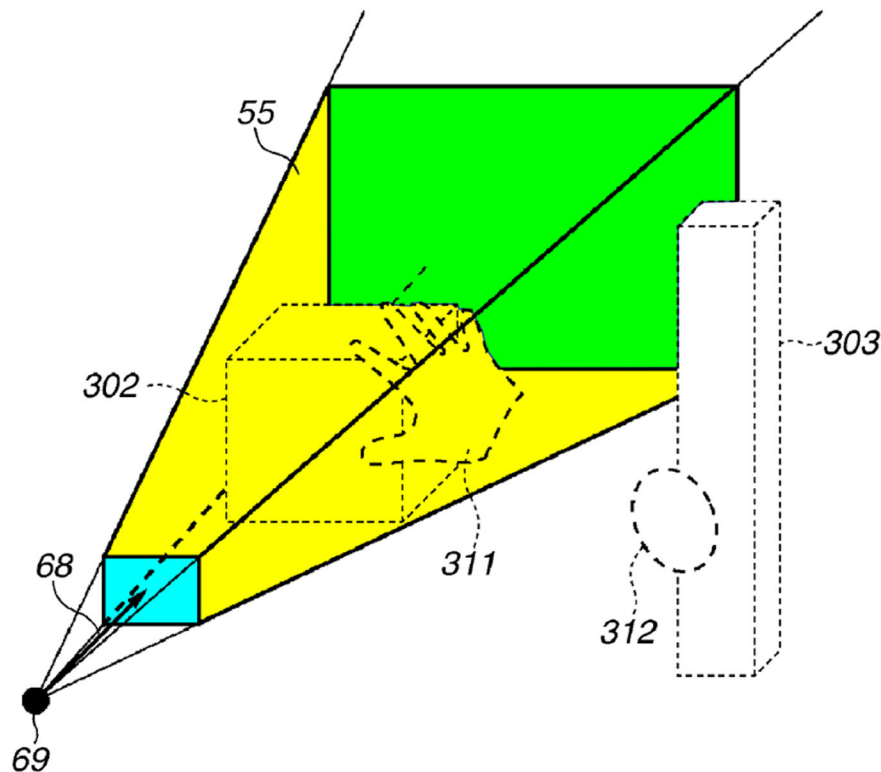
(Nogami, ¶¶0270, 0272; *see also id.* ¶¶0271-0273.)

A region virtual object in the form of a virtual work tool region is “**interactive content**” because, like a background virtual object discussed earlier, a user can interact with it both visually and by touch. (Cooperstock, ¶75.) A user can visually interact with the virtual work tool, for example, by changing the relative positions of HMD **100** or the stimulation generation unit associated with the virtual work tool. (Nogami, *e.g.*, ¶¶0005, 0027, 0109, 0140-0147 (describing how virtual objects including region virtual objects are generated for display based on current position and orientation information).) A user can also interact with the virtual work tool by touch, by experiencing haptic feedback from the associated stimulation generation unit based on the system calculating that the virtual work tool has contacted a background virtual object. (Nogami, *e.g.*, ¶0270 (“[T]he virtual object can be... used in the processing for determining the presence of an interference with the background virtual object and the processing for determining whether the contact has occurred within the attention range.”); *see also id.*, ¶¶0097-0103, Fig. 4 (*e.g.*, steps **S4004 – S4007**), 0117-0123 (describing steps **S4004 – S4007**).)

As Nogami explains in the excerpted passage above from ¶¶0270 and 0272, as with background virtual objects, CPU **201** outputs the region virtual object to the user's display. (Nogami, ¶¶0270 (“the virtual object can be actually displayed”), 0272 (“CPU **201**... displays the same”).) The “**display**” of the region virtual object is “**based on the position of the peripheral,**” *i.e.*, HMD **100**, “**in real space**” because, like background virtual objects discussed earlier, how and whether the region virtual object is displayed depends on the position and orientation of HMD **100**. (Cooperstock, ¶76.) More specifically, the display of region virtual objects depends on position and orientation information of HMD **100** because that information is used to define the portion of virtual space that is displayed to the user at any given moment. (Nogami, ¶¶139-140, 143-145.)

In particular, Nogami describes using a “view volume corresponding to a virtual sight for looking at the virtual space” as the “range of the virtual space drawn on the display unit **102** of the HMD **100**.” (Nogami, ¶¶0143-0144.) The view volume **55** is illustrated in Figure 6:

**FIG.6**



(Nogami, Fig. 6 (highlighting added); *see also id.*, ¶0145.) The space defined by the highlighted frustum (bounded by near plane and far plane) in Figure 6 corresponds to view volume 55 for a user position in real space at viewpoint 69. (Cooperstock, ¶77; Nogami, ¶¶0143-0145.) This view volume provides an “attention range” for the user, which Nogami generally describes as “a range in which the user 1 can perceive a virtual object with the visual sense and a part thereof.” (Nogami, ¶¶0101, 0147 (“Here the view volume 55 is used as the attention range.”), 0159.) If a virtual object is within the view volume or attention range of the user, therefore, it is

displayed to the user. In this case, therefore, virtual object **302** will be displayed because it is within view volume **55**, but virtual object **303** will not. (Nogami, ¶¶0143-0144.) Because view volume **55** is based on position and orientation viewpoint information of HMD **100** in the real/physical world (Nogami, ¶¶0139-0140, 0143), the display of the region virtual object is “**based on the position of the peripheral,**” *i.e.*, HMD **100**, “**in real space.**” (Cooperstock, ¶77.)

A region virtual object (“**second interactive content**”) is also “**different from**” the one or more background virtual objects combined with images of a user’s surroundings (“**the first interactive content**”). As noted, Nogami expressly distinguishes between “**region virtual objects,**” which have corresponding real-world stimulation generation units, and “**background virtual objects**” in the virtual space. (Nogami, *e.g.*, ¶¶0114 (“**[A] virtual object other than the region virtual objects is referred to as a ‘background virtual object’.** That is, the virtual space includes the background virtual object, and the region virtual objects are disposed in the virtual space according to the position and orientation of each stimulation generation unit.”), 0109 (“[T]he 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**”); Cooperstock, ¶78.)

(h) **“determine a haptic signal based on the position of the peripheral in real space and the second interactive content; and” (Limitation 1[h])**

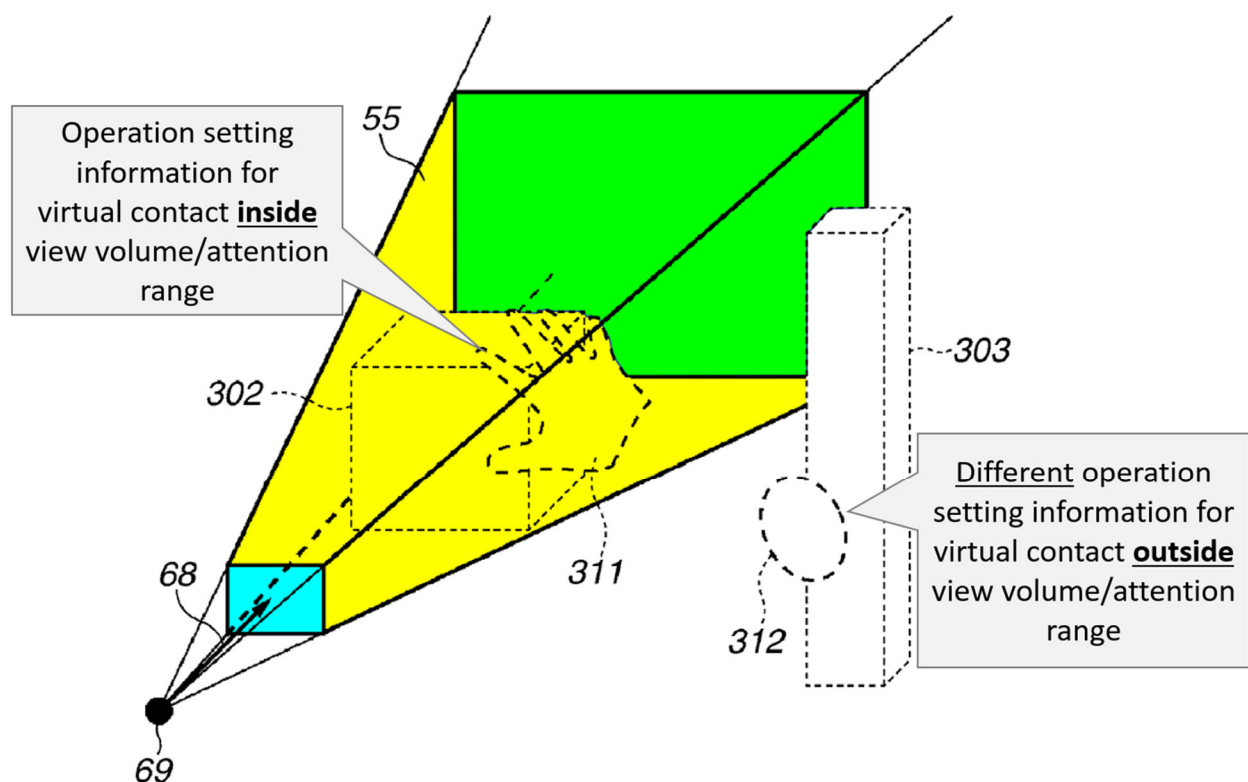
The **“haptic signal”** in Nogami corresponds to information sent by the processor to a stimulation generation unit in order to generate a haptic stimulation. Nogami refers to this information as “operation setting information.” (Nogami, *e.g.*, ¶¶0053 (“[T]he calculation processing apparatus **200** 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.”).)

For example, as noted previously, haptic stimulation can be provided via a stimulation generation unit when a region virtual object/virtual work tool (**“the second interactive content”**) makes contact with a background virtual object. (Nogami, *e.g.*, ¶¶0097 (“[T]he calculation processing apparatus **200** detects whether the stimulation generation unit **10**, **11**, or **12** contacts a virtual object.”), 0123 (“In step **S4007** [Fig. 4], the CPU **201** outputs, via the stimulation information output unit **210**, the operation setting information... to the stimulation generation unit... corresponding to the region virtual object contacting the background virtual object.”), 0270 (confirming that virtual contact can be made using region virtual

object work tool).) Nogami further explains that CPU **201** can generate different operation setting information based on whether the virtual work tool has contacted the virtual background object inside or outside the view volume. (Nogami, ¶¶0148-0154; Cooperstock, ¶¶81-82.) This operation setting information, in turn, determines the intensity level for the stimulation generation unit. (Nogami, ¶0154.)

This is illustrated in annotated Figure 6 below:

**FIG.6**



(Nogami, Fig. 6 (annotations and highlighting added); Cooperstock, ¶81.) In Figure 6, background virtual object **302** and region virtual object **311** (which is associated

with stimulation generation unit **10**) are making virtual contact within the view volume or attention range. (Nogami, ¶152.) But as also shown above, background virtual object **303** and region virtual object **312** (which is associated with stimulation generation unit **11**), are making virtual contact outside the view volume or attention range. (Nogami, ¶0153.) As Nogami further explains:

Then, in this case, the CPU **201** generates different operation setting information for the stimulation generation unit **10** [associated with virtual object **311** which is within the view volume/attention range] and the stimulation generation unit **11** [associated with virtual object **312** which is outside the view volume/attention range] to cause the stimulation generation unit **10** and the stimulation generation unit **11** to generate stimulations of respective different intensity levels.

(Nogami, ¶0154 (bracketed notations added).) Nogami therefore discloses that the processor “**determine[s] a haptic signal,**” *i.e.*, operation setting information, as recited in limitation 1[h]. For example, in one embodiment, a higher intensity may be provided when the region virtual object makes contact outside the view volume/attention range, and a lower intensity when contact occurs inside the view volume/attention range. (Nogami, *e.g.*, ¶¶0179-0181.) This reflects the fact that, when the virtual work tool is within the view volume/attention range of the user, it is visible to the user via HMD **100** and thus a lower intensity is warranted.

Nogami further discloses that the haptic signal is also determined “**based on**

**the position of the peripheral in real space and the second interactive content.”**

This is because whether the virtual work tool is within the view area of HMD **100**, in turn, depends on “**the position of the peripheral in real space,**” *i.e.*, HMD **100**, and “**the second interactive content,**” *i.e.* the virtual work tool. As explained above for limitation 1[g], Nogami uses the position and orientation of HMD **100** (“**the position of the peripheral in real space**”) to define a “view volume” that indicates the range of the virtual space that will be displayed on the HMD **100**. (Nogami, *e.g.*, ¶¶0139-0145.) This view volume in turn determines whether or not the region virtual object/virtual work tool (“**second interactive content**”) is positioned inside and has made contact within the view volume, as discussed. (Cooperstock, ¶¶80-82.) The operation setting information, therefore, is determined based on both the position of HMD **100** in real space and the position of region virtual object/work tool relative to HMD **100**. (Cooperstock, ¶79.)

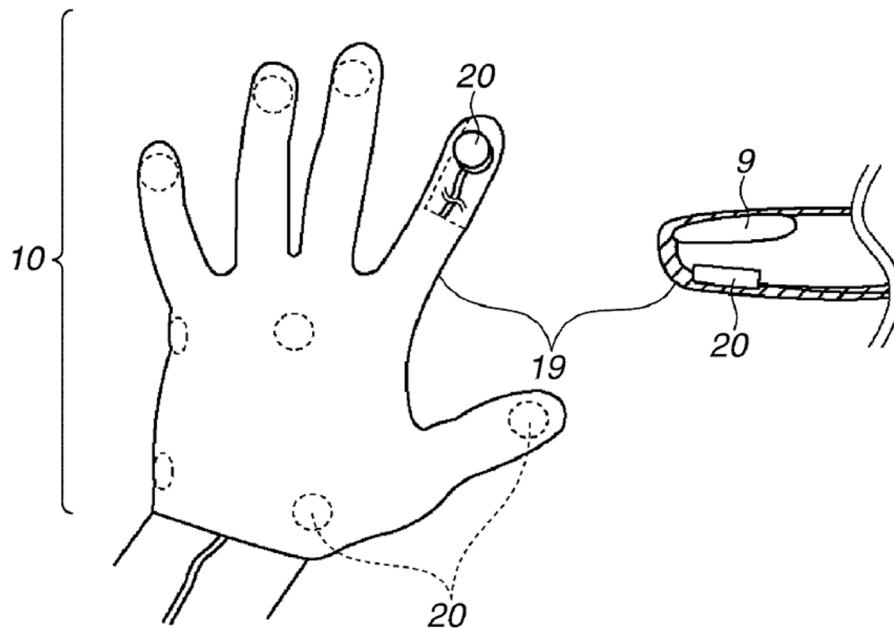
A person of ordinary skill in the art would have further understood, and found it obvious, that the operation setting information generated by CPU **201** would have taken the form of a haptic “**signal.**” (Cooperstock, ¶83.) Nogami explains that “CPU **201** outputs, via the stimulation information output unit **210**, the operation setting information.” (Nogami, ¶0123 (describing step S4007 of Fig. 4).) And for the same reasons discussed above, an ordinarily skilled artisan would have

understood and found it obvious that CPU **201** would have executed “**program code**” to carry out this claim step. (Cooperstock, ¶¶70, 84.)

- (i) “**transmit the haptic signal to a haptic output device, the haptic output device being configured to receive the haptic signal and output haptic feedback.**” (Limitation 1[i])

The “**haptic output device**” in Nogami corresponds to one or more cutaneous sense stimulation units included with a stimulation generation unit. Figure 3 of Nogami, shown below, shows a glove-like stimulation generation unit **10** having a number of cutaneous sense stimulation units **20**:

**FIG.3**



(Nogami, Fig. 3; *see also id.*, ¶¶0032, 0060-0072 (describing Figure 3); *see also id.*,

¶¶0061 (“Referring to FIG. 3, the stimulation generation unit **10** includes a glove-like shaped main body unit **19** and one or more cutaneous sense stimulation units **20**.”), 0233 (“In each of the above-described exemplary embodiments, the cutaneous sense stimulation unit is mounted on the stimulation generation unit to provide a cutaneous sense stimulation to the body of a user.”).)

A stimulation generation unit’s cutaneous sense stimulation unit (and any associated electronics within a stimulation generation unit enabling its operation) qualifies as a “**haptic output device**,” as claimed, because it is a device that expresses tactile sense information. (Cooperstock, ¶86; 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 ’143 patent and how that term was commonly understood. (Cooperstock, ¶86 (citing ’143, 3:9-12 (“Haptics 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.”).) 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 ’143 patent. (Nogami, ¶¶0067-0069; ’143, 4:61-67 (“electronic sound transducer,” “actuator”), 8:7-10 (“electric motor with an unbalanced mass on its driveshaft”); Cooperstock, ¶86.)

Nogami also discloses that CPU **201** “**transmit[s] the haptic signal to a haptic output device,**” *i.e.*, by transmitting operation setting information to cutaneous sense stimulation unit(s) of the stimulation generation unit, which in turn are “**configured to receive the haptic signal and output haptic feedback,**” by receiving the operation setting information and outputting corresponding haptic stimulation 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.*, Fig. 4, ¶0122.) And for substantially the same reasons as discussed above, a person of ordinary skill in the art would have understood and found it obvious that CPU **201** would have executed program code to carry out this step. (Cooperstock, ¶88; Nogami, Fig. 4, ¶¶0123 (“[T]he CPU **201** outputs...the operation setting information”), 0091, 0083, 0284-0287.)

**2. Claim 2: “The system of claim 1, wherein the position sensor is positioned on the peripheral.”**

Claim 2 was largely addressed by the analysis of limitation 1[a] above. As discussed, Nogami discloses an embodiment in which **“the position sensor”** (magnetic receiver/sensor) is included as part of HMD **100**. (Nogami, ¶0077 (“In this method, a transmitter for generating a magnetic field is provided in the real space, and the HMD **100**... each ha[s] a receiver for detecting a change in the magnetic field occurring accordingly as the HMD **100**... change[s] [its] position and orientation within the magnetic field.”).) It would have been obvious to implement Nogami such that the magnetic receiver/sensor **“is positioned on the peripheral,”** because Nogami uses changes in the magnetic field – as detected by the receiver – to determine the position and orientation of HMD **100**. (Cooperstock, ¶90; Nogami, ¶¶0077-0078.) It therefore would have been obvious for the magnetic receiver in Nogami to have been physically positioned on HMD **100**. (Cooperstock, ¶90.)

Additionally, in the event Patent Owner attempts to interpret the language of

claim 2, reciting that the sensor is positioned “**on**” the peripheral, to require that the position sensor be physically mounted to the *outside* of HMD 100 (as opposed to being integrated into internal electronics of HMD 100), this would have been an obvious design choice that would have beneficially allowed the receiver to detect the magnetic field from the transmitter while minimizing possible interference from internal components of HMD 100. (Cooperstock, ¶90.) Under any interpretation, therefore, an ordinarily skilled artisan would have been motivated to implement Nogami such that the magnetic receiver/sensor was “**positioned on**” HMD 100, in order for the magnetic field detected by the receiver to be used to determine the position and orientation of HMD 100. (Nogami, ¶0078; Cooperstock, ¶90.)

**3. Claim 3: “The system of claim 1, wherein the peripheral is a wearable device.”**

As explained for limitation 1[f], the claimed “**peripheral**” is HMD 100, “**a wearable device**” that the user wears on their head as shown in the excerpt of Figure 1 at right. (Nogami, ¶¶0049 (“HMD 100 is mounted on the head of the user 1”), 0056 (user 1 “wears the HMD 100 on his head”).)



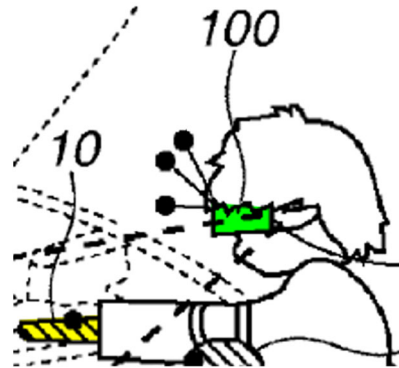
**4. Claim 7: “The system of claim 1, wherein the peripheral is a first peripheral, and wherein the haptic output device is positioned on a second peripheral that is separate from the first peripheral.”**

As fully explained for limitation 1[f], HMD 100 in Nogami is a peripheral.

(Cooperstock, ¶¶71, 92.) HMD 100 discloses “a first peripheral” as claimed.

Nogami also discloses “a second peripheral,” for example, a glove-like stimulation generation unit worn by a user on their hand (such as stimulation generation unit 10), which includes the one or more cutaneous sense stimulation units (“the haptic output device”), as explained for limitation 1[i]. (Cooperstock, ¶¶85-86, 93.) Nogami therefore discloses that “the haptic output device is positioned on a second peripheral,” as recited in claim 7.

The stimulation generation unit also qualifies as a “peripheral” because the user can manipulate and interact with it by wearing and moving it, and because it is a device that is controlled by calculation processing apparatus 200. (Nogami, *e.g.*, ¶¶0120-0123, Fig. 4; Cooperstock, ¶93.) And finally, as illustrated in the excerpt of Figure 1 of Nogami at right, this “second peripheral” (highlighted in yellow) “is separate from the first peripheral” (highlighted in green).



## 5. Independent Claim 8

Independent claim 8 is substantially identical to independent claim 1 except that it is written as a method claim. (Cooperstock, ¶94.) Claim 8 recites a method with six steps that are identical to the six functions recited in limitations 1[d] through

1[i] addressed above. Claim 8 is thus disclosed and rendered obvious for the same reasons as claim 1 above. Claim 8 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, ¶¶95, 57-59, 68, 72, 74, 76, 84, 88.)

## 6. Claims 9, 10 and 14

The limitations added by these claims are identical to those of claims 2, 3 and 7, respectively. Therefore, for the reasons discussed above for claims 2, 3 and 7, claims 9, 10 and 14 are disclosed by and obvious over Nogami. (Cooperstock, ¶¶96, 89-90 (analysis of claim 2).)

## 7. Independent Claim 15

Independent claim 15 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, ¶97.) As explained for limitation 1[c], the “**non-transitory computer-readable medium**” corresponds in Nogami to either data recording unit **205** or random access memory (RAM) **202**, or both. (Cooperstock, ¶¶56-57.) Claim 15 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 steps recited in limitations 1[d]-1[i] addressed above. As explained for limitation 1[c], the computer-readable medium in Nogami includes “**program code that is**

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**executable by a processor,”** *i.e.*, program code executed by CPU **201** that causes the processor to perform the claim steps. (Cooperstock, ¶¶57, 59.) Claim 15 is thus disclosed and rendered obvious for the same reasons as claim 1 above.

#### **8. Claims 16, 17 and 20**

The limitations added by these claims are identical to those of claims 2, 3 and 7, respectively. Therefore, for the reasons discussed above for claims 2, 3 and 7, claims 16, 17 and 20 are disclosed by and obvious over Nogami. (Cooperstock, ¶¶99, 89-90 (analysis of claim 2).)

#### **VII. CONCLUSION**

Petitioner respectfully requests institution of review on the challenged claims.

Dated: May 26, 2023

Respectfully submitted,

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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 8,422 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. 10,664,143 B2**, including all exhibits (**Nos. 1001-1008**) 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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