

Petition for *Inter Partes* Review of
U.S. Patent No. 9,744,448 B2

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.,
Petitioner

v.

MULLEN INDUSTRIES LLC,
Patent Owner.

Case IPR2025-00738
U.S. Patent No. 9,744,448 B2
Issue Date: August 29, 2017

Title: LOCATION-BASED GAMES AND
AUGMENTED REALITY SYSTEMS

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,744,448 B2**

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List of Exhibits

Exhibit No.	Description of Document
1001	U.S. Patent No. 9,744,448 B2 to Jeffrey David Mullen (filed May 30, 2016, issued August 29, 2017) (“ 448 ” or “ 448 patent ”)
1002	Declaration of Jeremy Cooperstock, Ph.D. (“ Cooperstock ”)
1003	U.S. Patent No. 6,166,744 to Ivan J. Jaszlics and Sheila L. Jaszlics (filed Sep. 15, 1998; issued Dec. 26, 2000) (“ Jaszlics ”)
1004-1005	(Reserved)
1006	U.S. Patent No. 6,361,438 B1 to Shigeki Morihira (filed Jul. 24, 1998; issued Mar. 26, 2002) (“ Morihira ”)
1007	U.S. Patent App. Pub. No. 2004/0002843 A1 to James O. Robarts et al. (filed May 13, 2003; published Jan. 1, 2004) (“ Robarts ”)
1008	Int’l Patent App. Pub. No. WO 2003/107039 A2 to Eli Sofer et al. (filed Jun. 12, 2003; published Dec. 24, 2003) (“ Sofer ”)
1009	U.S. Patent App. Pub. No. 2002/0163486 A1 to Peter A. Ronzani et al. (filed May 16, 1997; published Nov. 7, 2002) (“ Ronzani ”)
1010	U.S. Patent App. Pub. No. 2004/0110565 A1 to Louis Levesque (filed Dec. 4, 2003; published Jun. 10, 2004) (“ Levesque ”)
1011	U.S. Provisional Patent App. No. 60/066,904 (“ Jaszlics Provisional ”)
1012	Excerpts from Microsoft Computer Dictionary (5th ed. 2002)
1013	(Reserved)
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1015	Excerpts from Benefits.com Glossary [available at https://benefits.com/glossary/boundary/]
1016	’448 Patent File History
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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 '448 patent is the subject of pending litigation involving Petitioner: *Mullen Industries LLC v. Meta Platforms, Inc.*, Case No. 1:24-cv-00354-DAE (W.D. Tex.). Petitioner was served on April 5, 2024. (EX1018, p.003.)

Petitioner is filing IPR petitions against twelve related patents asserted by Patent Owner in the pending litigation involving Petitioner:

U.S. Patent No.	IPR Case
8,585,476 B2	IPR2025-00737
9,744,448 B2	IPR2025-00738
10,179,277 B2	IPR2025-00739
10,828,559 B2	IPR2025-00740
10,967,270 B2	IPR2025-00702
11,033,821 B2	IPR2025-00703
11,376,493 B2	IPR2025-00741
11,904,243 B2	IPR2025-00742
11,947,716 B2	IPR2025-00743
12,019,791 B2	IPR2025-00744
9,662,582 B2	IPR2025-00745
10,974,151 B2	IPR2025-00746

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

Petitioner provides the following designation of counsel.

Petition for *Inter Partes* Review of
U.S. Patent No. 9,744,448 B2

LEAD COUNSEL	BACK-UP COUNSEL
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D. Service Information

This Petition is being served by Federal Express to the attorney of record for the '448 patent, 32733 - JEFFREY D. MULLEN, 2212 Hassinger Lane, Glenshaw, PA 15116. Petitioner consents to electronic service at the addresses provided above for lead and back-up counsel.

II. FEE PAYMENT

Petitioner requests review of 5 claims, with a \$51,875 payment.

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

A. Grounds for Standing

Petitioner certifies that the '448 patent is available for IPR and that Petitioner is not barred or otherwise estopped.

B. Identification of Challenge and Statement of Precise Relief Requested

Petitioner requests IPR institution based on:

Ground	Claims	Basis for Challenge under §103
1	1, 3, 7	Jaszlics (EX1003) in view of Sofer (EX1008) and Ronzani (EX1009)
2	6	Ground 1 Prior Art + Morihira (EX1006)
3	8	Ground 1 Prior Art + Robarts (EX1007)

Submitted with this Petition is the Declaration of Jeremy Cooperstock, Ph.D. (EX1002) (“Cooperstock”), a qualified technical expert. (EX1002, ¶¶1-18, Appendix A.)

C. Considerations Under §§ 314(a) and 325(d)

§314(a): The *General Plastic* factors are not relevant as this is the first and only IPR petition filed by Petitioner with respect to the '448 patent.

Nor do the *Fintiv* factors support discretionary denial under §314(a). The pending litigation against Petitioner is in relatively early stage, with little substantive discovery having taken place to date and claim construction proceedings ongoing.

Trial is scheduled to start October 5, 2026—over eighteen months from now—and a motion to transfer the case by Petitioner to the Northern District of California is currently pending, which if granted would likely result in an even later trial date. Petitioner also intends to move to stay the litigation pending resolution of the IPRs. Additionally, to allay concerns over duplication of efforts, Petitioner represents that, in the event of institution, it will not pursue in litigation any invalidity defense that was or could have been raised in IPR.

§325(d): *Advanced Bionics* does not apply to any reference relied upon in **Ground 1**—Jaszlics (**EX1003**), Sofer (**EX1008**), and Ronzani (**EX1009**)—because none of these references were presented during prosecution.

With respect to Morihira (**EX1006**), it was listed among approximately one hundred references on an applicant-submitted information disclosure statement (**EX1016**, pp.00120-00124), but was not otherwise cited or discussed. Similarly, with respect to Robarts (**EX1007**), it appears that a similar published application to Robarts (US 2005/0009608 A1) was listed on that same IDS, but was likewise not otherwise cited or discussed.

For these reasons, Petitioner respectfully submits that the cited prior art does not raise § 325(d) issues that would warrant discretionary denial of the Petition.

IV. OVERVIEW OF THE PATENT

A. Level of Ordinary Skill

A person of ordinary skill would have possessed a bachelor's degree in electrical engineering, computer science, or similar field, with two years combined experience in designing and/or developing interactive location-based computer systems/software, such as video games or other simulations incorporating location information (such as GPS information associated with a user's physical location), and in designing and/or developing computer systems/software involving graphical virtual and/or augmented reality. A person could also have qualified as a person of ordinary skill in the art with some combination of (1) more formal education (such as a master's of science degree) and less technical experience, or (2) less formal education and more technical or professional experience. (EX1002, ¶¶21-25.)

B. Specification Overview

The '448 patent states that it provides "a location-based game system in which the physical location (or physical movement) of a user on a physical playfield" obtained by, for example, a GPS device, "determines the virtual location (or virtual movement) of a virtual character on a virtual playfield." ('448, 7:22-28.) The system may include a head-mounted display so that "video game indicia may be overlaid onto the user's physical playfield," such as the user's "physical environment." ('448, 3:50-52; *see also id.*, 1:55-59 (listing "the physical world, a

physical environment, or a defined physical playfield” as examples of a “physical playfield”).) “The physical environment can then be manipulated by a processor such that, for example, virtual indicia (e.g., a video game character or component is added [sic]) is added to the physical environment.” (’448, 3:60-63.)

The ’448 patent further states that “[a] landscape detector may be provided with a location-based game system such that information on the physical terrain of the user’s physical environment may be utilized by the gaming system.” (’448, 4:18-21.) Figure 4, reproduced below, “is an illustration of landscape detection constructed in accordance with the principles of the present invention”:

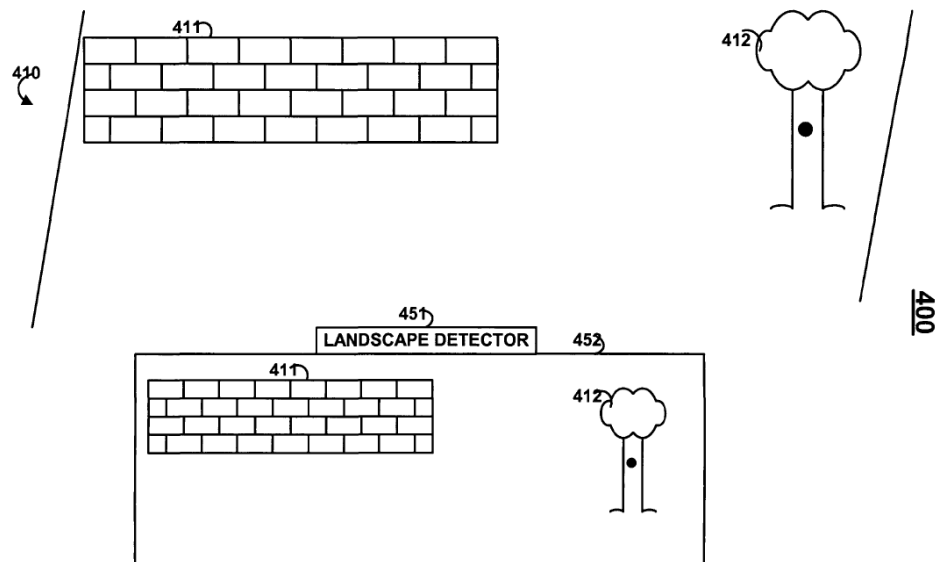


FIG. 4

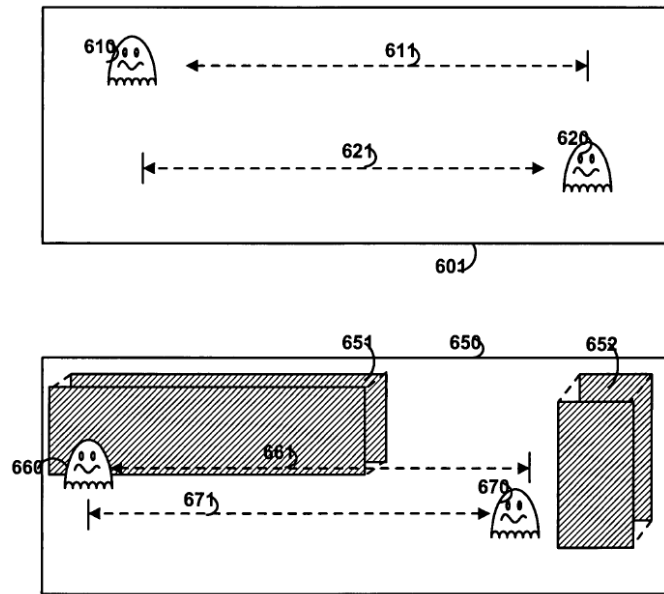
(’448, Fig. 4, 6:13-14.) Referring to Figure 4, the ’448 patent states that “[l]andscape detector **451** may take multiple forms”:

For example, landscape detector **451** may measure the distance to

objects and the shape of the object. This may be done for example by sound/light sensing (e.g., reflective sensing such as sound/light echoing or color sensing with respect to light source) or any type of object/distance sensing (e.g., infrared). A camera may be utilized to take a picture/video of the environment. Video processing features may be utilized to determine landscape as, for example, a user moves around the landscape.

(’448, 15:18-27.) “The information provided by the landscape detector may be utilized, for example, to position where portions of a video game playfield, objects, and characters may be positioned on a display (e.g., on a head-mounted display).”

(’448, 4:24-27.) “Such information may also be used, for example, to control the movement characteristics of computer-controlled video game characters and indicia.” (’448, 4:27-30.) For example, Figure 6, reproduced below, “is an illustration of computer-controlled character positioning and movement based on detected landscape objects constructed in accordance with the principles of the present invention”:



009

(’448, Fig. 6, 6:20-23.) Referring to Figure 6, the ’448 patent states that “[i]n environment **650**, actual environmental object may be present and stored in memory as virtual objects **651** and **652**.” (’448, 18:14-16.) “If the stored location of virtual objects **651** impedes on the planned movement of virtual characters, then program logic (e.g., game code) may manipulate the movement path of virtual characters around these virtual objects.” (’448, 18:21-25.)

V. CLAIM CONSTRUCTION

Petitioner does not believe express claim construction is necessary at this time. The prior art cited herein, as demonstrated below, renders the challenged claims obvious under any reasonable construction. Petitioner therefore respectfully submits that, for purposes of this IPR, express constructions are not required.

VI. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Overview of Grounds

The challenged claims attempt to lay claim to techniques for location-based video games in which a user sees their real-world surroundings combined with virtual objects. But these techniques were well-known before the '448 patent.

All grounds rely on Jaszlics (**EX1003**), which as its title demonstrates, describes a “system for combining virtual images with real-world scenes.” The augmented reality gaming and simulation system it describes is remarkably similar to the '448 patent. (Cooperstock, ¶52.) Jaszlics is a strong reference that discloses the majority of the claim limitations. Focusing on war gaming applications, but also making clear that the system is broadly applicable to outdoor location-based augmented reality gaming, Jaszlics provides a “combined reality” experience for a user by combining real-time, real-world imagery of a user’s physical surroundings with images of virtual entities, such as tanks. (*Id.* (citing Jaszlics, 1:64-67, 2:60-63).) For example, Jaszlics describes how, using data collected with a range scanning device (such as a modified infrared surveyor’s ranging laser), the distance and shape of real-world physical features around the user are detected and used to more realistically overlay virtual entities in the real-world scene. (*Id.* (citing Jaszlics, Fig. 1, 4:12-23).) The combined imagery—for example, as shown by Figure 1d below—can then be presented via head-mounted display to the user.

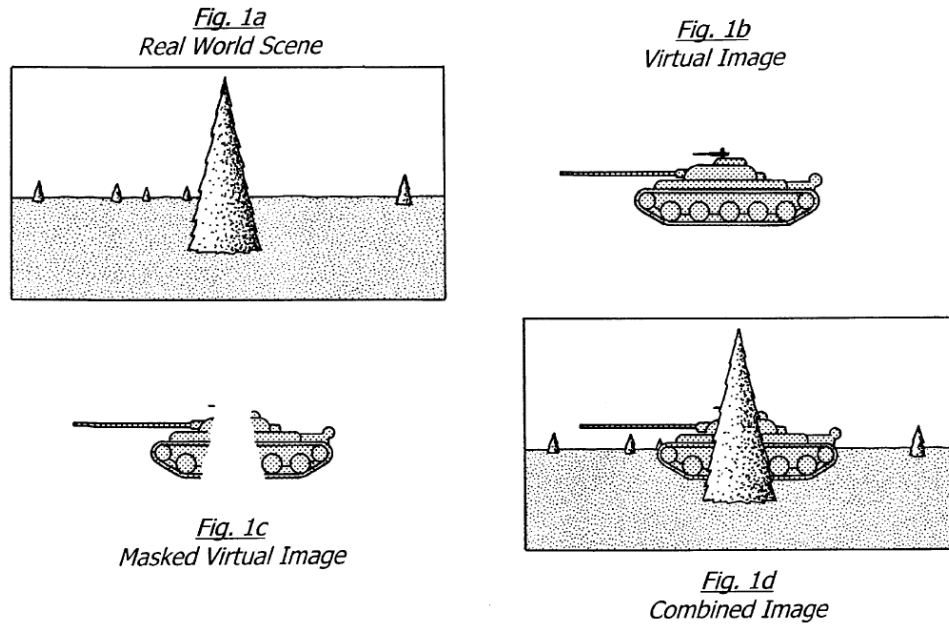


Fig. 1

(*Id.* (citing Jaszlics, 9:36, 9:48-57, 2:10-13).)

All grounds also cite Sofer (**EX1008**) and Ronzani (**EX1009**) in connection with minor points that are arguably disclosed by or at least obvious over Jaszlics alone. Sofer is cited to address a possible interpretation that the claim language “**detector of said head-mounted device**” is claim 1 means that the “**detector**” must itself be mounted on the user’s head. (Cooperstock, ¶¶56-57.) Similarly, Ronzani is cited to address a possible interpretation that the claim language “**locating device of said head-mounted device**” means that the “**locating device**” must itself be mounted on the user’s head. (Cooperstock, ¶¶60-61.)

The additional references are cited for ancillary features cited in dependent claims. Morihira (**EX1006**) is cited in Ground 2 for dependent claim 6, and Robarts (**EX1007**) in Ground 3 for dependent claim 8.

B. Prior Art Status of Relied-Upon References

Pre-AIA law applies to the challenged claims, and each reference cited in the grounds listed in **Part III.B** qualifies as prior art to the '448 patent. Jaszlics, Ronzani, and Morihira qualify as prior art under § 102(b) because they issued more than one year before the priority date.¹ Sofer qualifies as prior art under § 102(e) (and § 102(a)) because it is a PCT application that designated the United States and published in English before the priority date. Robarts qualifies as prior art under § 102(e) because was published from an application filed before the priority date.

¹ The '448 patent claims priority to a provisional application (no. 60/628,475) filed November 16, 2004. For purposes of this Petition, Petitioner has assumed a priority date of November 16, 2004. Petitioner at this time expresses no opinion on whether the '448 patent is actually entitled to the benefit of the provisional application filing date. This issue is not relevant here because all of the prior art references relied upon predate November 16, 2004. In the event entitlement to the provisional filing date or another earlier priority date may later become relevant, Petitioner reserves the right to respond at that time.

C. Ground 1: Claims 1, 3, and 7 Are Obvious Over Jaszlics in View of Sofer and Ronzani

1. Independent Claim 1: “A system comprising:” (1[pre])

As shown below, the combination of Jaszlics, Sofer, and Ronzani renders the claimed “**system**” obvious.

- (a) “a display of a head-mounted device, wherein 3-D video game indicia is operable to be provided to said display with respect to a physical playfield based on video game logic associated with a video game;” (1[a])**

Claim 1[a] is disclosed by and obvious over Jaszlics.

Jaszlics discloses a “combined reality” computer system in which virtual images, such as images of a virtual tank or other animated virtual entities, are combined with real-world scenes and displayed together to a user. (Jaszlics, 2:40-56 (“This invention provides a system for combining virtual images with images of the real world.... The resulting combined image is presented in an electronic or optical display.”), 1:13-15 (“...systems for combining virtual images with real-world scenes.”), 3:13-16 (“FIGS. 1*a* through 1*d* are examples of the real-world scene, a virtual image, the resulting masked virtual image, and combined images, respectively.”) (emphasis in original), Table 7 (col. 21) (defining “combined reality” as “Apparent reality, with virtual elements projected into the image of the real world. Virtual and live elements may interact through simulation.”); Cooperstock, ¶75.)

Jaszlics discloses using “**a display of a head-mounted device**” to display the combined virtual images and real-world scenes to a user, such as “electronic display goggles,” “virtual reality goggles or visors worn by the observer [i.e., the user of the system²].” (Jaszlics, 9:48-57; *see also id.*, 2:10-13 (“The present invention can be used with electronic display goggles to greatly extend this entertainment medium by injecting, in real time, three-dimensional virtual elements into the view of the real world.”), 9:34-39 (“The display **111** may be any display system capable of displaying the combined image, such as...an electronic goggle or visor....”), 10:52-57 (“The position and orientation of the observer (including the movement and attitude of the vehicle, if any, housing the observer) is sensed by observer sensors and controls **115** such as a magnetic or infrared head tracker system used in conjunction with virtual reality goggles.”).)³ Jaszlics therefore discloses “**a display of a head-mounted device**,” as claimed, such as the display included as part of a head-worn visor/goggle device. (Jaszlics, ¶76.)

² Jaszlics describes a player/user of its system as an “observer.” (*See* Jaszlics, 10:11-17 (“The observer **113** of the display is assumed to be the user of the invention for various purposes, such as military training, or entertainment....”).)

³ All underlining added to quoted material unless noted.

Jaszlics also teaches that “**3-D video game indicia is operable to be provided to said display with respect to a physical playfield.**” (Cooperstock, ¶¶77-84.)

Petitioner notes that the '448 patent describes “**physical playfield**” as broadly including “the physical world, a physical environment, or a defined physical playfield[.]” ('448, 1:55-59.)

Jaszlics teaches that the “electronic display goggles” or “visors” (“**a display of a head-mounted device**”) are used to display, for example, virtual tanks and other virtual objects (“**3-D video game indicia**”) overlaid within a physical landscape surrounding the user (“**physical playfield**”). (Cooperstock, ¶78.) Figure 1 of Jaszlics illustrates, with Fig. 1d in particular showing how a virtual tank (exemplary “**3-D video game indicia**”) is displayed within a real world scene (“**display[ed] with respect to a physical playfield**”):

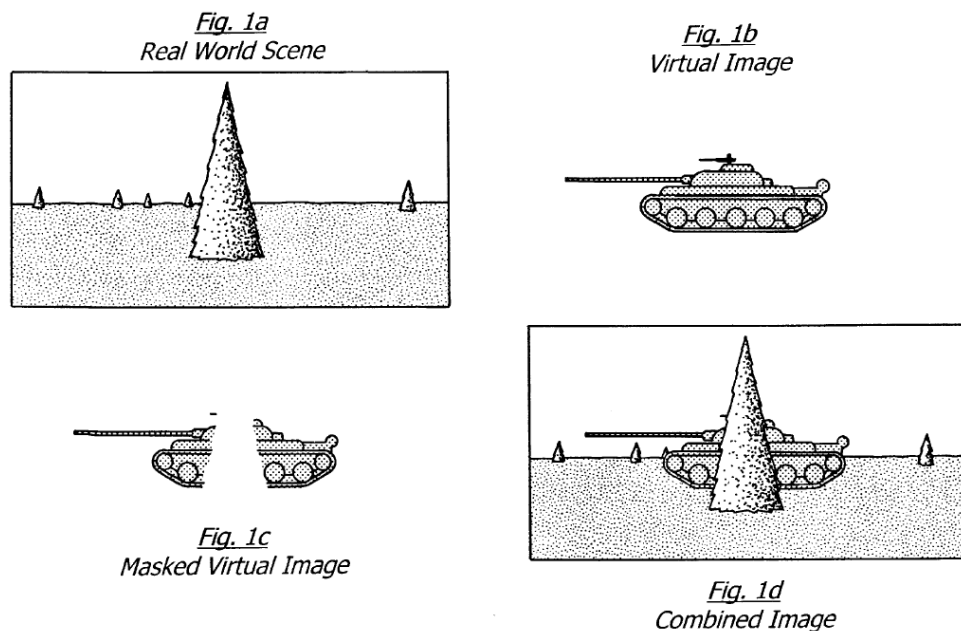


Fig. 1

(Jaszlics, Fig. 1; *see also id.*, 4:19-23 (“The masked virtual image and the image of the real world are then combined in such a manner that in the resulting combined image (FIG. 1*d*) the virtual object will appear to exist and move in the real world at its virtual position.”), 8:53-56 (“In this step **110** of FIG. 2, the virtual images constructed in the virtual image generation step **109** are combined with the real-world image **114** originating from the video camera **100**.”), 23:56-59 (claim 4, reciting “wherein said display means comprises an electronically-controlled visor and wherein the field of view comprises the field of view visible through said visor”), 25:3-6 (claim 15).)

As another example, Figure 14 of Jaszlics (below) illustrates virtual tanks **162** (“**3-D video game indicia**”) overlaid on hills **160** of the user’s physical environment (“**physical playfield**”):

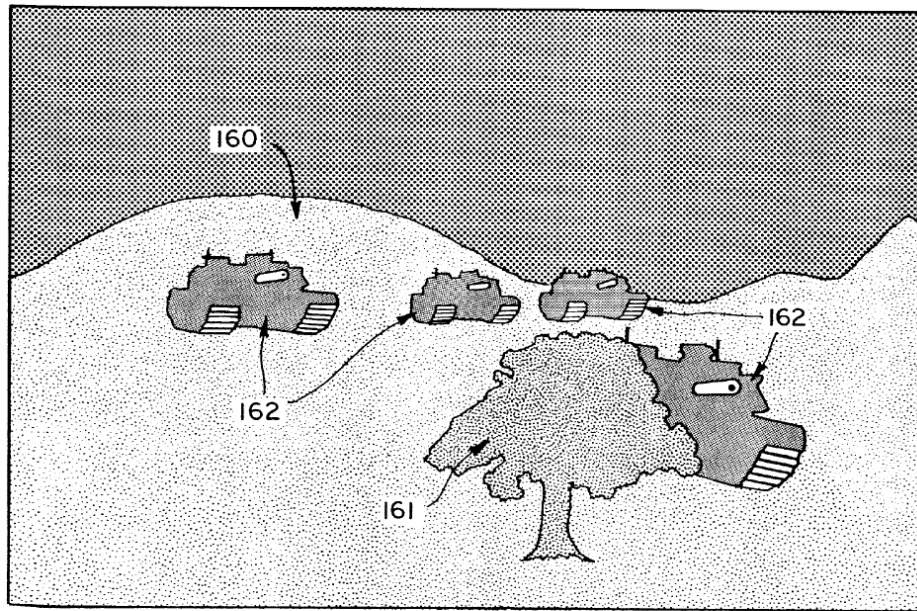


Fig. 14

(Jaszlics, Fig. 14; *see also id.*, 3:49-51, 9:60-62 (describing Fig.14); EX1011 (Jaszlics Provisional), 00152, Fig. 14 (identifying **160** as “Hills” and **162** as “Virtual Entities”); Cooperstock, ¶79.)

As a third illustration, referring to Figure 15 (below), Jaszlics explains how the overlaid “**3-D video game indicia**” can be a variety of virtual elements, such as a path marker **172**, a unit boundary **173**, a navigational marker **174**, and a phase line **175**, which are overlaid on terrain **170**:

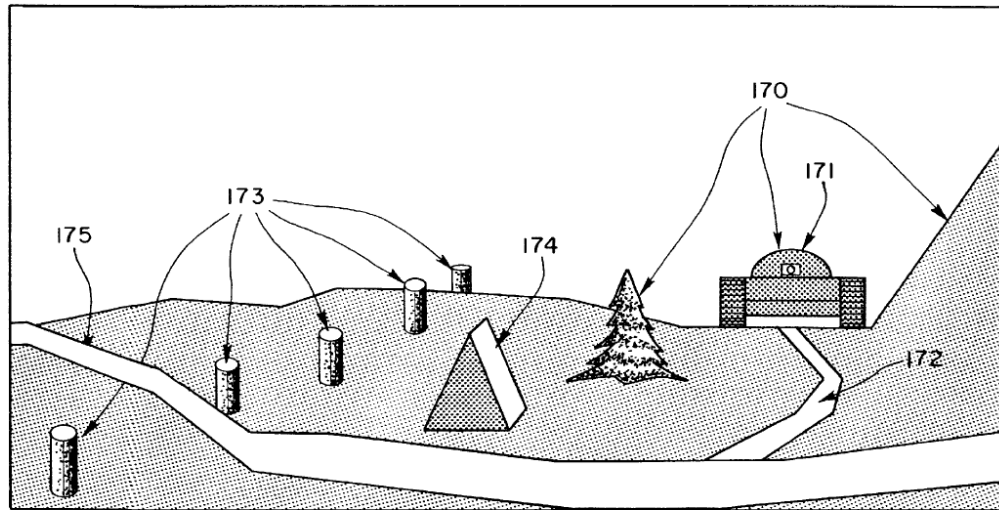


Fig. 15

(Jaszlics, Fig. 15; *see also id.*, 9:64-10:9 (“The virtual entities generated by a virtual entity simulation do not necessarily represent a real-world object. For example, they may represent fictional characters or entities, or views of conceptual objects. An example of conceptual virtual entities is shown in FIG. 15. In FIG. 15, the real-world objects 170 include the terrain, a tree, and a battle tank, in which the observer or observers 171 of a combined reality view presented to them are located. The conceptual virtual entities in the figure are conceptual objects: a path marker 172, a unit boundary 173, a navigational marker 174, and a phase line 175. The present system positions the conceptual virtual entities in the display in such a manner that they appear to be present in the landscape visible to the observer(s).”); Cooperstock, ¶80.)

Turning more specifically to the phrase “**3-D video game indicia**,” Jaszlics teaches that the virtual entities, such as virtual tanks and other characters, entities or

conceptual objects, are both “**3-D**” and “**video game**” indicia. With respect to “**3-D**,” the figures from Jaszlics shown above include 3-D virtual elements, most clearly shown by unit boundary **173** and navigational marker **174** in Figure 15. More generally, Jaszlics explains that the virtual entities can be generated and rendered using the “Virtual Reality Modeling Language” (“VRML”) or “any rendering system capable of rendering three-dimensional objects, or two-dimensional projections of three-dimensional objects.” (Jaszlics, e.g., 8:7-16, 6:34-41.) VRML was a standard language for modeling three-dimensional interactive objects. (Cooperstock, ¶81 (citing EX1012, p.009 (entry for “VRML”))). Jaszlics therefore discloses and renders obvious “**3-D**” indicia. (Cooperstock, ¶81.)

With respect to “**3-D video game indicia**,” Jaszlics makes clear that its combined reality system is for “video games.” (Cooperstock, ¶82.) For starters, Jaszlics specifically describes using its system for virtual war games, and related game play, such as engaging in a virtual tank battle. (Jaszlics, e.g., 10:15-25, 11:4-6, 15:15-30.) This is just like the ’448 patent, which similarly states that “an AR game system may be utilized in the military training of soldiers” and specifically recognizes this sort of military simulation as “game play.” (’448, 5:23-24; *see also id.*, 5:24-27 (“To accommodate such an application the landscape of a pre-determined area (e.g., a particular square area of a military based [sic]) may be scanned at a point before a game is played.”), 15:40-42 (“For example, if the military

desires an AR system for special operations warfare then a particular field may be utilized for game play.”.)

More specifically, Jaszlics explains that “[t]he present invention can be used in these war games to generate virtual tanks that appear to move about the terrain. This can completely eliminate the need, for example, for live tanks representing the enemy force in a war gaming exercise. Virtual vehicles and real vehicles can appear in the same scene.” (Jaszlics, 1:53-58.) Jaszlics describes military simulation game play that includes a player/user (which Jaszlics refers to as an “observer”) engaging a virtual combat vehicle and taking damage or getting “killed.” (Jaszlics, 10:15-25 (“An example of such direct interaction is the engagement of a virtual opponent from a combat vehicle, such as a battle tank.”), 11:59-63 (“For example, if one of the virtual tanks represented in this simulation engage the avatar of the observer’s tank, the resulting damage information will activate damage displays, or a ‘killed’ indicator in the observer’s sensors and controls suite.”); *see also id.*, 11:4-6 (“virtual battle damage”), 15:53-56 (“The virtual entities implemented by the virtual simulation and control software are capable of engaging the avatar of the observer’s vehicle, depending on the scenario loaded in.”), 15:25-30 (“engaging the virtual T-80s operated by the virtual simulation”), 10:39-44 (engaging virtual tank).) Jaszlics’ disclosure of using its combined reality system for simulated war games therefore discloses “**3-D video game indicia**.” (Cooperstock, ¶83.)

Putting aside its military-specific gaming applications, Jaszlics expressly teaches that its system can be used as “an interactive, recreational device,” and is broadly applicable to gaming generally, explaining that, for example, “[a]nother possible field of use is in games, such as laser tag, so that virtual players, objects, and special effects can be combined with real players and real objects in the playing field.” (Jaszlics, 1:64-67, 18:48-55; *see also id.*, 15:21-25 (“Other scenarios not related to tanks, or military training, can be selected by a user...”).) Jaszlics therefore clearly discloses and renders obvious “**3-D video game indicia**.” Jaszlics therefore teaches a system in which “**3-D video game indicia is operable to be provided to said display with respect to a physical playfield**” as claimed. (Cooperstock, ¶84.)

Jaszlics also discloses, and a person of ordinary skill in the art would have understood and found it obvious, that Jaszlics’ virtual entities (“**3-D video game indicia**”) would be operable to be provided to the head-mounted display with respect to a physical playfield “**based on video game logic associated with a video game**”—i.e., logic associated with Jaszlics’ “virtual simulation and control software” and virtual simulations executed by the software. (Cooperstock, ¶¶85-86.)

In particular, Jaszlics describes its system as using a conventional computing system, such as “a personal workstation running two 266 MHz Pentium II

processors,” to execute software including “virtual simulation and control software” and virtual simulations executed by the software, such as various “scenarios” providing game simulations—military-based or otherwise. (Jaszlics, 14:13-18 (“Virtual masking object generation is presently implemented by virtual masking object (VMO) generation software running in a virtual simulation computer 210 (e.g., a personal workstation running two 266 MHz Pentium II processors).”), 14:66-15:1 (“Virtual entity simulation is implemented in the virtual simulation computer through the virtual simulation and control software.”), 15:53-56 (“The virtual entities implemented by the virtual simulation and control software are capable of engaging the avatar of the observer’s vehicle, depending on the scenario loaded in.”), 17:11-14 (describing “scenario” “executed by the virtual simulation and control software”), 15:21-24 (“Other scenarios not related to tanks, or military training, can be selected by a user...”).) The logic associated with Jaszlics’ “virtual simulation and control software” and virtual simulations executed by the software—i.e., logic associated with one or more video games—discloses the claimed **“video game logic associated with a video game.”** (Cooperstock, ¶86.)

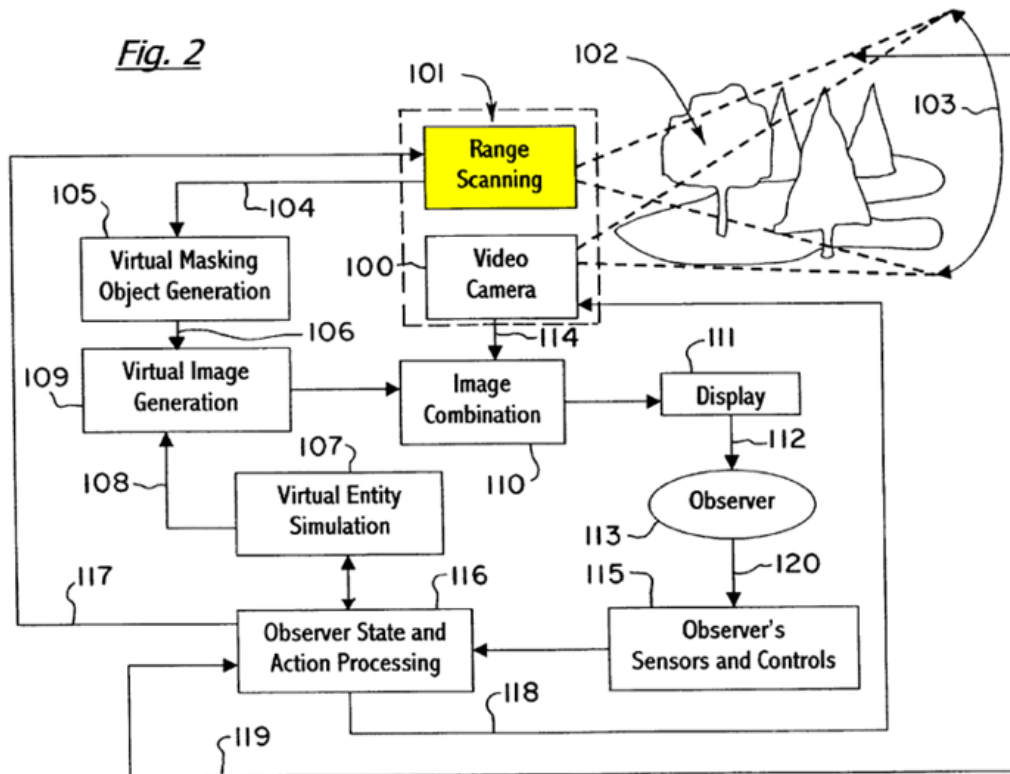
Therefore, Jaszlics discloses and renders obvious **“a display of a head-mounted device, wherein 3-D video game indicia is operable to be provided to said display with respect to a physical playfield based on video game logic associated with a video game,”** as claimed. (Cooperstock, ¶87.)

- (b) **“a detector of said head-mounted device operable to determine landscape characteristics of said physical playfield, wherein said video game logic utilizes said landscape characteristics in providing said video game;”**
(1[b])

As explained below, claim 1[b] is disclosed by and obvious over Jaszlics alone or in combination with Sofer. (Cooperstock, ¶88.) The Petition combines with Sofer to address a possible interpretation that the claim language **“detector of said head-mounted device”** means that the **“detector”** must itself be mounted on the user’s head.

Jaszlics discloses and renders obvious **“a detector of said head-mounted device operable to determine landscape characteristics of said physical playfield”** in the form of a range scanner, such as a laser range scanner or other technology for scanning a real-world outdoor scene to determine characteristics of the scene, such as “the shape and distance of real-world objects within a field of regard of interest to the observer using the apparatus.” (Jaszlics, 2:41-46; *see also id.*, 12:19-13:44 (detailing laser scanner functionality, including transmitter and receiver sections for emitting and detecting, respectively, laser pulses); Cooperstock, ¶¶89-90.)

For example, Figure 2 of Jaszlics depicts a Range Scanning component **101** within Jaszlics’ system:



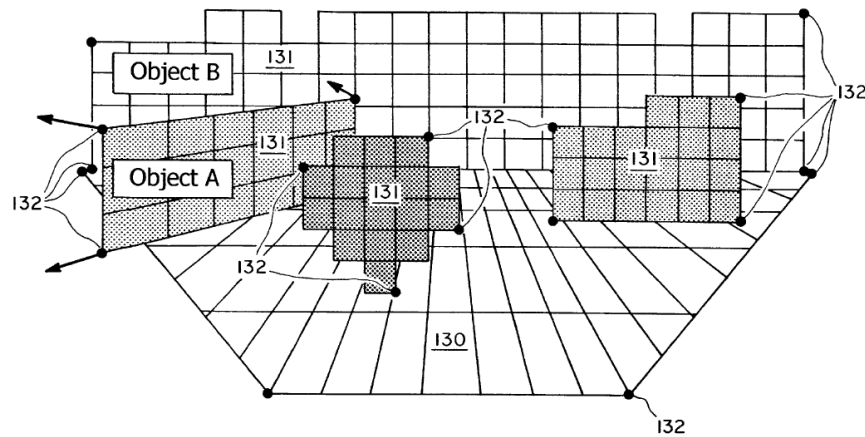
(Jaszlics, Fig. 2 (highlighting added); *see also id.*, 4:35-37 (“[A] range scanner **101** determines the distance of the entities present in a real-world scene **102** within small ranging sectors.”).) Jaszlics explains that “[r]ange scanning may be performed by a laser range scanner (as in the reference apparatus shown in FIGS. 16-22) or by other means that can determine the distance of objects within the angular space of ranging sector.” (Jaszlics, 4:43-46; *see also id.*, Figs. 16 (illustrating Laser Scanner **203**), 17 (illustrating transmitter section of laser scanner), 18 (illustrating receiver section of laser scanner), 4:60-5:6 (describing other methods for landscape detection).) The range scanner can be “a modification of a commercially available solid-state infrared surveyor’s ranging laser.” (Jaszlics, 12:19-20; *see also id.*, 12:34-36 (“The scanner

elements are built from commercially available components[.]”).)

The written description of the ’448 patent provides further confirmation that Jaszlics’ range scanner is “**a detector of said head-mounted device operable to determine landscape characteristics of said physical playfield**” as claimed. (Cooperstock, ¶91.) Jaszlics’ description of a range scanner that determines “the shape and distance of real-world objects” (Jaszlics, 2:41-46) in the user’s physical environment is remarkably similar to the ’448 patent’s own description of a “landscape detector” that “may measure the distance to objects and the shape of the object.” (’448, 15:18-27.)

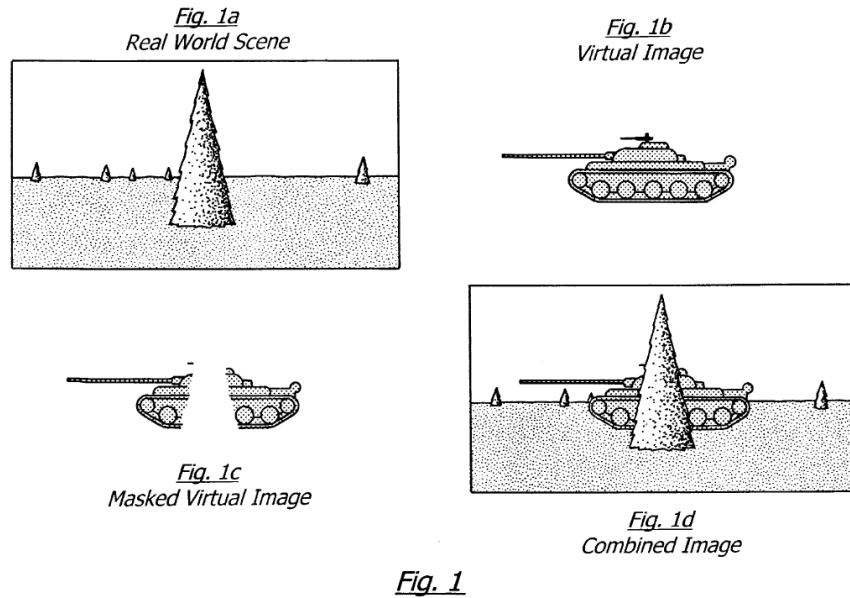
Jaszlics also discloses “**said video game logic utilizes said landscape characteristics in providing said video game.**” (Cooperstock, ¶92.) Jaszlics’ system uses the distance and shape information provided by range scanning data (“**said landscape characteristics**”) to generate “virtual masking objects” that it uses to present a more realistic virtual simulation. (Jaszlics, 2:41-46 (“Virtual masking objects, which are simplified computer models of real-world objects, are derived from the range data.”), 4:50-55 (“Range scanning is an existing technology that provides range data necessary for virtual masking object generation.”).) Figure 9 of Jaszlics, below, illustrates how the range scanning data is used to generate virtual masking objects:

Fig. 9



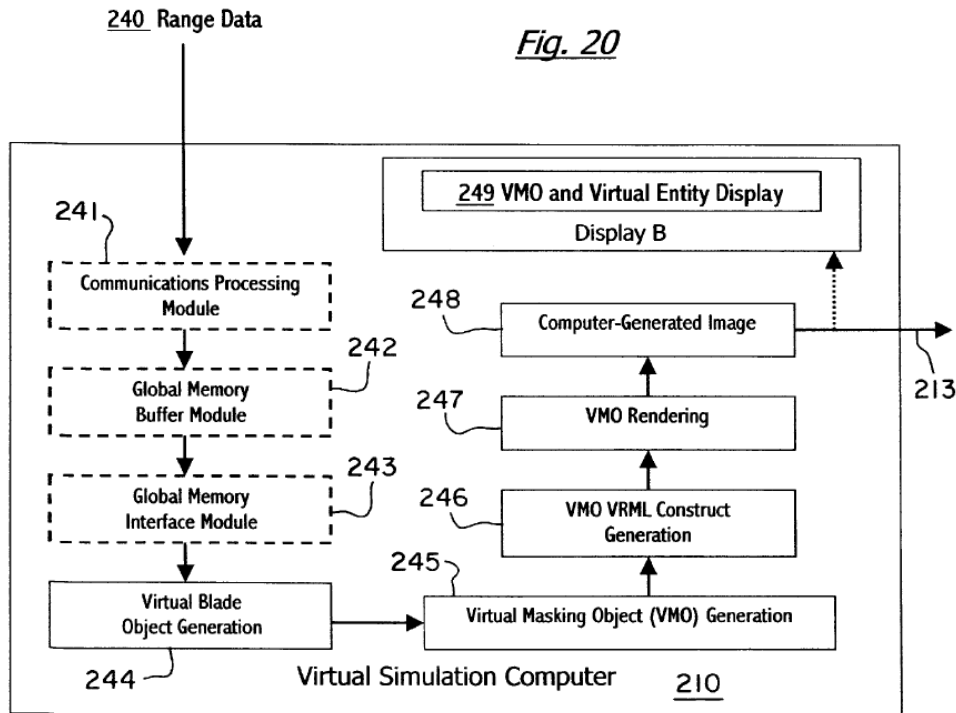
(Jaszlics, Fig. 9.) Referring to Figure 9, Jaszlics explains that it “shows several virtual masking objects, including the apparent terrain 130 observed by range scanning, and other virtual masking objects 131, which include Object A located near to the observation point, and Object B located at the extreme range of range scanning.” (Jaszlics, 7:29-34.) Jaszlics uses these virtual masking objects to present a more realistic virtual simulation, by for example, using them to generate a combined reality image where a portion of a virtual object, such as a tank, is masked out such that it appears to be partially concealed behind a real-world object, such as a tree. Figure 1 of Jaszlics illustrates:

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(Jaszlics, Fig. 1; *see also id.*, 4:13-27 (describing Figs. 1a-1d).)

Figure 20 of Jaszlics further illustrates how the detected ranging data—Range Data **240**—is input into and processed by Virtual Simulation Computer **210**, which implements “[v]irtual entity simulation” “through the virtual simulation and control software” (“**said video game logic**”):



(Jaszlics, Fig. 20; *see also id.*, 3:64-65 (“FIG. 20 is a simplified block diagram of the virtual masking object (VMO) generation software.”), 14:32-52 (describing input and processing of ranging data), 14:66-15:1 (“Virtual entity simulation is implemented in the virtual simulation computer through the virtual simulation and control software.”); Cooperstock, ¶93.)

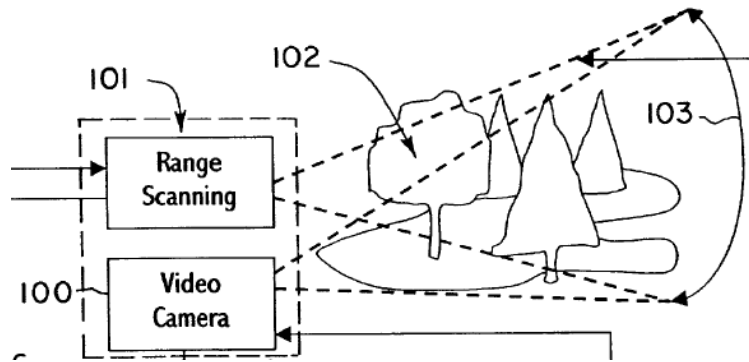
Jaszlics therefore teaches that ranging data corresponding to the distances and shapes of real-world objects in the user’s physical environment (“**landscape characteristics of said physical playfield**”) is utilized by Jaszlics’ virtual simulation and control software (“**said video game logic**”) in providing a virtual simulation, such as military or non-military games (“**in providing said video game**”). (Cooperstock, ¶94.)

The Petition will turn now in more detail to the claim language “**a detector of said head-mounted device.**” Petitioner notes that the claim language does not require the detector to be “on” or “in” the head-mounted device, only that the detector be “of” the head-mounted device. Therefore, for starters, in Jaszlics’ embodiment where the system comprises a head-mounted device that includes electronic goggles/visor, the range scanner is “**of said head-mounted device**” because it is used in providing the simulation to that device. In other words, the range scanner is “**of said head-mounted device**” because it is associated with, at least logically (if not physically) connected to, and used in enabling the operation of, the head-mounted device. (Cooperstock, ¶95.)

Moreover, it would have been obvious to a person of ordinary skill in the art for the range scanner itself to be head-mounted or at least body-worn in close proximity to the user’s head. (Cooperstock, ¶96.) This is because Jaszlics itself describes a user wearing electronic display goggles or visor and further discloses that the user can be a mobile individual—not necessarily an individual located in a vehicle. (Jaszlics, e.g., 10:63-67 (“For moving observers, who may be individuals moving in the real world, or housed in a vehicle...”), 5:13-18 (“dynamic scenes with a moving observation point and mobile elements within the real-world scene”), 11:16-18 (“State vectors (three dimensional position, angles, velocity, and angular velocities) are generated for the observer, and for the observer’s vehicle (if any).”),

1:64-67 (describing laser tag).) A person of ordinary skill in the art would have understood that, in order to continue to present a usable and realistic simulation, updated ranging data would need to be collected from the user's vantage point as the user moved around their environment. (Cooperstock, ¶96.)

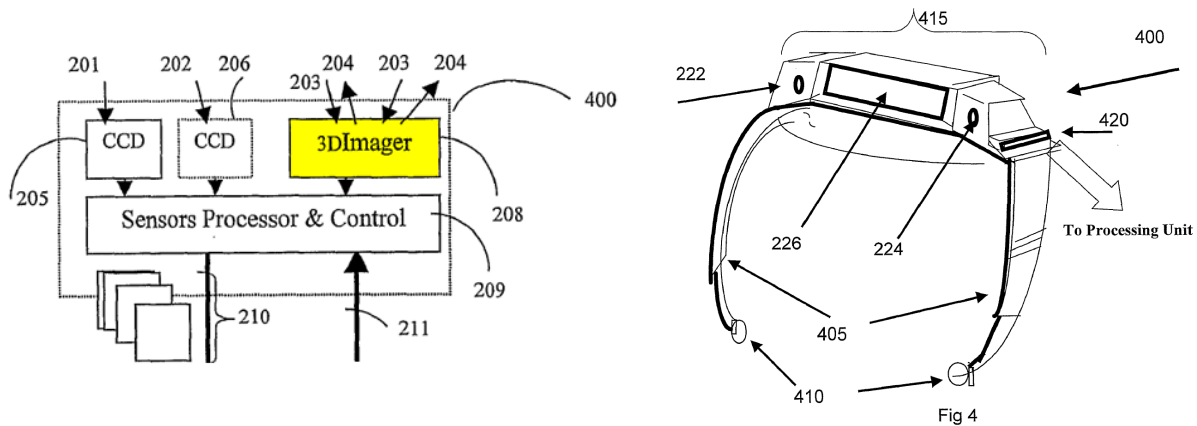
And in fact, Jaszlics discloses that the range scanner is used to periodically scan the user's field of view, including more scanning often for “dynamic scenes with a moving observation point and mobile elements within the real-world scene.” (Jaszlics, e.g., 24:38-40 (“...said range scanner periodically scans an array of ranging sectors in the field of view.”) (claim 10), 5:7-18 (“For dynamic scenes with a moving observation point and mobile elements within the real-world scene....”).) In addition, Jaszlics further suggests that the range scanner is mounted on or closely coupled to the user's head, explaining that “[c]hanges in the head position of the observer in some implementations of the invention will control the optical axes of the video camera and range scanner, to ensure that scanning and real-world scene acquisition coincides with the observer's current field of view.” (Jaszlics, 11:43-47; Cooperstock, ¶97.) The close coupling of a user's field of view and the range scanner is shown in Figure 2 of Jaszlics, which illustrates a range scanner (**101**) placed in proximity to the user's vantage point captured by a video camera (**100**), so that “[t]he field of regard **103** of the camera **100** coincides approximately with the field of regard of the range scanning **101**”:



(Jaszlics, Fig. 2 (excerpt), 8:61-63.) A range scanner kept in close physical proximity to the user wearing electronic goggles/visor (such as on the user's body or head) is another way in which the range scanner is “**of said head-mounted device.**” (Cooperstock, ¶97.)

To the extent there is any question whether it would have been obvious for a range scanner to be head-mounted, this is expressly disclosed by Sofer. (Cooperstock, ¶¶98-102.) Sofer, entitled “Method and Apparatus for a Multisensor Imaging and Scene Interpretation System to Aid the Visually Impaired,” describes a system to aid a person in “negotiating spaces where one’s view is partially or completely obstructed.” (Sofer, p.002 (“Field Of The Invention”).) Sofer’s system “provides detection and identification of fixed or moving obstacles, and can provide estimates of the relative range, speed and bearings of several simultaneous obstacles and objects.” (Sofer, pp.006-007.) Sofer accomplishes this, at least in part, by using a head-mounted laser range scanner. (Sofer, p.008 (“3D imager **208** emits sequences of laser beams **204** and measures the time of arrival of the return beams **203** in order

to compute the distance to the point on the surface of any object in the field of vision.”.) Figures 2 and 4 of Sofer, both reproduced below, together illustrate an exemplary headset “for use with the present invention, in accordance with an exemplary embodiment of the present invention”:



(Sofer, Fig. 2 (excerpt; highlighting added to indicate laser range scanner (“3D imager”) 208), Fig. 4; *see also id.*, p.0013.) As Sofer explains, the headset includes a “scanning range-finder” “mounted in the headset carrying compartment 415.” (Sofer, p.0013; *see also id.*, p.008 (“The input unit 400, illustrated in Fig. 4 comprises two sensors, CCD sensor 205 and 3D imager 208, and an optional third sensor shown as CCD sensor 206.”).)

Rationale and Motivation to Combine (Jaszlics with Sofer). It would have been obvious to combine Sofer’s teachings regarding a head-mounted range scanner with Jaszlics’ combined reality computing system. (Cooperstock, ¶99.) The combination involved the incorporation of Sofer’s range scanning techniques, with no change in function, into Jaszlics’ system utilizing a head-mounted device. (*Id.*)

This combination would have predictably resulted in a head-mounted range scanner used for the user's electronic goggles/visor—thereby disclosing “**a detector of said head-mounted device**” as claimed. (*Id.*)

Jaszlics and Sofer are both analogous references to the '448 patent, in the same field and reasonably pertinent to problems facing the '448 patent inventor. (Cooperstock, ¶100 (citing Jaszlics, 1:13-15, 10:63-67; Sofer, p.002 (“Field Of The Invention”); '448, 1:28-31, 19:54-57).)

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶101.) As discussed above, a person of ordinary skill in the art would have appreciated that it would be desirable for Jaszlics' range scanner to be placed in close proximity to the user's vantage point, and in fact Jaszlics teaches such an arrangement. (Jaszlics, 11:43-47, Fig. 2, 8:61-63.) As also discussed, Jaszlics further describes how its system can be used by an individual mobile user. (Jaszlics, 10:63-67, 5:13-18, 11:16-18, 1:64-67.) Therefore, a person of ordinary skill in the art, seeking to implement or adapt Jaszlics' teachings, would have been motivated to investigate potential ways in which range scanning could be implemented for a mobile individual—and would have recognized that a head-mounted range scanner would have been obvious to try. (Cooperstock, ¶101.) A person of ordinary skill in the art would have therefore looked to a reference like Sofer for its disclosures

confirming and describing an implementation of a lightweight, head-mounted range scanning device for a mobile individual. (*Id.*)

A person of ordinary skill in the art would have had a reasonable expectation of success. The combination would have simply involved where to place a known, available range scanner—in this case, mounting the scanner on the user’s head.

- (c) **“a locating device of said head-mounted device operable to determine the physical location of said locating device on said physical playfield, wherein said video game logic utilizes the physical location of said locating device in providing said video game; and” (1[c])**

As explained below, this limitation is disclosed by and obvious over Jaszlics alone or in view of **Ronzani**. As with claim 1[b], the Petition combines with Ronzani to address a possible interpretation that the claim language **“a locating device of said head-mounted device”** means that the **“locating device”** must itself be mounted on the user’s head.

The ’448 patent identifies a GPS device as an example of a **“locating device.”** (’448, 4:21 (“If the locating device is a GPS device...”), 20:64-66 (“location devices (e.g., GPS, LPS, accelerometers, gyroscopes, inertial movement sensors, hybrid location systems) **1445**”); Cooperstock, ¶104.)

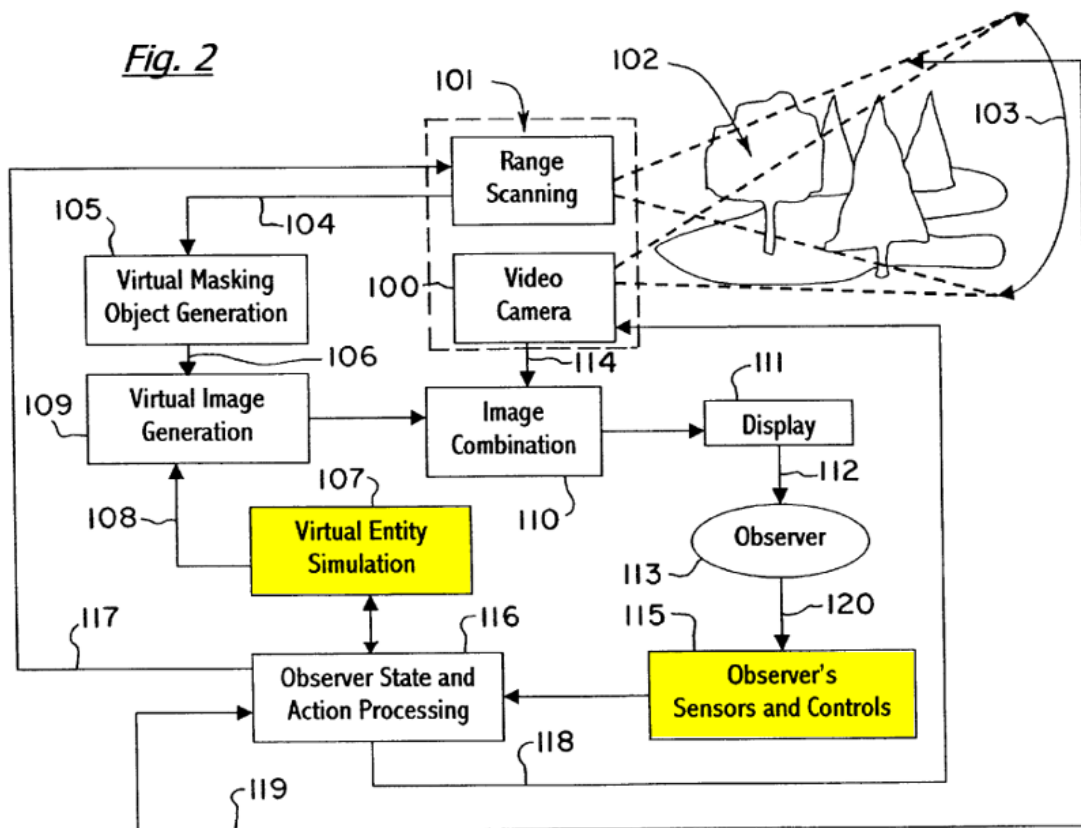
Jaszlics likewise discloses GPS. Jaszlics discloses using “observer sensors” for sensing a user’s position, and that the observer sensors can include “a position determination system, such as a differential Global Positioning Satellite System

(GPS).” (Jaszlics, 10:52-11:4; *see also id.*, 16:30-32 (“Global Positioning Satellite (GPS) receiver”).) Jaszlics therefore discloses the claimed **“locating device”** in the form of a device comprising a GPS receiver associated with the user and used to determine the receiver’s (and thereby, the user’s) physical location (**“operable to determine the physical location of said locating device on said physical playfield”**). (Cooperstock, ¶105.)

Jaszlics also teaches **“said video game logic utilizes the physical location of said locating device in providing said video game.”** (Cooperstock, ¶106.) Jaszlics explains that the system utilizes user sensor information that it receives, such as position information, to update the simulation (**“said video game”**) accordingly, for example:

Changes in the position and orientation of the observer, of a vehicle housing the observer, or of movable elements of the vehicle (e.g. a tank’s turret) as sensed by the observer’s sensors and controls are processed by the observer state and action processing step. The virtual entity simulation receives this information for updating the simulation, in which the avatar of the observer, or the avatar of the observer’s vehicle is represented. Both the virtual entity simulation and the virtual masking object generation function will respond to the position and attitude changes of the observer, or the observer’s vehicle. Such changes will affect the angular orientation of the virtual entities and virtual masking objects, and the apparent distance from observer to virtual entities and masking objects.

(Jaszlics, 11:30-43; *see also id.*, 11:14-21 (“Observer actions sensed by the observer’s sensor and controls are transformed into data or control signals appropriate for responding to the observer’s actions.”).) Figure 2 of Jaszlics, below, illustrates how information from observer sensors **115** (such as a GPS receiver) is input into a virtual entity simulation **107** provided by the virtual simulation and control software (“**said video game logic**”), which ultimately results in the combined reality image provided to the user:



(Jaszlics, Fig. 2 (highlighting added); *see also id.*, 14:66-15:1 (“Virtual entity simulation is implemented in the virtual simulation computer through the virtual simulation and control software.”).)

Jaszlics therefore teaches that system software including virtual simulation and control software (“**said video game logic**”) uses physical location information provided by a GPS receiver (“**utilizes the physical location of said locating device**”) to provide updated virtual simulation game play based on that information (“**in providing said video game**”). (Cooperstock, ¶107.)

The Petition will turn now in more detail to the claim language “**a locating device of said head-mounted device**.” As with the “detector” of claim 1[b], Petitioner notes that the claim language does not require the locating device to be “on” or “in” the head-mounted device, only that it be “of” the head-mounted device. Therefore, for starters, in Jaszlics’ embodiment where the system comprises a head-mounted device that includes electronic goggles/visor, the user’s GPS receiver is “**of said head-mounted device**” because it is used in providing the simulation to that device. In other words, as with Jaszlics’ range scanner, the GPS receiver is “**of said head-mounted device**” because it is associated with, at least logically (if not physically) connected to, and used in enabling the operation of, the head-mounted device. (Cooperstock, ¶108.)

Moreover, just like Jaszlics’ range scanner, it would have been obvious to a person of ordinary skill in the art for the user’s GPS receiver to be head-mounted or at least body-worn in close proximity to the user’s head. (Cooperstock, ¶109.) This is because, as discussed, Jaszlics teaches that the user can be a mobile individual.

(Jaszlics, e.g., 10:63-67, 5:13-18, 1:64-67 (describing laser tag).) A person of ordinary skill in the art would have understood that, in order to continue to present a usable and realistic simulation, updated positioning information would need to be collected about the user as the user moved around their environment—in fact, as noted above, this is expressly acknowledged in Jaszlics. (Cooperstock, ¶109; Jaszlics, e.g., 11:30-43.) In order to collect accurate information about that user’s position, the GPS receiver would need to be kept in close proximity to the user—and the user’s head, as the body location most capable of receiving unobstructed signals from overhead GPS satellites, would have been an obvious choice from a finite number of body locations. (Cooperstock, ¶109.) Such a GPS receiver kept in close physical proximity to the user is another way in which the GPS receiver is “**of said head-mounted device.**” (*Id.*)

To the extent there is any question whether it would have been obvious for a GPS receiver to be head-mounted, this is expressly disclosed by **Ronzani**. (Cooperstock, ¶110.) Ronzani, entitled “Head-Mounted Display System,” describes various embodiments of a head-mounted display device, including head-mounted display devices that include a GPS receiver. The head-mounted devices have a variety of uses—including, like Jaszlics, military and “entertainment purposes.” (Ronzani, ¶¶0005 (“The present invention relates generally to systems and methods for mounting display and electronic systems on the human body for numerous

applications including commercial, industrial and entertainment purposes.”), ¶0189 (“**FIG. 42** is a functional block diagram of a head-mounted military computer 710F.”) For example, Figure 42 of Ronzani, shown below, is a “functional block diagram of a head-mounted military computer **710F**”:

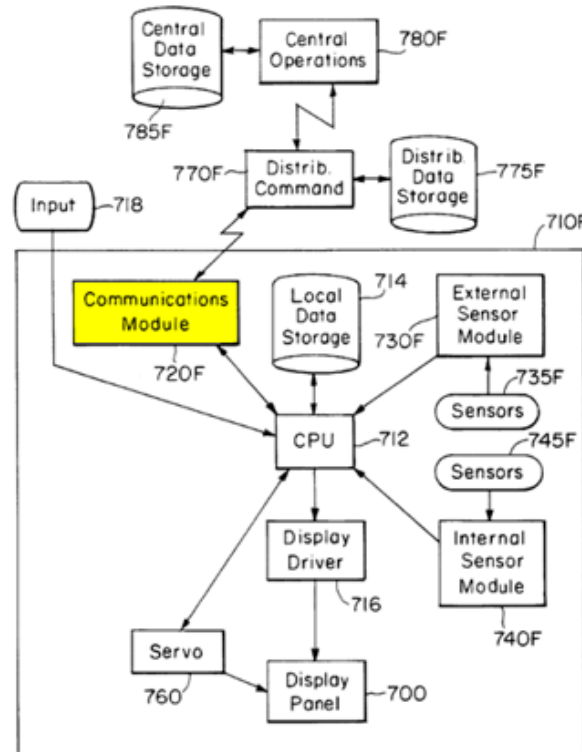


Fig. 42

(Ronzani, Fig. 42 (highlighting added), ¶0189.) As highlighted in the figure above, the “head-mounted military computer” includes a Communications Module 720F, which can “contain a GPS, which provides the soldier and command officers with the soldier’s location.” (Ronzani, ¶0191.) Ronzani also describes numerous other, non-military, head-mounted devices that include GPS. (Ronzani, e.g., ¶¶0179-0181 (“head-mounted police computer” “can also include a GPS”), 0182-0183 (“head-

mounted computer 710C for use by chemical factory workers” “can also include a GPS”), 0200-0201 (“head-mounted survival computer” “includes a GPS”).)

Rationale and Motivation to Combine (Jaszlics-Sofer with Ronzani). It would have been obvious to combine Ronzani’s teachings regarding a head-mounted GPS receiver with Jaszlics’ combined reality computing system under the proposed combination of Jaszlics-Sofer. (Cooperstock, ¶111.) The combination with Ronzani would have involved no change in function and would have predictably resulted in a head-mounted GPS receiver used for the user’s electronic goggles/visor—thereby disclosing “**a locating device of said head-mounted device**” as claimed. (*Id.*)

Ronzani is an analogous reference to the ’448 patent, in the same field and reasonably pertinent to problems facing the ’448 patent inventor. (Cooperstock, ¶112 (citing Ronzani, e.g., ¶¶0005, 0189).)

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶113.) As discussed above, a person of ordinary skill in the art would have appreciated that it would be desirable for Jaszlics’ GPS receiver to be placed in close proximity to the user. Therefore, a person of ordinary skill in the art, seeking to implement or adapt Jaszlics’ teachings, would have been motivated to investigate potential ways in which a GPS receiver could be implemented for a mobile individual—and would have recognized that a head-mounted GPS receiver would have been obvious to try. (*Id.*) A person of ordinary skill in the art would have

therefore looked to a reference like Ronzani for its disclosures confirming and describing implementations of a head-mounted GPS receiver for a mobile individual. (*Id.*)

A person of ordinary skill in the art would have had a reasonable expectation of success. The combination would have simply involved where to place a known, available GPS receiver—in this case, mounting the device on the user’s head. (Cooperstock, ¶114.)

(d) **“a processor, wherein a first virtual object is operable to be provided to said display and a first virtual character is operable to be provided to said display.” (1[d])**

To start, Jaszlics discloses **“a processor.”** As discussed for claim 1[a], Jaszlics describes using conventional computing components, including a “virtual simulation computer” having a processor for executing “virtual simulation and control software” to provide a virtual simulation (e.g., a video game). (Jaszlics, 14:13-18 (“virtual simulation computer **210** (e.g., a personal workstation running two **266** MHz Pentium II processors)”), 14:66-15:1, 15:53-56.) Moreover, because a processor is a basic component of a conventional computing system, a person of ordinary skill in the art would have understood and found it obvious that Jaszlics’ system would have included a processor. (Cooperstock, ¶115 (citing EX1012, pp.007-008 (entry for “microprocessor”)).)

Turning to “**a first virtual object**” and “**a first virtual character**,” Petitioner explained in connection with claim 1[a] and the recited “**3-D video game indicia**” how Jaszlics discloses displaying various virtual entities, such as virtual tanks, other characters or entities, and conceptual objects. (Jaszlics, e.g., Fig. 1 (virtual tank), 4:19-23 (describing Fig. 1), 4:23-27 (“...many other virtual objects, including animated human figures, geometric figures, or injection of three-dimensional building plans into a real-world environment.”), Fig. 14 (virtual tanks), 3:49-51 (describing Fig. 14, “virtual tanks”), Fig. 15, 9:64-10:9 (“The virtual entities generated by a virtual entity simulation do not necessarily represent a real-world object. For example, they may represent fictional characters or entities, or views of conceptual objects. An example of conceptual virtual entities is shown in FIG. 15....The conceptual virtual entities in the figure are conceptual objects: a path marker 172, a unit boundary 173, a navigational marker 174, and a phase line 175.”).) The ’448 patent makes clear that the “video game indicia” include both video game characters and other video game objects. (’448, e.g., 3:60-63 (“...virtual indicia (e.g., a video game character or component is added [sic]) is added to the physical environment.”), 4:8-13 (“...such video game indicia may be provided...such that at least virtual objects/characters are semi-transparent...”); Cooperstock, ¶116.) Similarly, Jaszlics’ various virtual entities (“**3-D video game indicia**”) comprise both “**virtual object(s)**” and “**virtual character(s)**.”

In particular, Jaszlics discloses “**a first virtual object**” in the form of what Jaszlics calls a “conceptual object” that is displayed to the user, such as a path marker, a unit boundary, a navigational marker or a phase line. (Cooperstock, ¶117.)

Figure 15 of Jaszlics illustrates these virtual objects:

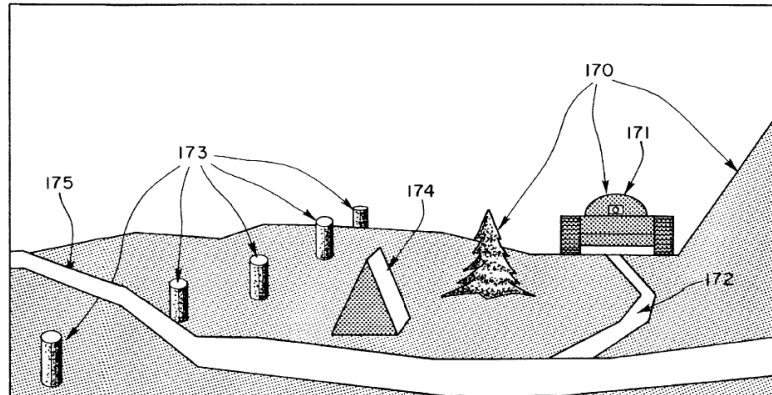


Fig. 15

(Jaszlics, Fig. 15; *see also id.*, 10:1-9 (“In FIG. 15, the real-world objects **170** include the terrain, a tree, and a battle tank, in which the observer or observers **171** of a combined reality view presented to them are located. The conceptual virtual entities in the figure are conceptual objects: a path marker **172**, a unit boundary **173**, a navigational marker **174**, and a phase line **175**. The present system positions the conceptual virtual entities in the display in such a manner that they appear to be present in the landscape visible to the observer(s).”).)

Jaszlics also discloses “**a first virtual character**” in the form of a virtual entity, such as a virtual tank (or other type of virtual opponent/character, such as animated human figures or animals), which is displayed to the user and with which

the user may interact, such as by engaging in a battle, as explained in connection with claim 1[a]. (Jaszlics, e.g., 9:60-67, 10:11-23, 11:57-63, 15:18-30, 15:53-56, 18:48-51; *see also id.*, 1:64-67 (describing laser tag game involving real and “virtual players”), 2:16-20 (“The virtual elements injected into real-world environments in entertainment applications may be representations of persons, animals, natural phenomena, cartoon characters, and other real or imaginary visual elements.”), 4:23-27 (“...many other virtual objects, including animated human figures, geometric figures, or injection of three-dimensional building plans into a real-world environment.”); Cooperstock, ¶118.)

Jaszlics therefore discloses and renders obvious “**a processor, wherein a first virtual object is operable to be provided to said display and a first virtual character is operable to be provided to said display**” as claimed. (Cooperstock, ¶119.)

2. Claim 3: “The system of claim 1, wherein said first virtual object is a pre-defined virtual barrier.”

With respect to a “**virtual barrier**,” the ’448 patent states: “Virtual barriers may then be provided (e.g., rendered and augmented on a display) at this proximity (or at predefined boundaries) to immerse the user in the augmented world. For example, if a child is playing in a city, then the visual barriers may take the form of fog and this may hide any skyscrapers that may take away from the believability of the augmented reality.” (’448, 18:49-55.) The ’448 patent therefore makes clear

that a “virtual barrier” encompasses a virtual object that serves as a visual boundary or that provides some form of separation—in the passage above, a virtual fog that acts to separate more distant physical surroundings from the user’s view. (Cooperstock, ¶120.) This is consistent with the ordinary understanding of “barrier,” which includes “something immaterial that impedes or separates.” (*Id.* (quoting EX1014, p.003 (entry for “barrier”))).)

As discussed for claim 1[d], Jaszlics discloses displaying various conceptual objects (“**virtual object[s]**”), including a “unit boundary” highlighted in yellow below:

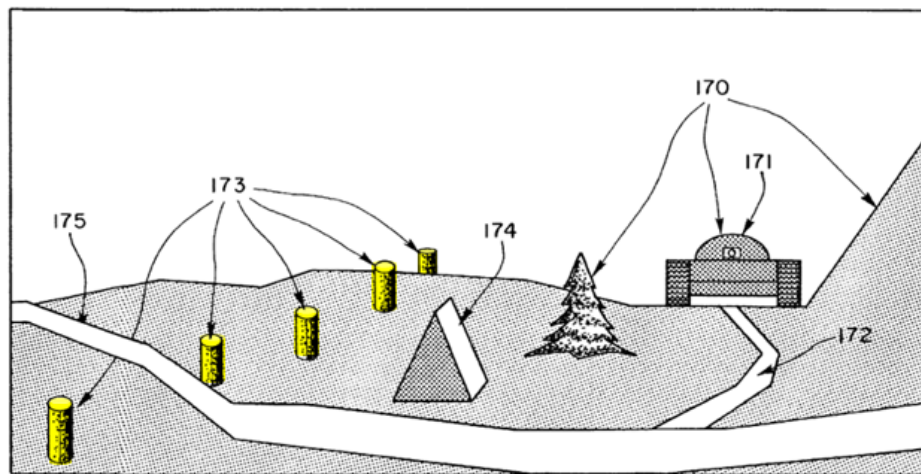


Fig. 15

(Jaszlics, Fig. 15 (highlighting added); *see also id.*, 10:1-9.) Jaszlics does not further describe the “unit boundary,” but as its name implies, a “unit boundary” refers to a boundary that separates one military unit from another. (Cooperstock, ¶121.) A unit boundary defines the area of deployment and helps ensure that military forces do not

enter hostile or restricted territory, and prevent confusion and potential friendly fire incidents during combat or other operations. (*Id.* (citing EX1015, pp.002-005).)

A person of ordinary skill in the art would have understood and found it obvious that the displayed “unit boundary” would serve as a “**virtual barrier**” because it would keep the user’s area of operation separated from off-limits areas and keep the user focused on and within the correct operational area. (Cooperstock, ¶122.) A person of ordinary skill in the art would have also recognized that this sort of virtual barrier would have broad applicability, such as to laser-tag like games also described in Jaszlics. (*Id.* (citing Jaszlics, 1:64-67).)

Moreover, a person of ordinary skill in the art would have appreciated and found it obvious for Jaszlics’ visual boundary to serve as a functional barrier by explicitly impeding or directing game play. (Cooperstock, ¶123.) Boundaries are an integral part of countless games (such as tennis, soccer, and even the kids’ games hopscotch or the floor is lava) and crossing them commonly affects game play, such as by imposing some sort of penalty, e.g., losing a turn or ending game play. (*Id.*) A person of ordinary skill in the art would have readily appreciated that crossing or approaching Jaszlics’ unit boundary too closely would similarly impact game play, such as by alerting the player and/or halting play. (*Id.*) One can easily imagine using boundaries in this manner in Jaszlics’ war gaming simulations (at least), where it is important to train and correct users regarding potentially life threatening mistakes in

a real-world scenario—there was nothing novel or non-obvious about this sort of “barrier.” (*Id.*)

In fact, this common sense notion applied to an augmented reality gaming environment is expressly confirmed in Levesque [EX1010]. (Cooperstock, ¶124.) Just like Jaszlics, Levesque, entitled “Mobile Electronic Video Game,” describes a location-based gaming system using a heads-up display. (Levesque, e.g., ¶0008.) Levesque explains that a user defines virtual boundaries of an area for game play, and those boundaries are visually presented in the user’s heads-up display during game play. (Levesque, ¶0035.) For example, Figure 4 of Levesque, reproduced below, shows “virtual boundary 60” presented within a heads-up display 20:

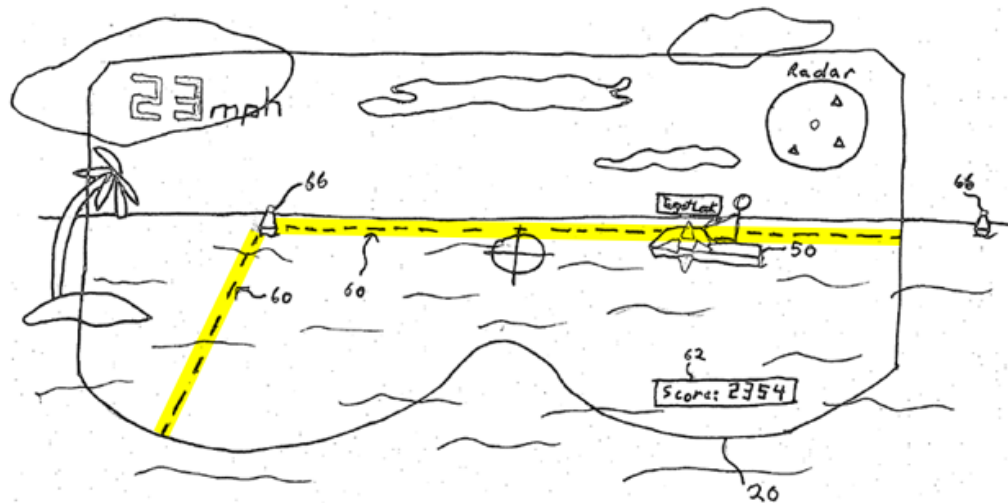


Fig. 4

(Levesque, Fig. 4 (highlighting added); *see also id.*, ¶0034 (“As illustrated in **FIG. 4**, a first example game may present simulated opponents 50 within a virtual

boundary 60.”.) Levesque teaches that the displayed virtual boundary serves as a barrier by impeding (e.g., disabling or slowing the user’s vehicle) and/or directing game play (e.g., displaying a warning to the user):

Further, as illustrated in FIG. 5 a virtual boundary 60 may be enforced by gaming device 10, to ensure safe game play. The virtual boundary 60 may initially be defined by way of a configuration screen similar to that illustrated in FIG. 5....Once the boundary 60 is defined and stored at central gaming unit 12, gaming unit 12 may react to an operator crossing the defined virtual boundary 60 (as sensed through location sensor 14) with the vehicle by disabling or slowing the vehicle’s engine through ECU interface 16 or alternatively sending a necessary warning to the operator by way of display 20 to shut down the vehicle and/or disable the game, thereby maintaining a level of safety.

(Levesque, ¶0035.) Accordingly, a “virtual object” in the form of a “**virtual barrier**” would have been obvious. (Cooperstock, ¶124.)

A person of ordinary skill in the art would have further understood and found it obvious that this sort of virtual barrier, as part of a defined game or scenario in Jaszlics, would be “**predefined**” (for example, as VRML data). (Cooperstock, ¶125 (citing Jaszlics, e.g., 8:39-42 (“The virtual entity appearance data result in virtual images rendered in their normal appearance attributes, that is in their color, texture, intensity and other attributes as defined in the virtual entity simulation.”), 15:18-24 (“Select Scenario selects one of several available scenarios for the behavior of the

virtual entities being simulated (in this case T-80 main battle tanks). Other scenarios not related to tanks, or military training, can be selected by a user of the reference apparatus after minor modification of the VRML data, and the labels of the scenario control list.”)).)

3. Claim 7: “The system of claim 1, wherein said first virtual character has a weapon for providing an interactive object.”

Jaszlics teaches that a virtual entity (“**first virtual character**”), such as a virtual tank, has a “**weapon**,” such as a gun, with which the entity can interact with the user, thereby providing “**an interactive object.**”

Fig. 1b
Virtual Image

(Jaszlics, e.g., 11:57-63 (“[I]f one of the virtual tanks represented in this simulation engage the avatar of the observer’s tank, the resulting damage information



will activate damage displays, or a ‘killed’ indicator in the observer’s sensors and controls suite.”), Fig. 1b (at right, showing tank guns); Cooperstock, ¶126.) This is consistent with the ’448 patent, which similarly states that “a virtual controlled character may have an interactive object like a weapon (e.g., a gun) that may shoot an interactive bullet over a particular distance.” (’448, 20:5-8; *see also id.*, 19:60-64 (“[F]ar-away characters may be semi-transparent (noting they can’t interact with you yet such as they can’t shoot you yet)...”).)

Moreover, as noted, Jaszlics explains that its system can be used for games like laser tag involving virtual players. (Jaszlics, 1:64-67.) Because laser tag

involves play guns, a person of ordinary skill in the art would have understood and found it obvious that a virtual laser tag player would likewise have a gun with which to interact with real players. (Cooperstock, ¶127.) More generally, virtual opponents having weapons for attacking a player have been fixtures since the earliest days of video games—for example, the classic 1978 video game Space Invaders involved aliens attempting to destroy a player’s cannon by firing projectiles (see image at right). (Cooperstock, ¶127.) There is nothing novel or non-obvious about this claim—it is disclosed and obvious. (*Id.*)



D. Ground 2: Claim 6 Is Obvious Over Ground 1 Prior Art in Further View of Morihira

1. Claim 6: “The system of claim 1, wherein the transparency of said first virtual character is based on a distance.”

As explained below, claim 6 would have been obvious in view of Morihira. Morihira, entitled “Video Game Transparency Control System for Images,” describes techniques for varying the transparency of displayed virtual elements depending on the perceived distance of the element from the viewer. (Cooperstock, ¶¶128-132.) Morihira explains the problem of how virtual elements in a user’s field of view can block the user’s view of important game play:

One problem with conventional combat video games is that when the viewpoint of a hypothetical camera is located at a certain position in the field of the pseudo-three-dimensional space, an object model such as a

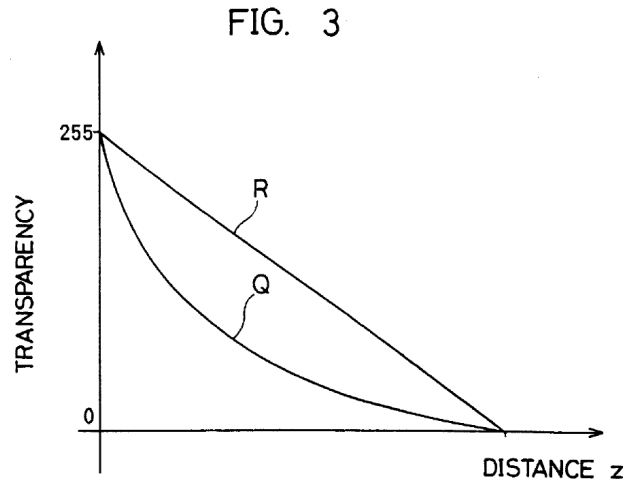
pillar in the field comes in front of the viewpoint of the hypothetical camera, concealing on the display screen important battle information of a game character which represents whether the game character is squatting or jumping.

(Morihiro, 1:41-48.) To address this problem, Morihiro explains that the virtual element blocking the user's view can be switched to a translucent rendition.

(Morihiro, 1:49-55.) Morihiro proposes a further improvement to this idea, where the amount of transparency of the virtual element's translucent rendition depends on distance from the viewpoint to the object:

Specifically, the transparency of an object model can be changed depending on the distance from the viewpoint of the hypothetical camera to the object model, e.g., the transparency of an object model can be lowered as the distance from the viewpoint of the hypothetical camera to the object model becomes greater. This process is referred to as a translucent fogging process.

(Morihiro, 8:28-34; *see also id.*, 7:23-44, 10:13-19.) Figure 3 of Morihiro illustrates an example of how element transparency (represented on the vertical axis below) can change depending on viewpoint distance (represented on the horizontal axis):



(Morihiro, Fig. 3; *see also id.*, 9:28-40 (describing Fig. 3).)

Rationale and Motivation to Combine (Ground 1 Prior Art with Morihiro). It would have been obvious to a person of ordinary skill in the art to combine Morihiro's teachings regarding virtual element transparency with Jaszlics' system under the proposed combination. (Cooperstock, ¶129.) It would have involved the straightforward incorporation of Morihiro's techniques for adjusting the transparency of displayed virtual elements based on perceived distance from the viewpoint of the user and would have predictably resulted in a virtual simulation system as taught by Jaszlics in which the transparency of virtual elements (such as vehicles, players, and other virtual opponents and characters, as well as markers and boundaries) varied depending on their perceived distance from the user wearing their head-mounted display. (*Id.*) The combination therefore discloses and renders obvious **"the transparency of said first virtual character is based on a distance"** as claimed. (*Id.*)

Morihira is an analogous reference to the '448 patent, in the same field and reasonably pertinent to problems facing the '448 patent inventor. (Cooperstock, ¶130 (citing Morihira, 1:6-15).)

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶131.) Morihira addresses a known issue for video games involving a movable viewpoint in a three-dimensional space—what to do when a virtual element, based on its distance to the user's viewpoint, obscures the user's view. Such a problem, left unresolved, can impair user experience and realism, as well as risk player safety. (*Id.*) A person of ordinary skill would have recognized that this same issue is applicable to Jaszlics—as a user approached virtual elements, reducing their transparency accordingly would enable the user to better focus on real-world objects as well as pertinent aspects of game play, such as tracking or engaging other virtual characters. (*Id.*) A person of ordinary skill in the art would have further recognized that, as a user approaches a virtual element, there can come a point where continuing to display the object in front of the user no longer provides a realistic experience or may unduly risk player safety. (*Id.*) In those cases, applying Morihira's techniques would improve game play by allowing the user to see beyond the virtual element. (*Id.*) These benefits are expressly discussed in Morihira, which explains “[s]ince the obstacle in front of the game character is translucent, the viewpoint of the hypothetical camera can be moved without concern over the

presence of the obstacle, and the game player can easily recognize the combat situation for the game character and hence can maneuver the game character easily for fighting against the opponent character.” (*Id.* (quoting Morihira, 9:14-20).)

A person of ordinary skill in the art would have had a reasonable expectation that the combination would have been successful, as it would have involved the routine application of conventional software programming. (Cooperstock, ¶132.)

E. Ground 3: Claim 8 Is Obvious Over Ground 1 Prior Art in Further View of Robarts

1. Claim 8: “The system of claim 1, wherein an event envelope is provided and an event is operable to occur upon entry of said first virtual character into said event envelop [sic].”

The ’448 patent describes an “**event envelope**” as encompassing an area where entry by a character (either a computer-controlled character or a user-controlled character) results in some sort of event occurring:

Virtual characters (either opponent-controlled or computer controlled) may have certain functionalities that have certain functionality envelopes. For example, a virtual controlled character may have an interactive object like a weapon (e.g., a gun) that may shoot an interactive bullet over a particular distance. Such envelopes may take any form. For example, if a virtual character has a force field then the force field may be mapped around, for example, a controlling location a particular distance. Thus, an event may occur if a different character (such as a user-operated character) walks into this envelope (e.g., the user’s health may decrease).

(’448, 20:3-14; Cooperstock, ¶133.)

An “**event envelope**” as claimed would have been obvious in view of **Robarts**. (Cooperstock, ¶¶134-140.) Robarts, entitled “Method and System for Interacting with Simulated Phenomena,” describes a location-based gaming system involving “enhanced computer- and network-based methods and systems for interacting with simulated phenomena using mobile devices.” (Robarts, ¶0036.) Robarts explains that “a simulated phenomenon includes any computer software controlled entity....For example, a simulated phenomenon may be a ghost, playmate, animal, particular person, house, thief, maze, terrorist, bomb, missile, fire, hurricane, tornado, contaminant, or other similar real or imaginary phenomenon, depending upon the context in which the SPIS is deployed.” (Robarts, ¶0037.) Robarts describes a “Simulated Phenomena Interaction System (‘SPIS’), which enables users to enhance their real world activity with computer-generated and computer-controlled simulated entities, circumstances, or events, whose behavior is at least partially based upon the real world activity taking place.” (Robarts, ¶0036.) As explained below, Robarts’ systems includes an “**event envelope**” in the form of an area around a user’s character, which causes various events related to virtual characters when those characters enter that area. (Cooperstock, ¶¶134-136.)

As an example, Robarts describes a game called “Spook” in which simulated phenomena (“SP”) in the form of “ghosts” “are scattered about a real world

environment in which the user is traveling with the mobile device, for example, a park.” (Robarts, ¶0042.) Robarts explains that the object of the “Spook” game is to find ghosts, which are detected depending on the player’s physical location, and interact with them in order to find a particular ghost that needs help. (Robarts, ¶0042; Cooperstock, ¶135.) Referring to Figure 3 (reproduced with highlighting at right), Robarts details how detection and visibility of ghosts is limited to a certain area around the ghost and player. In particular, Figure 3 shows a display of a “spectra-meter” that “indicates the locations of each simulated

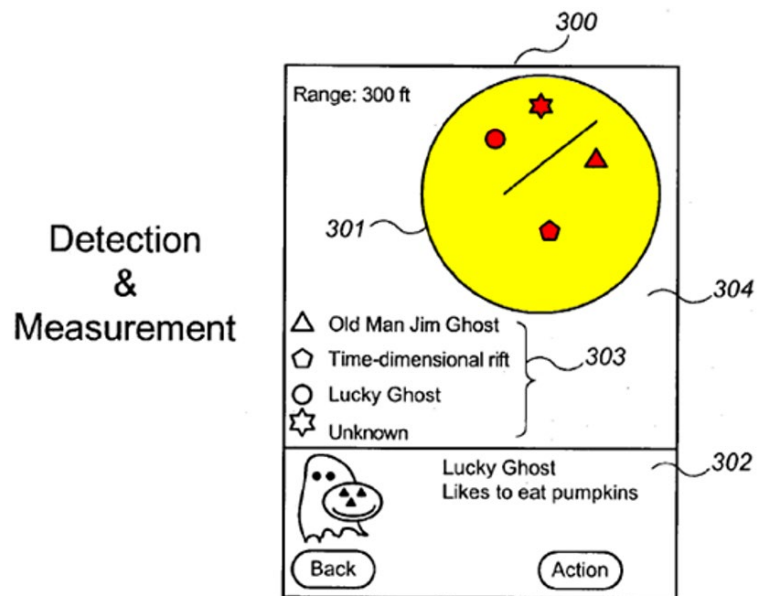


Fig. 3

phenomena (“SP”) that was detectable and detected by the device 300”—in this example, simulated phenomena within 300 feet of the user. (Robarts, ¶0043.) As the figure shows, four different ghosts (highlighted in red) were detected in that area (highlighted in yellow) and are displayed by the spectra-meter. (Robarts, ¶0043.) Therefore, Robarts explains that the visibility of a “simulated phenomenon” is limited to a certain area—for example, the area corresponding to a 300 foot range surrounding the user. When a simulated phenomenon enters this area, an “event”

occurs, i.e., the simulated phenomenon is detected and becomes visible to the user.

(Cooperstock, ¶135.)

As another example of an “**event**,” Robarts further explains that a simulated phenomenon can react to entering a player’s area by “jump[ing] away” from the player:

Once the location of the device is sensed, this location can in turn be used to model the behavior of the SP in response to the different interaction requests. For example, the position of the SP relative to the mobile device may be dictated by the narrative to be always a multiple from the current physical location of the user’s device until the user enters a particular spot, a room, for example. Alternatively, an SP may “jump away” (exhibiting behavior similar to trying to swat a fly) each time the physical location of the mobile device is computed to “coincide” with the apparent location of the SP. To perform these type of behaviors, the simulation engine typically models both the apparent location of the SP and the physical location of the device based upon sensed information.

(Robarts, ¶0083.) Robarts therefore discloses providing “**an event envelope**”—the area around a user (or the user’s associated character)—and “**an event...operable to occur upon entry of [a] virtual character into said event envelop [sic]**”—i.e., an event such as the virtual character being detected and becoming visible or jumping away. (Cooperstock, ¶136.)

Rationale and Motivation to Combine (Ground 1 Prior Art with

Robarts). It would have been obvious to a person of ordinary skill in the art to combine Robarts’ teachings regarding an event envelope for simulated phenomena with Jaszlics’ virtual simulation system described for claim 1. (Cooperstock, ¶137.) The combination would have involved the straightforward application of Robarts’ techniques to Jaszlics’ similar virtual characters in the system under the proposed combination, such as Jaszlics’ virtual vehicles and players, or to incorporating a “Spook”-like game described in Robarts into the Jaszlics system. (*Id.*) The combination would have predictably resulted in game play in which **“an event envelope is provided and an event is operable to occur upon entry of said first virtual character into said event envelop [sic]”** as claimed. (*Id.*)

Robarts is an analogous reference to the ’448 patent, in the same field and reasonably pertinent to problems facing the ’448 patent inventor. (Cooperstock, ¶138 (citing Robarts, ¶¶0036-0037, 0068-0069).)

A person of ordinary skill in the art would have been motivated to combine. (Cooperstock, ¶139.) As discussed, Jaszlics and Robarts make clear that their systems are applicable to a wide range of gaming and simulation experiences. (*See also* Robarts, ¶0048 (“Many other gaming, training, and computer aided learning experiences can be similarly presented and supported using the techniques of a Simulated Phenomena Interaction System.”).) Recognizing the strong similarities in these systems, a person of ordinary skill in the art would have readily appreciated

and been motivated to incorporate features and techniques in one system to another to obtain the same or similar benefits. (Cooperstock, ¶139.) For example, incorporating a computer-controlled video game character whose actions are affected as a result of entering a certain area as taught by Robarts would have provided additional possibilities for game play, including increased variety, challenge and suspense. (*Id.*) Even when limited to a realistic war gaming context, there are readily apparent examples of virtual characters whose actions should be affected by entering a certain area, such as a hidden virtual player that attacks or flees only once the user is within a certain range. (*Id.*) More generally, many adults will likely remember playing “guns” or “war games” as a child with their friends, and saying things like, “don’t come any closer or I’ll shoot.” (*Id.*) The incorporation of such timeless behavior into a virtual simulation as an “**event envelope**” accordingly would have been obvious to try and to implement in a video gaming system. (*Id.*)

A person of ordinary skill in the art would have had a reasonable expectation of success, as the combination would have involved at most the routine application of conventional software programming. (Cooperstock, ¶140.) For example, as Robarts notes, “[o]ne skilled in the art will recognize that appropriate software modeling can be incorporated into a phenomenon modeling component or the simulated phenomena attributes data repository to account for the 3D modeling

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supported by such devices and enhance them to represent simulated phenomena in
the user's field of view." (*Id.* (quoting Robarts, ¶0088).)

VII. CONCLUSION

Petitioner respectfully requests IPR institution.

Dated: March 26, 2025

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 10,748 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: March 26, 2025

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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. 9,744,448 B2**, including all exhibits (**Nos. 1001-1003, 1006-1012, 1014-1016, 1018**) and related documents, are being served via Federal Express on the 26th day of March, 2025, 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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UNITED STATES

And, via Federal Express upon counsel of record for Patent Owner in the litigation pending before the U.S. District Court for the Western District of Texas entitled *Mullen Industries LLC v. Meta Platforms, Inc.*, Case No. 1:24-cv-00354-DAE (W.D. Tex.) as follows:

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