

Filed: March 25, 2025

Filed on behalf of Meta Platforms, Inc.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.,
Petitioner

v.

MULLEN INDUSTRIES, LLC,
Patent Owner

Case No. IPR2025-00703

U.S. Patent No. 11,033,821

**Petition for *Inter Partes* Review of
U.S. Patent No. 11,033,821**

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	CHALLENGES.....	1
III.	BACKGROUND	1
	A. '821 Patent.....	1
	1. Priority No Earlier Than September 1, 2004	2
	B. Prosecution History	4
IV.	PRIOR ART	4
	A. Cheok (EX1006).....	4
	1. Cheok is Prior Art	10
	B. Nakamura (EX1007)	12
	C. Foxlin077 (EX1008)	13
	D. Benini (EX1009)	13
	1. Benini is Prior Art.....	16
	E. Rallison (EX1014).....	17
V.	LEVEL OF ORDINARY SKILL.....	17
VI.	CLAIM CONSTRUCTION.....	17
VII.	GROUND 1: CHEOK IN VIEW OF FOXLIN077 RENDERS CLAIMS OBVIOUS 1, 4, AND 11	18
	A. Claim 1	18
	1. Preamble.....	18
	2. 1[a]	19
	3. 1[a.1]	20
	4. 1[a.2]	21
	5. 1[a.3]	23

a.	Foxlin077	29
b.	Motivation to Combine.....	34
c.	Reasonable Expectation of Success.....	36
B.	Dependent Claim 11	38
VIII.	GROUND 2: CHEOK IN VIEW OF FOXLIN077 AND RALLISON RENDERS OBVIOUS CLAIMS 16 AND 30.....	38
1.	Claim 16.....	38
2.	Claim 30.....	41
IX.	GROUND 3: CHEOK IN VIEW OF NAKAMURA RENDERS OBVIOUS CLAIM 102	42
A.	Independent Claim 102	42
1.	Preamble.....	42
2.	102[a]	42
3.	102[b]	42
4.	102[c]	43
5.	102[d]	43
a.	Nakamura.....	45
b.	Motivation to Combine.....	48
c.	Reasonable Expectation of Success.....	53
X.	GROUND 4: NAKAMURA IN VIEW OF BENINI RENDERS OBVIOUS CLAIMS 1, 4, 11, 16, AND 30.....	55
A.	Claim 1	55
1.	Preamble.....	55
2.	1[a]	56
3.	1[a.1]	56

4.	1[a.2]	57
5.	1[a.3]	59
a.	Benini.....	65
b.	Motivation to Combine.....	68
c.	Reasonable Expectation of Success.....	73
B.	Dependent Claims	74
1.	Claim 4.....	74
2.	Claim 11	75
3.	Claim 16.....	76
4.	Claim 30.....	76
XI.	GROUND 5: NAKAMURA RENDERS OBVIOUS CLAIM 102	77
A.	Independent Claim 102	77
1.	Preamble.....	77
2.	102[a]	78
3.	102[b]	78
4.	102[c]	78
5.	102[d]	78
XII.	SECONDARY CONSIDERATIONS	83
XIII.	THE BOARD SHOULD REACH THE MERITS.....	84
A.	Institution is appropriate under § 325(d).....	84
B.	Institution is appropriate under § 314(a).....	84
XIV.	MANDATORY NOTICES	84
A.	Real Parties-in-Interest.....	84
B.	Related Matters.....	84

C.	Notice of Counsel and Service Information.....	85
D.	Fee for <i>Inter Partes</i> Review	86
E.	Grounds for Standing	86
XV.	CONCLUSION	86

TABLE OF AUTHORITIES

	Page(s)
Cases	
<i>Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH,</i> IPR2019-01469, Paper 6 (Feb. 13, 2020)	84
<i>Apple Inc. v. Fintiv, Inc.,</i> IPR2020-00019, Paper 11 (Mar. 11, 2020)	84
<i>Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.,</i> 800 F.3d 1375 (Fed. Cir. 2015)	3
<i>KSR Int’l Co. v. Teleflex Inc.,</i> 550 U.S. 398 (2007).....	<i>passim</i>
<i>Mass. Inst. of Tech. v. AB Fortia,</i> 774 F.2d 1104 (Fed. Cir. 1985)	11, 12, 13, 16
<i>Mullen Industries LLC v. Meta Platforms, Inc.,</i> 1:24-cv-00354-DII (W.D. Tex)	84
<i>Perfect Web Techs., Inc. v. InfoUSA, Inc.,</i> 587 F.3d 1324 (Fed. Cir. 2009)	73, 74
<i>Tech. Licensing Corp. v. Videotek, Inc.,</i> 545 F.3d 1316 (Fed. Cir. 2008)	3
<i>Zenon Envtl., Inc. v. U.S. Filter Corp.,</i> 506 F.3d 1370 (Fed. Cir. 2007). U.S. Provisional Application No. 60/499,810	2
Statutes	
35 U.S.C. § 103	1
35 U.S.C. § 112	2

Other Authorities

37 C.F.R. § 42.10(b)	86
37 C.F.R. § 42.15(a).....	86
37 C.F.R. §42.24(a).....	91
37 C.F.R. § 42.24(d)	91
37 C.F.R. §42.100(b)	17, 18

TABLE OF EXHIBITS

Exhibit No.	Description
1001	U.S. Patent No. 11,033,821 to Mullen (“the ’821 Patent”)
1002	File History of U.S. Patent No. 11,033,821
1003	Declaration of Gregory Welch, Ph.D. (“Welch”)
1004	Curriculum Vitae of Gregory Welch, Ph.D.
1005	Declaration of Scott Delman (“Delman”)
1006	Cheok, A. et al., <i>Human Pacman: A Sensing-based Mobile Entertainment System with Ubiquitous Computing and Tangible Interaction</i> (May 2003) (“Cheok”)
1007	Japanese Patent Application Publication No. JP2001070658A to Nakamura (“Nakamura”)
1008	U.S. Patent No. 5,645,077 to Foxlin (“Foxlin077”)
1009	Benini, L. et al., <i>Palmtop Computer for Managing Interaction with Immersive Virtual Heritage</i> (2002) (“Benini”)
1010	RESERVED
1011	Darken, R. & Cevik, H., <i>Map Usage in Virtual Environments: Orientation Issues</i> (1999)
1012	Lehikoinen, J. & Suomela, R., <i>WalkMap: Developing an Augmented Reality Map Application for Wearable Computers</i> (2002)

Exhibit No.	Description
1013	InterSense Inc, <i>Inertia Cube2 Bringing 3D To Life – Manual for Serial Port Model</i> (2001)
1014	U.S. Patent No. 5,991,085 to Rallison (“Rallison”)
1015	Sutherland, I., <i>A Head-Mounted Three Dimensional Display</i> (1968)
1016	Fitzmaurice, G., et al., <i>Virtual Reality for Palmtop Computers</i> (1993) (“Fitzmaurice”)
1017	Fitzmaurice, G., <i>Situated Information Spaces and Spatially Aware Palmtop Computers</i> (1993) (“FitzmauriceB”)
1018	Schilit, B. and Theimer, M., <i>Disseminating Active Map Information to Mobile Hosts</i> (1994)
1019	Björk, S. et al., <i>Pirates! Using the Physical World as a Game Board</i> , (2001)
1020	Falk, J. et al., <i>Pirates!: Proximity-Triggered Interaction in a Multi-Player Game</i> (2001)
1021	Thomas, B. et al., <i>First Person Indoor/Outdoor Augmented Reality Application: ARQuake</i> (2002)
1022	Azuma, R., <i>A Survey of Augmented Reality</i> (1997)
1023	Young, W.R., <i>Advanced Mobile Phone Service: Introduction, Background, and Objectives</i> (1979)
1024	Gratschew, S. et al., <i>A Multimedia Messaging Platform for Content Delivering</i> (2003)

Exhibit No.	Description
1025	Kamerman, A. and Monteban, L., <i>WaveLAN®-II: A High-Performance Wireless LAN for the Unlicensed Band</i> (1997)
1026	Ramanujan, R. et al., <i>Active Network Services for Mobile Wireless Environments</i> (2000)
1027	Hewlett-Packard Singapore (Pte) Ltd., <u>HP Jornada 600 Series Handheld PC User's Guide</u> (2000)
1028	Welch, G., <i>Motion Tracking: No Silver Bullet, but a Respectable Arsenal</i> (2002)
1029	Ware, C. and Osborne, S., <i>Exploration and Virtual Camera Control in Virtual Three Dimensional Environments</i> (1990)
1030	Bowman, D., <i>Interaction Techniques for Common Tasks in Immersive Virtual Environments Design, Evaluation, and Application</i> (1999)
1031	Arns, L., <i>A new taxonomy for locomotion in virtual environments</i> (2002)
1032	Razzaque, S. et al., <i>Redirected Walking</i> (2001)
1033	Cheok, A. et al., <i>Touch-Space: Mixed Reality Game Space Based on Ubiquitous, Tangible, and Social Computing</i> (2002)
1034	Declaration of Mark Claypool ("Claypool")
1035	Declaration of Philippe Geril ("Geril")
1036	U.S. Provisional Application No. 60/499,810 ("the '810 provisional")

Exhibit No.	Description
1037	RESERVED
1038	Declaration of Ayman K JP2001070658A Translation
1039	Transmeta Corporation, <i>Transmeta™ Crusoe™ TM5900 System Development Kit Product Sheet</i> (2003)

I. INTRODUCTION

Meta Platforms, Inc. (“Petitioner”) respectfully requests *inter partes* review of claims 1, 4, 11, 16, 30, and 102 of U.S. Patent No. 11,033,821 (EX1001, “’821 Patent”) and a finding that all such challenged claims are unpatentable.

II. CHALLENGES

Ground	Claims	Statute	Prior Art ¹
1	1, 11	pre-AIA 35 U.S.C. § 103	Cheok (EX1006), Foxlin077 (EX1008)
2	16, 30		Cheok, Foxlin077, Rallison (EX1014)
3	102		Cheok, Nakamura (EX1007)
4	1, 4, 11, 16, 30		Nakamura, Benini (EX1009)
5	102		Nakamura

III. BACKGROUND

A. ’821 Patent

The ’821 Patent describes well-known systems that employ wireless communication devices with locating and directional devices to allow multi-user gameplay in a virtual world. Welch ¶79. The ’821 Patent describes a multiplayer virtual PACMAN game as an example of such a reality-based video game, where one player may “[c]ontrol...PACMAN...by changing the location of the wireless [device]” and “[a] different player could use a different game system...to control a ghost in the same game.” EX1001., 3:47-54. Each “user may look down at a display

¹ Each is §§ 102(a), (b), and/or (e) prior art.

screen, see his/her character, and run around his/her physical environment in order to similarly run his/her virtual character through a virtual maze.” *Id.*, 3:56-59; Welch ¶80.

The ’821 Patent describes that “[l]ocation information may be utilized, for example, to determine a virtual character’s location (e.g., a particular first-person perspective) in the virtual realm.” EX1001, 3:15-18. Various “locating devices” and “directional devices” enable collection of a user’s location information during gameplay. *Id.*, 3:42-4:34; Welch ¶81.

1. Priority No Earlier Than September 1, 2004

The challenged claims² of ’821 Patent are not entitled to claim the benefit of its provisional application. *Zenon Env’tl., Inc. v. U.S. Filter Corp.*, 506 F.3d 1370, 1378 (Fed. Cir. 2007). U.S. Provisional Application No. 60/499,810, filed September 2, 2003 (“the ’810 provisional”), does not have written description support for claims 1, 102, or their respective dependents. *Id.*; Welch ¶85-90. Thus, the effective filing date is no earlier than September 1, 2004.

To claim priority to either provisionals’ filing date, “each application in the chain leading back to the earlier application must comply with the written description requirement of 35 U.S.C. § 112.” *Zenon Env’tl.*, 506 F.3d at 1378. To

² Claims 4, 11, 16, and 30 depend on claim 1. Claim 102 is independent.

satisfy the written description requirement, “the specification of the **provisional** must contain a written description of the invention and the manner and process of making and using it, in such full, clear, concise, and exact terms . . . to enable an ordinarily skilled artisan to practice the invention **claimed** in the **non-provisional** application.” *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (emphasis in original). Moreover, the provisional application “must describe the later claimed invention in sufficient detail that one skilled in the art can clearly conclude that the inventor invented the claimed invention as of the filing date sought.” *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1331 (Fed. Cir. 2008).

The ’810 provisional fails to comply with the written description requirement for claims 1, 102, and respective dependent claims. *See generally* EX1036; Welch ¶¶85-90. The ’810 provisional does not provide written description support for “recording a manually provided direction in response to a prompt requesting said manually provided direction,” as claim 1 recites. EX1001, 24:5-9; Welch ¶85. Further, dependent claim 4 recites, “said video game utilizes a perimeter selected by user-inputs,” for which there is no written description support in the ’810 provisional. EX1001, 24:14-15; Welch ¶85.

Claim 102 recites “said locating device comprises a movement measuring device operable to be utilized, at least in part, to determine said physical location,”

for which there is no written description support in the '810 provisional. EX1001, 30:27-29; Welch ¶86.

B. Prosecution History

For most of the prosecution spanning 15 years, claims 30 (corresponding to prosecution claim 32), and 102 (corresponding to prosecution claim 100) were subject to minimal amendments and largely recited limitations that resemble the final language of the claims. Welch ¶91; *see generally* EX1002. The Office allowed the claims on February 17, 2021, when PO amended all claims to recite a *wireless communication device* rather than a *wireless telephone*, and amended claim 1 to additionally recite “*a direction of gameplay of said video game is operable to be established by recording a manually provided direction in response to a prompt requesting said manually provided direction,*” and claim 102 (original claim 100) to additionally recite “*an origin of gameplay of said videogame is operable to be established by recording a manually provided origin in response to a prompt requesting said manually provided origin.* *Id.*, 265-68, 271, 283. Subsequently, the '821 Patent issued on June 15, 2021 (EX1001, 1).

IV. PRIOR ART

A. Cheok (EX1006)

Cheok discloses a “Human Pacman” AR and VR gaming system like the '821 Patent. *Compare* EX1006, 1-3, *with* EX1001, 3:11-5:15. As shown below in

Figures 5 and 6, Cheok's Human Pacman game closely resembles the original Pacman set in an outdoor area for gameplay. *Id.*, 106, 110-11; Welch ¶100-101.



Figure 6. Correspondence between the physical world and the virtual Pac-world

Cheok's system features "Pacmen and Ghosts" as "real human players in the real world experiencing mixed computer graphics fantasy-reality provided by using wearable computers that are equipped with GPS and inertia sensors for players' position and perspective tracking." *Id.*, 106. As example of a user's wearable computer is shown in Figure 4 below. *Id.*, 110; Welch ¶101.



Figure 4. Detail configuration of wearable computer

Id., FIG. 4. The wearable computer also incorporates a HMD which enables users to switch between AR and VR modes, which Figure 11 below shows. *Id.*; Welch ¶101.



Figure 11: HMD display and the corresponding label under VR mode when Pacman gains power

Id., FIG. 11.

As shown in Figure 9 below, when a player encounters and collects a cookie, the cookie disappears from the virtual world in real-time. *Id.*, 112, Welch ¶102.

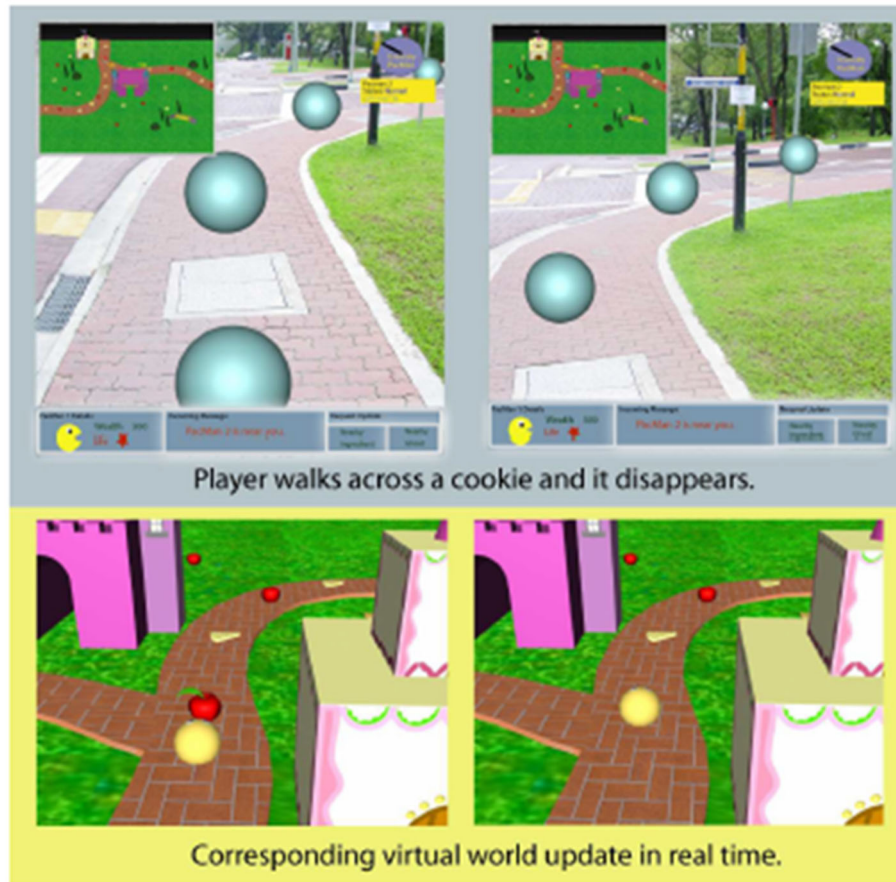


Figure 9: Pacman collecting cookies

Id., FIG. 9.

Cheek also introduces a third type of player—Helpers, as shown in Figure 8 below, who participate in the game remotely via a computer terminal, and because they are remote, they exclusively use a “VR mode”—a mode where the user only sees the *virtual* scene and objects—to help Pacmen and Ghosts with identifying enemy mobile units and hidden ingredients. *Id.*, 106, 111; Welch ¶103.



Figure 8. Close collaboration between the outdoor Pacman and her Helper

Id., FIG. 8.

Cheek's AR and VR game runs on "a centralized architecture that is made up of four main entities, namely the central server, wearable computers, Sony VAIO laptops, and Bluetooth embedded objects," as shown in Figure 3 below. *Id.*, 109. "[T]he Wireless Lan serves as a communication highway between" the entities. *Id.*; Welch ¶104.

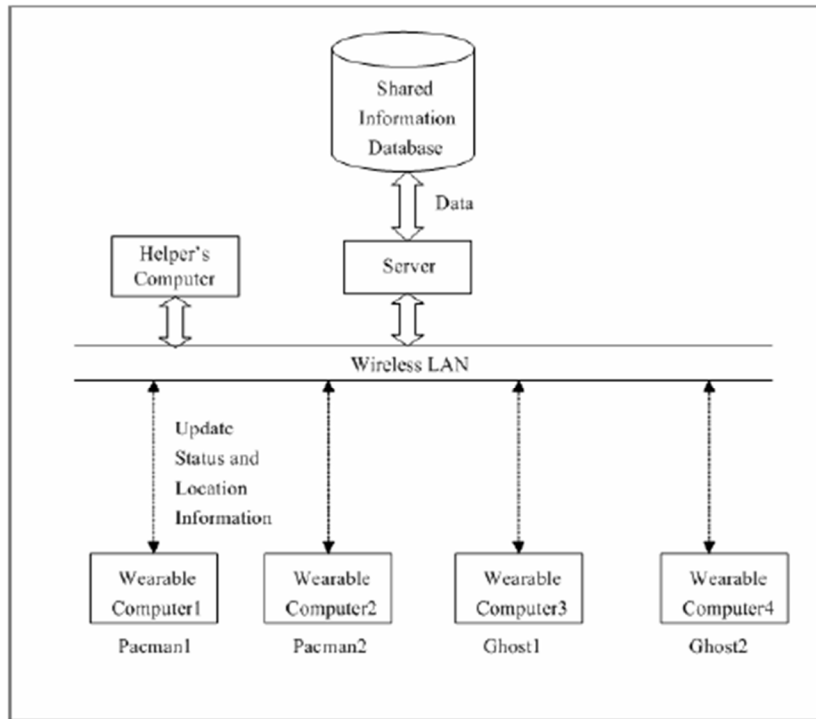


Figure 3. Complete system overview of Human Pacman

Id., FIG. 3.

Cheek recognizes that there are vast sensor tracking issues that its paper does not address and would lead one to look to other sources that have addressed these issues. EX1006, 108, 115; Welch ¶105.

1. Cheek is Prior Art

Cheek is a printed publication that was publicly available on May 22, 2003 when it was disseminated to attendees of the NetGames 2003 Conference participants. *See* Claypool ¶¶6-10; Delman ¶11. Also, Cheek was publicly available on January 6, 2004 through the ACM digital library. Delman ¶¶5-10.

Cheok originated at the NetGames 2003 conference (the “NetGames ’03 Conference”) where Cheok’s subject matter was presented on May 22-23, 2003. Claypool ¶¶6-7. Each conference made available and disseminated to all attendees of NetGames Conferences peer-reviewed research papers... that have been accepted for publication at the NetGames Conference. Claypool ¶4. Cheok’s paper was submitted and accepted. Thus, the NetGames’03 Conference disseminated Cheok to all attendees. Delman ¶10, Claypool ¶7. *See Mass. Inst. of Tech. v. AB Fortia*, 774 F.2d 1104 (Fed. Cir. 1985) (holding that an orally presented paper that was distributed only six times at conference was a printed publication); *see also* Claypool ¶¶6-10 (“The NetGames ’03 Conference Proceedings, including Human Pacman, was disseminated to conference attendees on the first day of the NetGames ’03 Conference (May 22, 2003). I received a printed copy of the NetGames’03 Conference Proceedings, including Human Pacman, when I attended the conference on May 22, 2003”). Delman ¶11 (“The conference started on May 22, 2003, and the paper would have been available to the conference attendees on this date.”). Moreover, the ACM Digital Library published Cheok online on January 6, 2004 in a searchable database (e.g., by keywords) and it is still accessible today. Delman ¶¶10. It is in the regular business practice of ACM to publish articles accepted to its conference proceedings, journals, and full-text publications. Delman ¶5-6. Cheok is prior art because publication through dissemination and publication online occurred

before September 1, 2004. Delman ¶10 (“The conference started May 2003, and the paper would have been available to the conference attendees on this date.”)

B. Nakamura (EX1007)

Nakamura is presented as a primary and a secondary reference in combination with Cheok. EX1007 is a true and correct translation of Nakamura. *See* Ayman (EX1038).

Nakamura discloses “a system for controlling a computer based on location information,” which involves a virtual role-playing game with virtual characters on a virtual playfield with virtual locations. EX1007, ¶[0001]. As such, “new scenes or worlds automatically open depending on certain conditions.” EX1007, ¶[0005]. For example, “by utilizing current location information, which can be obtained through technologies such as GPS, a new virtual world is opened.” *Id.* A user walks, runs, or bicycles through the real world, and the user’s current location in the real world is reflected in the virtual world, allowing the role-playing game to progress. *Id.*, ¶[0015]. This enhances the game playing environment by combining real location information with conventional gaming methods. *Id.*, Abstract; Welch ¶108.

Nakamura implements its system on a mobile terminal equipped with a GPS unit for acquiring the user’s current location. *Id.*, ¶¶[0016], [0019]. The mobile terminal “connect[s] to a server system 20 that provides the role-playing game through the general internet 1 as the computer network.” *Id.*, ¶[0018]. Nakamura

further explains that “[i]n the role-playing game executed by the game system 10, a position icon (such as an illustration resembling a human figure) displayed on the screen moves in response to the movements of the user holding terminal 6.” *Id.*, ¶[0031]. This display of virtual position allows the user to feel as if they are “entering and moving through the virtual world of the role-playing game screen.” *Id.* The virtual world also allows for the display of “event icons representing other users who are accessing the same role-playing game,” as well as “communication (chat) through the screen” with the other users of the role-playing game. *Id.*, ¶[0029]; Welch ¶109.

C. Foxlin077 (EX1008)

Foxlin077 is presented as a secondary reference in combination with Cheok. Foxlin077’s inertial sensor addresses drift issues. *Id.*, 6:27-32. In particular, Foxlin077 recognizes “[a] difficulty with using gyroscopes for head-orientation tracking is drift,” which “arises from integrating over time, a signal that is noisy, or has a bias.” *Id.*, 2:56-58. Foxlin077 resolves this with a “drift compensator” component that attempts to automatically correct drift. *Id.*, 6:27-32, 9:1-23; Welch ¶112-116. *See* Sec. VII.5.a.

D. Benini (EX1009)

Benini is presented as a secondary reference in combination with Nakamura.

Benini discloses a “hardware/software system for PDA-based interaction with IVEs [(immersive virtual environments)] realized in the field of Virtual Heritage (VH): Virtual Reality applied to Cultural Heritage.” As shown below in Figure 3, the system consists of portable terminals for interfacing with the virtual environment (e.g., a virtual theatre) over a wireless network, along with client-server software that runs on the terminals (client) and virtual reality engine (server). *Id.* at 4; Welch ¶119.

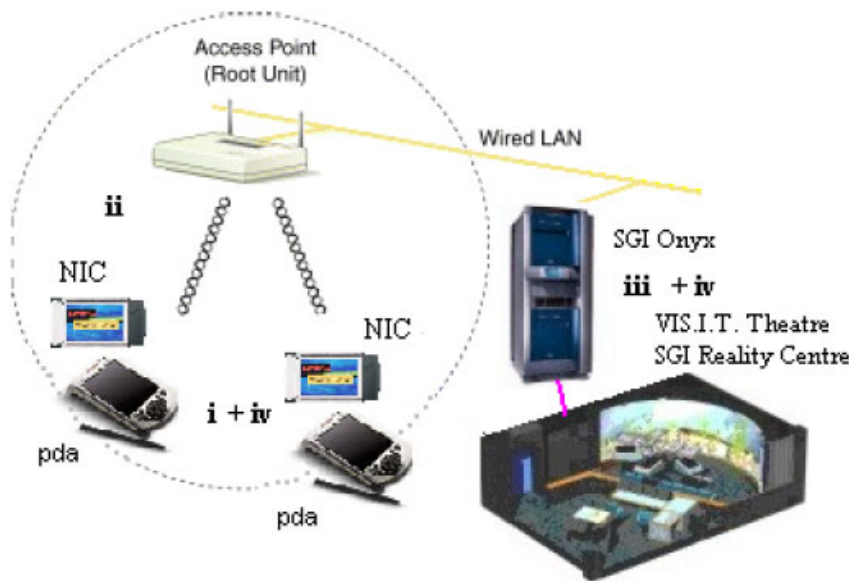


**Figure 3: Components of the interactive system:
portable terminals(i), wireless network(ii), virtual
theater (iii), client-server software (iv).**

Id., FIG. 3.

Figure 2 below shows an example PDA with arrows (in green) for visualizing position and direction in the virtual environment.

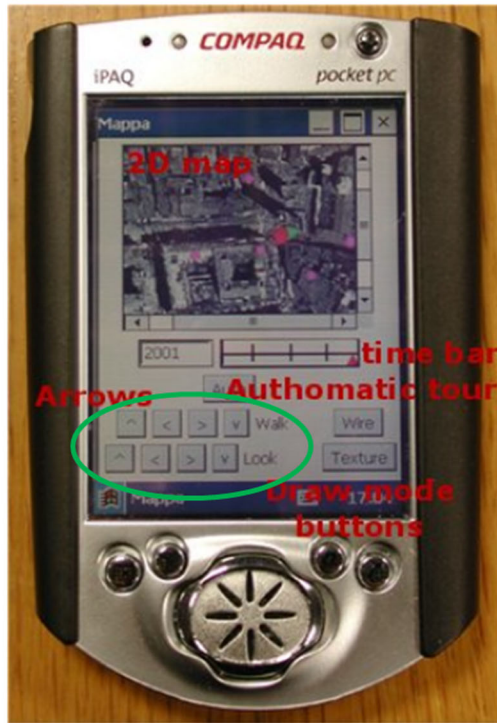


Figure 2: The User Interface developed for interacting via PDA with the Nu.M.E. VE

Id., FIG. 2 (annotated). “[F]our arrows realizes the metaphor of moving forward, backward, left and right the avatar in the VE as if it is walking into it; and four arrows are used to turn around and to look up and down...” *Id.*, 4. Benini further discloses that the user interface arrows can be used to “change [the] camera’s position and orientation (interacting with the 2D map or with the arrows),” thereby changing the view in the virtual environment. *Id.*, 5. This allows the server “to increment [the] current camera’s position and orientation” to show a new view in the virtual environment. *Id.*; Welch ¶120.

1. Benini is Prior Art

Benini originated at the EUROMEDIA'2002 Conference (the "EUROMEDIA Conference") where Benini's subject matter was presented on April 15-17, 2002. Geril ¶¶7, 11-13 ("Benini... was published in the Conference Proceedings Book," where "the Conference Proceeding Book was shipped... for distribution to attendees at the start of the conference"). The Conference, "as part of its ordinary course of business," created and organized an event in which "papers peer-reviewed by an intentional program committee that were subsequently accepted... were collected together for the conference's proceedings." *Id.*, ¶5-6. Benini submitted a paper that was peer-reviewed and accepted for publication. *Id.*, ¶12. At the EUROMEDIA Conference, Benini's paper was disseminated to all conference attendees on April 15, 2002. *See Mass. Inst. of Tech.*, 774 F.2d at 1104 (holding that an orally presented paper that was distributed only six times at conference was a printed publication); *see also* Geril ¶¶4, 7, 10-13 ("It was the regular business practice to... make available, and public the proceedings of the... Conferences," "Benini was published in the Conference Proceedings Book for the EUROMEDIA'2002 Conference and distributed to all attendees of the EUROMEDIA'2002 Conference, no later than April 15, 2002, according to the process described above."). Moreover, Benini was published in the Conference Proceedings Book for the EUROMEDIA'2002 Conference and was available to the

general public for order and purchase in the SCS Publications Catalogue and on the SCS Europe Bvba website after the conference. Geril ¶14. Benini is prior art as of April 15, 2002.

E. Rallison (EX1014)

Rallison is presented as a secondary reference in combination with Cheok and Foxlin077. Rallison discloses features associated with a head mounted display, specifically, a speaker and microphone as recited in claim 16, for communication as recited in claim 30 (EX1014, 18:21-28; 20:7-12). Welch ¶123.

V. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art (“POSITA”) in 2004 would have had at least a bachelor’s degree in electrical engineering, computer science, or similar field, with at least two years of relevant experience working with VR and AR systems. Additional experience could substitute for less education, and additional education could likewise substitute for less experience. Welch ¶95; *see also* ¶¶94.

This Petition does not turn on this precise definition, and the challenged claims would be unpatentable from the perspective of any reasonable person of ordinary skill in the art at the relevant time. *Id.* ¶96.

VI. CLAIM CONSTRUCTION

The Board construes the claims “using the same claim construction standard that would be used” in district courts. 37 C.F.R. §42.100(b). This Petition

establishes the prior art meets each of the claim limitations under any reasonable construction.³ Thus, no express construction is required.

VII. GROUND 1: CHEOK IN VIEW OF FOXLIN077 RENDERS OBVIOUS CLAIMS 1, 4, AND 11

A. Claim 1⁴

1. Preamble

To the extent limiting, Cheok discloses “*a system.*” Welch ¶¶129-130. As further discussed for Section IV.A., Cheok discloses a “Human Pacman” gaming *system* that brings existing iterations of Pacman into an augmented and virtual reality environment, allowing for human players representing Pacmen and Ghosts to engage in a physical role-playing game in a wide outdoor physical area. *See* Sec. IV.A. “Helpers” participate in the game remotely via a computer terminal and exclusively use the VR mode to help Pacmen and Ghosts with identifying enemy mobile units and hidden ingredients. *Id.*; Welch ¶129.

As shown in Figure 3 below, “Human Pacman features a centralized architecture that is made up of four main entities, namely the central server, wearable computers, Sony VAIO laptops, and Bluetooth embedded objects.” EX1006, 109.

³ Petitioner reserves the right to argue alternative constructions in other proceedings, including indefiniteness.

⁴ Appendix A contains the claim language for all challenged claims.

A “Wireless Lan serves as a communication highway between the wearable computers, the helper computers (Sony VAIOs laptops), and the server desktop computer” that “maintains up-to-the minute players’ information (location, status etc.), and presides over any communication between Bluetooth objects and the wearable computers.” *Id.*, 109-10; Welch ¶130.

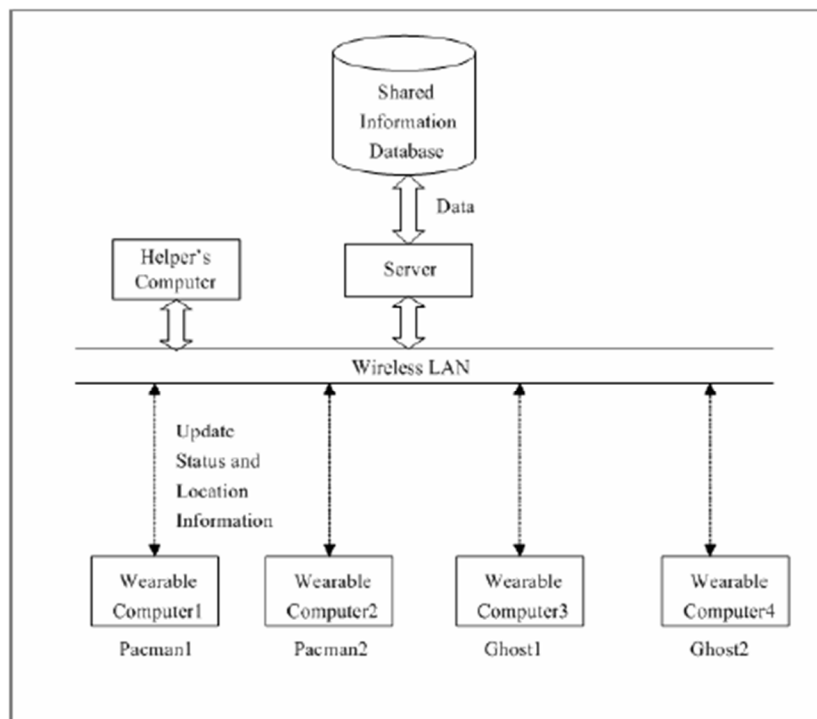


Figure 3. Complete system overview of Human Pacman

Id., FIG. 3; Welch ¶130.

2. 1[a]

Cheek discloses *a wireless communications device*. Welch ¶131-133. Cheek’s wearable computer (*device*) includes a wireless LAN card (*wireless*

communications device) (red in Figure 4 below), which enables *wireless LAN communication* in the system. EX1006, 109.



Figure 4. Detail configuration of wearable computer

Id., FIG. 4 (annotated); Welch ¶133.

3. 1[a.1]

Cheek discloses *a device having a display*. Welch ¶134.; EX1006, 106; *see also id.*, 107-109. As shown in Figure 4 below, the red circle identifies the Cy-Visor Head Mounted Display (*a device having a display*). *Id.*, 110. Figure 8 below shows the game player donning the wearable computer installed on a vest and HMD on the player's head. *Id.*, 111-12; Welch ¶134.



Figure 4. Detail configuration of wearable computer



Figure 8. Close collaboration between the outdoor Pacman and her Helper

Id., FIG. 4 (annotated), FIG. 8; Welch ¶134.

4. 1[a.2]

Cheek discloses “a locating device operable to determine the physical location of said locating device on a physical playfield.” Welch ¶¶135-137. Cheek uses a system that contains “**location and body tracking technologies**, namely the Global Positioning System (GPS), **Dead-Reckoning module (DRM)**, and inertia sensors, to provide the necessary context-awareness of the system for the game play.” EX1006, 106; *see also id.*, 108 and 110; FIG. 4 (below).



Figure 4. Detail configuration of wearable computer

Id., FIG. 4 (annotated). As part of the wearable computer, the dead-reckoning module (*a locating device*) tracks the “real-time position of each mobile user” (*operable to determine the physical location of said locating device*), as the user moves through the physical world (*on a physical playfield*). *Id.*, 108 (“The DRM measures the displacement of the user from an initialization point by measuring the direction (with data obtained from the compass), and distance traveled (using accelerometer data) with each footstep taken.”); *see also id.*, 108 (describing the calculation of “[t]he position of a player with respect to another player or location in the physical world”). Welch ¶136.

5. 1[a.3]

Cheok in view of Foxlin077 renders obvious this limitation. Welch ¶¶138-62.

First, Cheok discloses *a processor coupled to said display and said locating device*. Welch ¶139. As shown in Figure 4 below, Cheok explains that the wearable computer has a single board computer (in red) which contains a processor (*processor*), which is connected to the HMD (in green) (*coupled to said display*) and the dead-reckoning module (in blue) (*said locating device*). EX1006, 110 (The main components are **Transmeta Single Board Computer (PC104 plus compliant motherboard running on Crusoe processor)**, Twiddler2 (handheld keyboard and mouse), **Cy-Visor Head Mounted Display (video see-through HMD) with FireWire camera attached**, two Sony F960 InfoLithium batteries, InertiaCube2 (inertia sensor), **DRMIII module (GPS and Dead-Reckoning device from Point Research Corporation)**, and JVC Bluetooth device.”). *See also* Fig. 4 below.

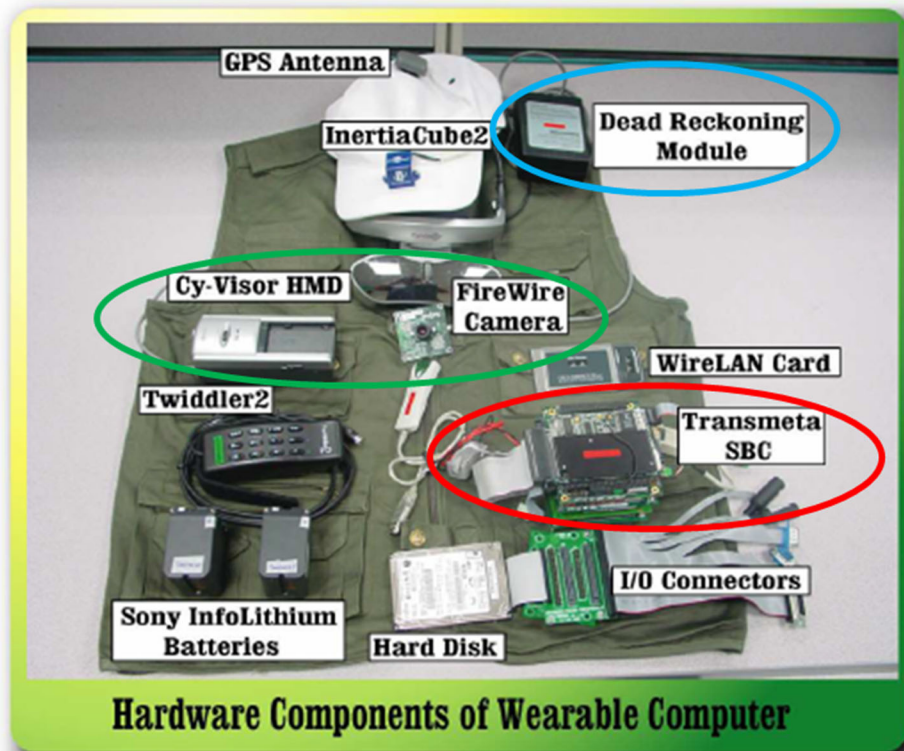


Figure 4. Detail configuration of wearable computer

Id., FIG. 4 (annotated); Welch ¶139

Second, Cheok discloses *wherein said processor is operable to provide a video game comprising a virtual character with a virtual location on a virtual playfield*. Welch ¶140. Cheok discloses that Human Pacman is a *video game* because the wearable computer provides the game as a video stream through the HMD. EX1006, 109 (“wearable computer calculates the relative position of each plain cookie within the view of the **camera**, and superimposes a 3-D virtual cookie image of a proportionate size on corresponding position on the **video stream**”). The position (location) of other mobile players obtained from the server is used to **update**

the 2-D virtual map in the HMD view of the player.”), 110. A POSITA would have understood that the wearable computer’s *processor is operable to provide a video game* because the processor executes the software that controls the game. Welch ¶140; *see also* EX1006, 110 (“software architecture...[] [is] the backbone of the game engine and the hardware as enabling tools”). As shown in Figure 6 below, players “physically and immersively role-play the **characters** of the Pacmen and Ghosts” (*virtual character*) “with a **direct and real time link between the wide-area physical world and the virtual Pac-World** at all times” (*virtual playfield*). *See also* EX1006, 110; Welch ¶140.



Figure 6. Correspondence between the physical world and the virtual Pac-world

Id., FIG. 6. Each Pacman and Ghost (*virtual character*) “starts the game from a Pac-castle or Ghost-house” (*virtual location*) “in Pac-world” (*on a virtual playfield*). *Id.*, 112; Welch ¶141.

Third, Cheok discloses *said virtual character is displayed on said display*. Welch ¶142. As shown in red in Figure 10 below, a player’s *virtual character* (e.g., a Pacman) *is displayed on said display* of the HMD in the virtual world (i.e., Pac-world) view.



Figure 10: Sequence of pictures showing the collection of an ingredient

EX1006, FIG. 10 (annotated); Welch ¶142.

Fourth, Cheok discloses *said virtual location on said virtual playfield corresponds to said physical location on said physical playfield*. Welch ¶143. As discussed for limitation 1[a.2], the physical location of a player on the physical playfield (i.e., the location of the user's dead-reckoning module on the wearable computer) is tracked in real-time (*see* Sec. VII.C.4; Welch ¶143), which is reflected in corresponding virtual movement. EX1006, FIG. 10; Welch ¶143. For example, when a player walks in certain directions, to explore an area for ingredients (e.g., the sugar jar), the player's Pacman virtual character also moves in corresponding directions, such that the real world and virtual view correspond to one another at all times. *Id.*; EX1006, FIG. 10. Similarly, a movement by a player (e.g., walking across a cookie) is reflected with a corresponding virtual world update in real time (e.g., the cookie disappears and the Pacman advances forward). *See* FIG. 9 (below). Thus, a player's Pacman representation has a virtual location in Pac-world (*said virtual location on said virtual playfield*) that corresponds to the player's physical location in the real world (*corresponds to said physical location on said physical playfield*). Welch ¶143.

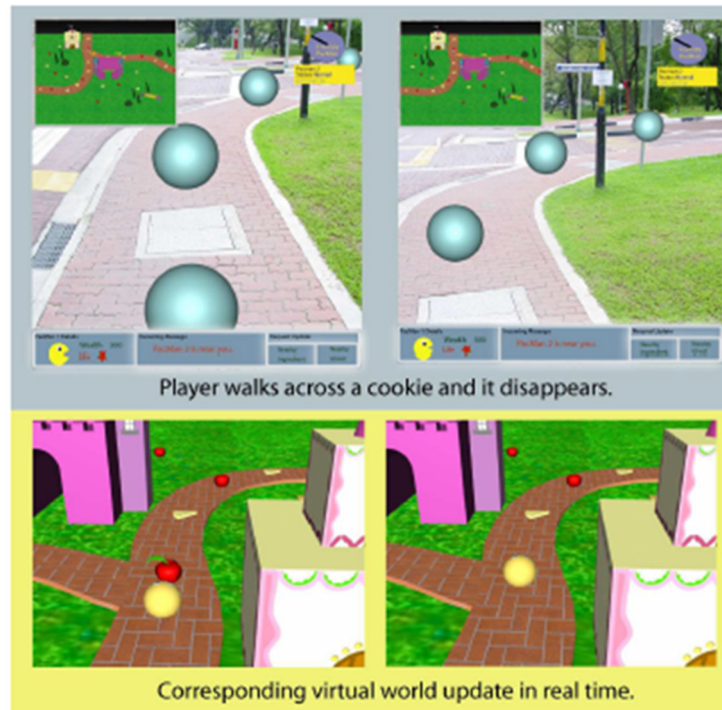


Figure 9: Pacman collecting cookies

EX1006, FIG. 9; Welch ¶143.

Fifth, Cheek in view of Foxlin077 renders obvious *a direction of gameplay of said videogame is operable to be established by recording a manually provided direction in response to a prompt requesting said manually provided direction.* Welch ¶144. As discussed for limitation 1[a.2], Cheek discloses that the dead-reckoning module (DRM) includes component parts such as a dead-reckoning device, GPS, digital compass, and inertial sensors to enable tracking of users. *See* Sec. VII.A.4; EX1006, 106, 108. The inertial sensor and digital compass of the dead-reckoning module to help establish a user's direction during gameplay where the "DRM measures the displacement of the user from an initialization point by

measuring the direction (with data obtained from the compass)” and “when GPS position data is available, it can be used to **correct...direction calculation”** (*a direction of gameplay of said videogame is operable to be established*). EX1006, 108, 109 (“By placing the [InertiaCube2] sensor on the cap of each player, her **head movement and orientation is tracked** to high accuracy.”). “[T]he point-of-view of each mobile player is sent to the computer of a helper through the server, and the corresponding view in the virtual PacWorld can be displayed” (*id.*, 109), thereby establishing the direction/orientation of a user’s Ghost or Pacman virtual character based on the direction the user is facing on the physical field. Welch ¶144.

Although Cheok does not explicitly disclose (underlined language) that *a direction of gameplay of said videogame is operable to be established by recording a manually provided direction in response to a prompt requesting said manually provided direction*, a POSITA would have been motivated and found it obvious to implement the underlined features in view of Foxlin077. Welch ¶145.

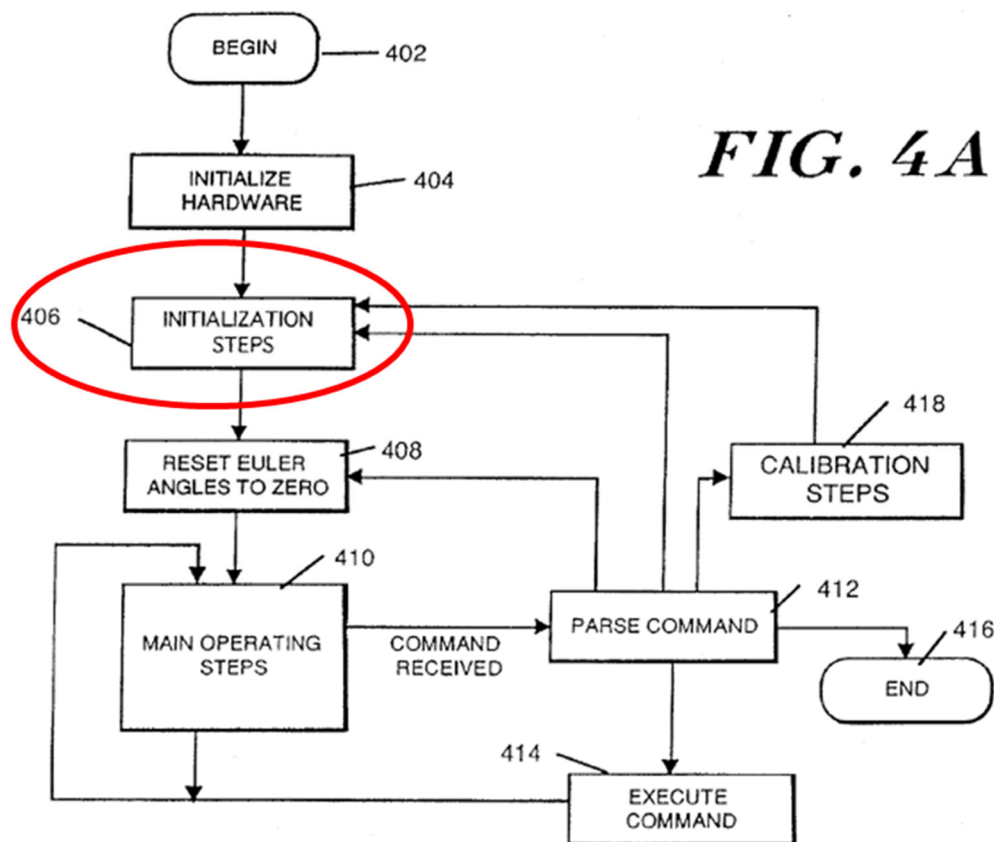
a. Foxlin077

Like Cheok, Foxlin077 relates to motion tracking in VR and AR applications and discloses an “inertial angular orientation tracking apparatus” to track motions of parts of a human body. Welch ¶146; EX1008, 6:20-22. For example, Foxlin077 uses the inertial sensor in “an apparatus for simulating a virtual environment that is displayed to a user” in an AR environment. EX1008, 5:7-9., 22:1-18; *see also* Sec.

IV.A. Foxlin077's inertial sensor is a "self contained sensor apparatus [that] generates a signal that corresponds to at least two of the three orientational aspects of yaw, pitch and roll of a human-scale body, relative to an external reference frame." EX1008., Abstract; Welch ¶147. Foxlin077's inertial sensor "track[s] the orientation of a body to which it is mounted, without interaction with radiation, energy, signals, or physical connections from any other apparatus." EX1008, 1:63-66; Welch ¶148. Thus, Foxlin077 relates to similar concepts as Cheok, which as discussed further above, discloses a virtual environment gaming system, compatible with both VR and AR modes, in which inertial sensors are incorporated into users' wearable computer devices to facilitate orientation/direction tracking. EX1006, 108-10; Welch ¶148. Indeed, a POSITA would have understood that Cheok and Foxlin077 both describe an InertiaCube2 inertial sensor, since the InertiaCube2 manual cited in Cheok identifies that the product is covered by the Foxlin077 patent. EX1006, 109 ("We use Inertiacle2 from InterSense [InterSense01]...."), 116 (citing InertiaCube 2 manual); EX1013, 2 (identifying the Foxlin077 patent as covering the InertiaCube2). A POSITA would have therefore been motivated to consider the teachings of Foxlin077 when implementing Cheok's Human Pacman system. Welch ¶148.

Foxlin077 further discloses that its inertial sensor is designed to address drift issues. Welch ¶149. Foxlin077 explains that "[a] difficulty with using gyroscopes

for head-orientation tracking is drift,” which “arises from integrating over time, a signal that is noisy, or has a bias.” EX1008, 2:56-58. “Drift would make the virtual world appear to gradually rotate about the user's head even when the user is not moving.” *Id.*, 2:58-60. Foxlin077 incorporates a “drift compensator” component that attempts to automatically correct drift. *Id.*, 6:27-32 9:1-23. Drift compensation “for errors” requires using parameters measured during an initialization process, as shown in red in Figure 4A below. *Id.*, 11:1-7; *see also id.*, 9:61-67; Welch ¶150.

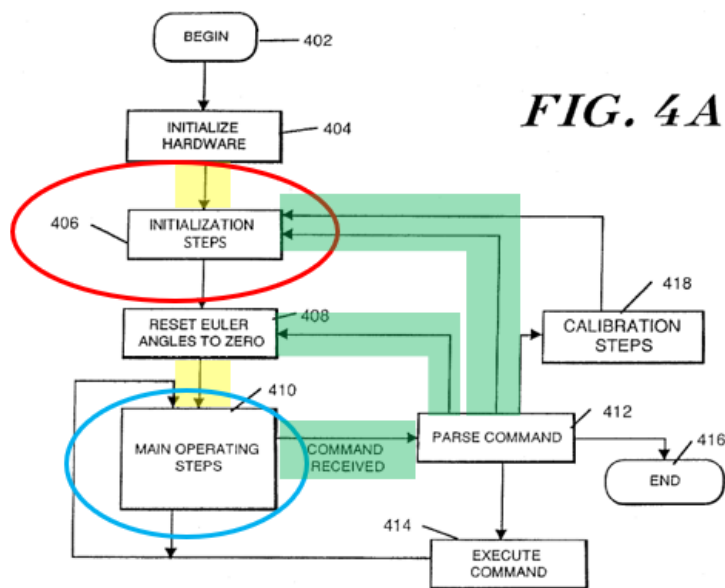


Id., FIG. 4A (annotated). The initialization steps “establish the rest position, from which orientation is measured and measure biases for the rate sensors,” after which “the main operating steps 410 are performed.” *Id.*, 9:67-10:7; see also 10:29-31. A “user is instructed 432 to place the sensor assembly in such a position by a message delivered to the apparatus input/output devices or implicitly by the fact of starting the tracker.” *Id.*, 10:31-35; Welch ¶150.

A POSITA would have understood that in such a process, the user is establishing a reference orientation (*a direction of gameplay of said videogame is operable to be established*) by providing a manual orientation (e.g., by holding the sensor assembly stationary in a certain direction) (*by recording a manually provided direction*) in response to a message delivered to the apparatus (*in response to a prompt requesting said manually provided direction*). Welch ¶151. Indeed, Foxlin077’s process for manually setting a direction of gameplay in response to a prompt is consistent with that described in the ’821 Patent, which explains that a “user may be prompted to select a direction for gameplay,” which “may be determined by the device prompting the user to point the device in a particular direction...and recording this direction.” EX1001, 16:2-8; Welch ¶151.

Foxlin077 discloses that after initialization, *a direction of gameplay* may also be established in another way—during a reinitialization process in which “operating steps are repeated...until a command has been received,” including a user-generated

command that includes operations such as a reinitialization process. EX1008, 10:9-11, 10:17-20; Welch ¶152. For example, as shown in Figure 4A below, a command may be received and parsed while the main operating steps (blue) are performed. For example, as shown in Figure 4A below, a command may be received and parsed while the main operating steps (in blue) are being performed.



Id., FIG. 4 (annotated). As shown by the green arrows, when a command for “reinitializing the operation” is received, *see id.*, 10:17-20, the same initialization steps (in red) as discussed above (i.e., those involving the initialization of an inertial sensor to establish a reference orientation) are performed again, and the Euler angles are reset to zero. And as shown by the orange arrows, the main operating steps resume when the reinitialization process is complete. In other words, the inertial sensor is reinitialized, thereby updating the reference orientation in the middle of the

performance of the main operating steps. Welch ¶152. A POSITA would have understood that such a reinitialization process, which operates like the original initialization process, thus also establishes *a direction of gameplay of said videogame...by recording a manually provided direction in response to a prompt requesting said manually provided direction.* Welch ¶153.

b. Motivation to Combine

When implementing Cheok's Human Pacman system, a POSITA would have been motivated to rely on the teachings of Foxlin077's initialization features to enhance Cheok, as a POSITA would understand that an initialization step would be required for the system. *Id.* ¶154. Cheok discloses that an InertiaCube2 inertial sensor is used and cites to the product manual, which further cites to Foxlin077 as covering the product. EX1006, 109, 116; EX1013, 2. Thus, a POSITA looking to implement the InertiaCube2 inertial sensor in Cheok's wearable computer would have looked to Foxlin077 and been instructed that the inertial sensor to be initialized through Foxlin077's described procedures. Welch ¶154.

Furthermore, Cheok discloses that its wearable computer uses "an inertial three degree-of-freedom orientation tracking system" "plac[ed]...on the cap of each player" to track head movement and orientation (EX1006, 109), and a dead-reckoning module that "measures the displacement of the user **from an initialization point** by measuring the direction...and distance traveled...with each

footstep taken.” *Id.*, 108; Welch ¶155. Because Cheok discloses tracking movement with respect to an “initialization” point, Cheok suggests that the sensors must be initialized prior to use. However, Cheok does not specifically disclose any particular initialization processes for the inertial sensors. A POSITA would have thus found it beneficial to modify Cheok with Foxlin077’s inertial sensor initialization/reinitialization that allows a user to manually set an orientation in response to a prompt. Welch ¶155. A POSITA would have consulted Foxlin077’s initialization/reinitialization process as a natural fit since it describes the InertiaCube2 sensor disclosed by Cheok. *Id.*

A POSITA would have been further motivated to rely on Foxlin077’s teachings to address sensor issues discussed by Cheok. *Id.* ¶156. Cheok suggests its sensors may have unaddressed tracking issues that “exceed the scope of the paper” (EX1006, 115) including: the need for GPS position data to correct direction calculations from the dead-reckoning module (*see id.*, 108) and the fact that GPS itself “suffers from accuracy and selective availability.” *Id.*, 115. Thus, Cheok provides express motivation for a POSITA to explore avenues to compensate for potential sensor issues, including issues associated with the inertial sensor. Welch ¶156.

A POSITA would have also understood that use of Foxlin077’s initialization/reinitialization process would have improved user experience when

interacting with the real environment. Welch ¶157. Foxlin077 discloses that while drift rates could be “tolerable for opaque VE applications with no interaction with the real environment,” that same drift rate in AR could result in “drift accumulated after several minutes [that] would be enough to make contact with the real environment confusing.” EX1008, 17:30-35. Thus, in Cheok’s virtual/real environment ecosystem, a POSITA would have understood that Foxlin077’s manual reinitialization process would be beneficial to correct insufficiently addressed accumulated drift. Welch ¶157.

Finally, a POSITA would have appreciated that a user could reach a point in the game where they are unable to proceed in their current direction (obstacle) and would need to be able to adjust the direction of gameplay to establish a new (temporary) alignment of the real world and virtual world directions, then restore the original direction of gameplay when past the obstacle. A POSITA would understand the initialization/reinitialization process disclosed by Foxlin077 could be used to adjust and then restore the direction of gameplay. Welch ¶158.

c. Reasonable Expectation of Success

A POSITA would have also had a reasonable expectation of success combining the teachings of Cheok and Foxlin077. *Id.* ¶160. As discussed above, both references are in the same field of art as Cheok discloses using an InertiaCube2 inertial sensor discussed in Foxlin077. *See* Sec. IV.A, C. Furthermore, a POSITA

would have understood that implementing the combination would have involved implementing the Cheok system in a manner that Cheok suggests is feasible—implementing the real-time tracking system such that an initialization process for the inertial sensors is performed. *Id.* Cheok suggests that a POSITA would necessarily look to other references like Foxlin077 for greater details on how to implement that initialization process. *Id.*

A POSITA would have had a reasonable expectation of success in achieving such a implementation, because they would have recognized that Cheok already includes a GUI system with manual inputs, and software to transform InertiaCube2 measurements into a direction for the virtual scene camera; thus, adding an InertiaCube2 reset/initialization feature would have only required adding an additional GUI element and adjusting the transformation angles. As such, the implementation would have been a combination of known technologies (e.g., known system of real-time tracking with respect to an initialization point (Cheok)) according to known methods (e.g., known methods of inertial sensor initialization (Foxlin077)) to yield the predictable result of a system in which inertial sensors are initialized by manually providing a direction of gameplay in response to a prompt. *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007); Welch ¶¶160, 162. Accordingly, Cheok in view of Foxlin077 renders obvious *a direction of gameplay of said videogame is operable to be established by recording a manually provided*

direction in response to a prompt requesting said manually provided direction.

Welch ¶161.

B. Dependent Claim 11

Cheok-Foxlin077 discloses this limitation. Welch ¶163. As discussed for limitation 1[a.3], a user's wearable computer (*communication device*) includes a dead-reckoning module (*directional device*) which uses its inertial sensor and digital compass component devices to determine a user's direction in the real world (i.e., by determining the direction the devices are facing) (*wherein said directional device is operable to determine the physical direction of said directional device on said physical playfield*). See Sec. VII.A.5; EX1006, 108-109. A POSITA would have understood that the inertial sensor and digital compass are also *directional device[s]* as claimed, since each is part of the wearable computer (*communication device*) and is used to determine the direction of the user in the real world (*determine the physical direction of said directional device on said physical playfield*). Welch ¶163.

**VIII. GROUND 2: CHEOK IN VIEW OF FOXLIN077 AND RALLISON
RENDERS OBVIOUS CLAIMS 16 AND 30**

1. Claim 16

A POSITA would have been motivated to modify Cheok-Foxlin077 to incorporate the *speaker* and *microphone* of Rallison into the Human Pacman's Cy-Visor HMD (*wireless communication device*). Welch ¶¶164-168. Like Cheok, Rallison discloses that an HMD can be used to "collect information regarding the

position, posture, orientation, attitude, location and/or movement of the user's head" to "provide a 'virtual reality' or simulated environment to the user, to allow the user to navigate through various displayed images" in the use of, for example, game applications. EX1014, 2:13-22; Welch ¶165. Rallison further discloses that "[h]eadphone-like *speakers* are positionable near the user's ears" to provide audio and video to the user. *Id.*, 3:61-63. The HMD can then be used for the communication of image (video) data or audio data "for generating audio to be heard by the user, e.g., through earphones" (*speaker*). *Id.*, 18:21-28. A microphone can also be "coupled to the HMD" and used to "provide input," including, for "telecommunications." *Id.*, 20:7-12; Welch ¶165.

Cheek similarly discloses students "immersed in real site of action, [] are given instructions visually through head mounted display or verbally through speaker/earphone." EX1006, 116; Welch ¶166. Accordingly, a POSITA would have found it obvious to modify the Human Pacman game to also allow for verbal communication between players through the HMD of the user's wearable computer further comprising a headset with a *speaker* and *microphone*. Welch ¶167.

A POSITA would have been motivated to make such a modification to Cheek's HMD because it would have been consistent with the goals and objectives of the Human Pacman game. *Id.* Cheek explains that an essential goal is to promote collaboration between members of the same team (i.e., Pacmen, Ghosts, or Helpers).

EX1006, 110 (“The main concepts of the game are...**team collaboration**” and “**interaction between the users**”). The players interact either directly when in close physical proximity (e.g., if both Helpers on the same team, or both players in physical proximity on the playing field), or indirectly between Helpers and their assigned Pacmen/Ghosts via wireless real-time messaging. *Id.*, 108. “[T]he Helper, who is always in VR mode and sees all, **guides her partner by messaging her** with important information” while the Pacmen/Ghosts “**click on preset message[s]** to be sent to Helpers” **via the Wireless LAN network by real time messaging.**” *Id.*, 114-116. A POSITA would have recognized that modifying Cheok’s HMD system with the *speaker and microphone* coupled to Rallison’s headset would have allowed for more flexible, personal, and effective collaboration between players physically distant from each other during gameplay in an improvement over messaging. Welch ¶167. In such a combination, a player would have used a *speaker and microphone* in the headset of the HMD to speak one-on-one with allied users on the playing field and/or Helpers, promoting increased collaboration. *Id.*

A POSITA would have also had a reasonable expectation of success in implementing this modification to the Cheok HMD system. *Id.* ¶168. As discussed above, Cheok already discloses expanding the use of Human Pacman technology (e.g., a wearable computer with HMD) using telephonic equipment/capabilities that enable verbal communication. For instance, Cheok discloses a “Transmeta Single

Board Computer (PC104 plus compliant motherboard running on Crusoe processor)” (EX1006, 110), that includes built-in audio codecs and connectors for line-in, line-out, and a microphone. EX1039, 1. Thus, a POSITA would have understood implementing Cheok’s HMD with the speakers and microphone of Rallison’s HMD in a way that both suggest is feasible. Welch ¶168. . A POSITA would have had a reasonable expectation of success in achieving such a modification because it would have involved a combination of known technologies (e.g., HMDs for wireless communication) using known methods of verbal communication (*speakers, microphone*) to yield the predictable result of a collaborative and interactive VR/AR game. *KSR*, 550 U.S. at 416.

2. Claim 30

Cheok-Foxlin077 in view of Rallison renders this claim obvious. Welch ¶¶169-170. As discussed for claim 16, a POSITA would have found it obvious to modify the Human Pacman system so that each player’s (Pacmen, Ghosts) HMD (*wireless communications device*) for telecommunications (e.g., with a speaker and microphone) would enable one-on-one verbal communication (*operable to provide human-communications*) with another player’s HMD (*a second wireless telephonic device*) during gameplay (*while said video game is being played*) in order to promote closer collaboration and strategizing opportunities. *See* Sec. VII.A; Welch ¶170.

**IX. GROUND 3: CHEOK IN VIEW OF NAKAMURA RENDERS
OBVIOUS CLAIM 102**

A. Independent Claim 102

1. Preamble

Cheok discloses the preamble. *See* Sec. VII.A.1 (same preamble); Welch ¶174.

2. 102[a]

Cheok discloses this limitation. Welch ¶175. *See* Sec. VII.A.3 (for a *display*); EX1006, 110. A POSITA would have further understood that while an optical see-through HMD is transparent, a video see-through HMD, such as that disclosed by Cheok, is non-transparent (*a non-transparent display*) because the wearable computer's "FireWire camera" (*id.*, 110) provides the real world view upon which the virtual world is superimposed in an augmented reality mode. Welch ¶175.

3. 102[b]

Cheok discloses this limitation. Welch ¶¶176-177. Cheok discloses that the wearable computer's dead-reckoning module is *a locating device operable to determine the physical location of said locating device on a physical playfield* for the same reasons as discussed for Ground 1, limitation 1[a.2]. *See* Sec. VII.A.4. Cheok further discloses *wherein said locating device comprises a movement measuring device operable to be utilized, at least in part, to determine said physical location*. Welch ¶177. As discussed for Ground 1, limitation 1[a.2], Cheok explains

that while the dead-reckoning module contains several different components (e.g., various sensors), one of the main components is a GPS receiver. *See* Sec. VII.A.4; EX1006, 110. Cheok explains that the dead-reckoning module, which includes a GPS receiver (*locating device*) and inertial sensors (*movement measuring device*) is a self-contained navigation unit that measures displacement from an initialization point by measuring direction and distance traveled and uses this data in order to determine the user's position (*operable to be utilized, at least in part, to determine said physical location*). *Id.*, 108; *see also* Sec. VII.A.4; Welch ¶177.

4. 102[c]

Cheok discloses this limitation for the same reasons as discussed for Ground 1, claim 11. *See* Sec. VII.B.2; Welch ¶178.

5. 102[d]

Cheok in view of Nakamura renders obvious this limitation. Welch ¶¶179-201.

First, Cheok discloses *a processor coupled to said display and said locating device, wherein said processor is operable to provide a video game comprising a virtual character with a virtual location and facing a virtual direction on a virtual playfield said virtual location on said virtual playfield corresponds to said physical location on said physical playfield* for the same reasons as discussed for Ground 1,

limitation 1[a.3], which recites substantially similar limitations. *See* Sec. VII.A.5; Welch ¶180.

Second, Cheok in view of Nakamura renders obvious *an origin of gameplay of said videogame is operable to be established by recording a manually provided origin in response to a prompt requesting said manually provided origin*. Welch ¶181.

Cheok discloses *an origin of gameplay of said videogame* where the wearable computer incorporates a dead-reckoning module and GPS that track the player's position in real time with respect to an initialization point (*origin of gameplay*). *See* Sec. VII.A.4; EX1006, 106, 108, 110; Welch ¶181-183. Cheok discloses that by calculating the location with respect to an initialization point, the real-time position data of each user may be communicated to the server and other players. *See* Sec. VII.A.4; EX1006, 108; Welch ¶183. As discussed above, Cheok discloses that this real-time tracking of a player's movement in the physical world is reflected in the corresponding virtual character's movement in the virtual Pac-World. *See* Sec. VII.A.4; EX1006, 112. Thus, a POSITA would have understood that the Human Pacman system (*video game*) tracks location data for each user with respect to an initialization point (*origin of gameplay of said video game*). Welch ¶184.

Although Cheok does not explicitly disclose that the initialization point is *operable to be established by recording a manually provided origin in response to*

a prompt requesting said manually provided origin, a POSITA would have been motivated and found it obvious to implement this feature in view of Nakamura. Welch ¶185; *see also* Sec. VII.A.4.

a. Nakamura

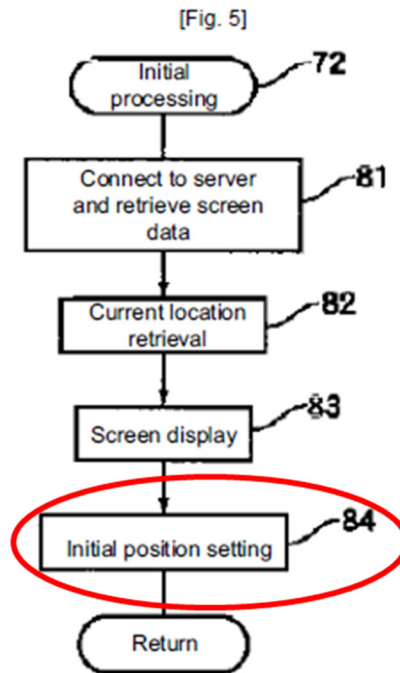
Like Cheok, Nakamura relates to a wireless location-based gaming system for interacting with a virtual space. Welch ¶186. Nakamura discloses a system for providing a role-playing game in a virtual world. EX1007, ¶¶[0005], [0018]. In the role-playing game, a user moves “through the real world, and the user’s current location in the real world is reflected in the virtual world, allowing the role-playing game to progress.” *Id.*, ¶[0015]. Further, a GPS tracks the location of a user’s device (e.g., a mobile phone or some computer-readable recording medium) and communicates with the server system” wireless[ly].” *Id.*, ¶[0016]. Nakamura’s game may be played by multiple “users who are accessing the same role-playing game” (*id.*, ¶[0029]), and those users may compete with each other (*id.*, ¶[0009]). Thus, the similarity between Nakamura and Cheok would have motivated a POSITA to consider the teachings of Nakamura when implementing Cheok’s Human Pacman system. Welch ¶186; Sec. VII.A.4.

Nakamura additionally discloses a feature for manually setting, in response to a prompt, a user’s current location in the real world as a predetermined initial position in the virtual world. *Id.* ¶187. Nakamura explains that “new scenes or

worlds automatically open depending on certain conditions” like, e.g., a user’s “current location information, which can be obtained through technologies such as GPS.” EX1007, ¶[0005]. This system for displaying virtual worlds may be provided on a “mobile terminal” equipped with a “GPS unit” to track the user’s “current location (typically coordinates including latitude and longitude information).” *Id.*, [0016], [0019]. “[I]nitial settings [can] be configured to reflect movements in the real world within the virtual world.” *Id.*, [0009]. Nakamura discloses that “it is desirable to perform an initial setup that defines the correspondence between the current location and the virtual position, as well as the ratio for converting actual displacement into virtual displacement, prior to starting the role-playing game.” *Id.*, [0025]. The “function 33 for performing the initial setup is provided as one of the features of the display control unit 30.” *Id.*; Welch ¶187.

The initial position may represent “the starting point of the game or, if the game was interrupted, the point where it was paused.” *Id.* Nakamura discloses that it is possible “to **manually set the initial position** setting” (*an origin of gameplay of said videogame is operable to be established by recording a manually provided origin*) “in response to the display of a position icon that prompts the user to manually adjust the position icon on the display to a suitable initial position setting” (*in response to a prompt requesting said manually provided origin*). For example, as shown in red in Figure 5 below, “[i]n step 84, the function 32 for displaying the

virtual position and virtual displacement displays the position icon 113 corresponding to the current location at the initial position 112 of the screen 111,” where the position icon may be “an icon in the shape of a human figure or even an icon representing the user’s face.” *Id.*, [0035].



Id., FIG. 5 (annotated). After the position icon is initially displayed on the screen, the “position icon 113, or position display icon, can be arranged according to the user's preference.” *Id.*, ¶[0035]. “If the position icon 113 is displayed at a virtual position that is appropriate to be set as the initial position, the user can perform a suitable operation, and the initial setting function 33 will set that current location as the initial position 112 on the screen 111 and store it as the parameter 13” (*an origin of gameplay of said videogame is operable to be established by recording a*

manually provided origin). *Id.*, ¶[0036]. The display of a movable position icon is a *prompt requesting said manually provided origin* because it indicates to a user that the user should either change the initial position setting or confirm that the current position is correct. Welch ¶188. Accordingly, Nakamura discloses *an origin of gameplay of said videogame is operable to be established by recording a manually provided origin in response to a prompt requesting said manually provided origin*. *Id.*, ¶190.

b. Motivation to Combine

A POSITA would have been motivated to rely on Nakamura's initialization features to enhance Cheok's Human Pacman system. *Id.* ¶191. As discussed above, Cheok discloses that when tracking real-time position of a player, the system determines location with respect to an initialization point. However, Cheok does not disclose the specific processes for an initialization step to set an initial location reference, a step that a POSITA would understand as necessary for any such system. A POSITA would have thus found it beneficial to modify Cheok based on Nakamura's teachings of an initialization step where a player manually inputs an initialization point in response to a movable icon prompt. *Id.*

As further discussed above, Nakamura also discloses that its initialization function is desirable because it allows for the alignment of real and virtual worlds. EX1007, ¶[0025]. Thus, a POSITA would have recognized that Nakamura's

initialization function would be a natural fit with Cheok's system, which also relies on a real and virtual world correspondence during gameplay. Welch ¶192.

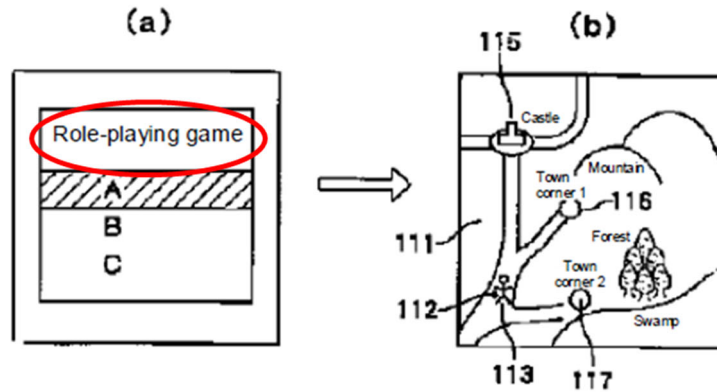
To the extent the Cheok-Nakamura combination's movable position icon on a display does not explicitly disclose *a prompt requesting said manually provided origin*, a POSITA would have been further motivated and found it obvious to implement this feature in the Cheok-Nakamura combination. Welch ¶193. Cheok discloses various written prompts for requesting manual input. For example, as shown in Figure 7 below, the HMD includes a panel showing incoming "alert messages" (in red), e.g., a "special cookie" or "power [] acquired." EX1006, 109, 114.



Figure 7. First person view as presented in HMD display of Pacman

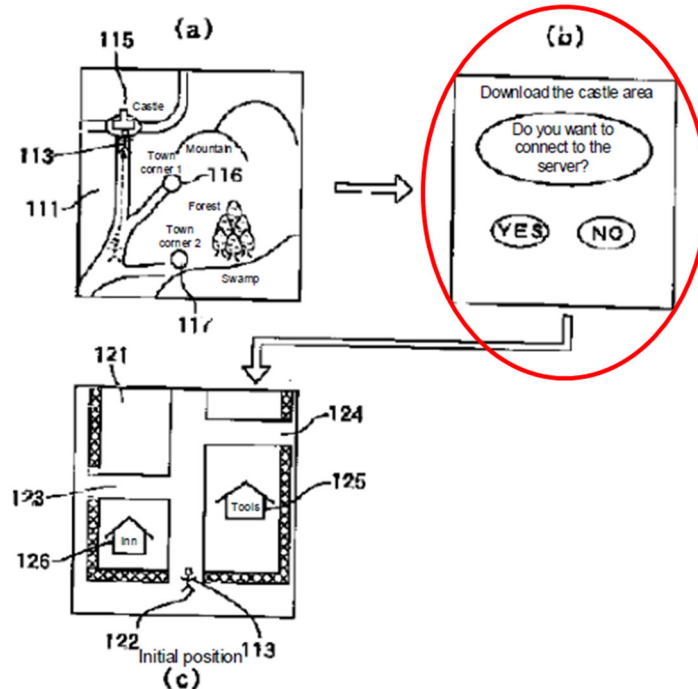
Id., FIG. 7 (annotated). As shown in blue, the display also includes a prompt that says “request update,” along with clickable buttons that allow a Pacman user to manually request updates via “preset messages” from Helpers on nearby ingredients or nearby Ghosts. *Id.*, 114, 115. Cheok discloses that the wearable computer user may respond to prompts on the display (e.g., by manually clicking) using the Twiddler2 component which consists of a handheld keyboard and a mouse. *Id.*, 110, 115. These alert messages are “highly effective” because the “graphical information is provided...directly in the zone of the user’s attention.” *Id.*; Welch ¶194. A POSITA would have thus understood the benefits of further implementing a manual origin prompt in the Cheok-Nakamura system, based on Cheok’s teachings of a written alert message (*a prompt requesting said manually provided origin*), for use in requesting a manual input from the user to set an initial position/origin in the virtual world. Welch ¶195. Such a combination would also be consistent with Nakamura, which discloses written prompts for manual user input are provided on the mobile terminal in various scenarios. For example, in Figure 9(a) below, “a screen to select the role-playing game is displayed,” which allows “[t]he user [to] select[] one of the games.” EX1007, ¶[0033].

[Fig. 9]

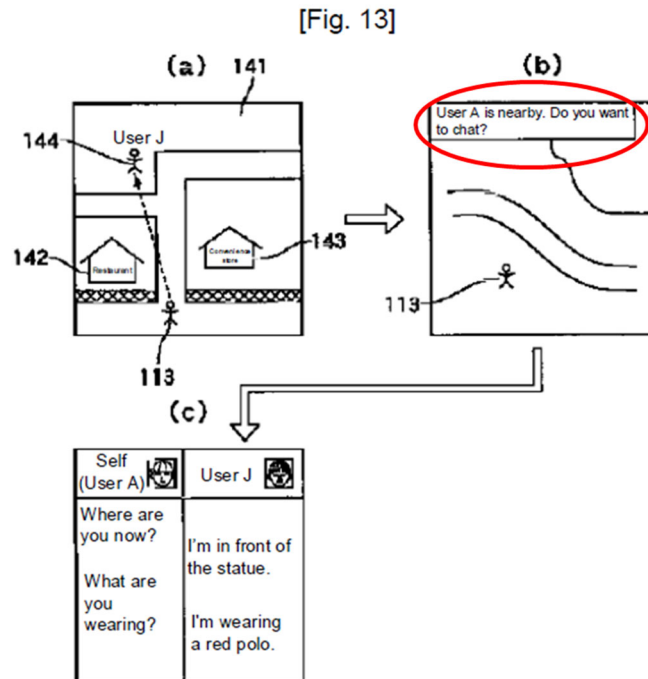


Id., FIG. 9 (annotated). In Figure 10(b) below, a user is asked whether they would like to connect to the server to download the screen corresponding to the castle area, such that the screen advances to Figure 10(c) if yes is selected or reverts to the screen in Figure 10(a) if no is selected. *Id.*, ¶¶[0042]-[0044].

[Fig. 10]



Id., FIG. 10 (annotated). In Figure 13(b) below, a prompt “is displayed on user J’s terminal, informing him/her that user A, who is playing the same role-playing game nearby, has made a chat request,” and asking “if user J grants permission for the connection.” *Id.*, ¶[0056]; Welch ¶196.



EX1007, FIG. 13 (annotated). Accordingly, to the extent the Cheok-Nakamura combination’s movable position icon on a display is found to not be *a prompt requesting said manually provided origin*, it would have been obvious to further modify the combined system such that a written prompt is used to request a user arrange the movable position icon on the display. Welch ¶197. *See also* Sec. VII.A.5.

c. Reasonable Expectation of Success

A POSITA would have also had a reasonable expectation of success combining the teachings of Cheok and Nakamura. Welch ¶199. As discussed above, both references are in the same field of art. Furthermore, a POSITA would have understood that implementing the combination would have involved modifying the Cheok system in a manner that Cheok suggests is feasible—implementing the real-time tracking system such that it operates with respect to an initialization point and such that a prompt requests user feedback. *Id.* A POSITA would have also had the skill to implement and reasonable expectation of success in achieving such a combination, because it would have involved a combination of known technologies (e.g., known system of real-time tracking with respect to an initialization point (Cheok)) according to known methods (e.g., known methods of initialization using a movable icon prompt (Nakamura)) to yield the predictable result of a system in which a manual input for origin of gameplay is provided in response to a prompt, as discussed above. Welch ¶199; *KSR*, 550 U.S. at 416. Accordingly, Cheok in view of Nakamura renders obvious *an origin of gameplay of said videogame is operable to be established by recording a manually provided origin in response to a prompt requesting said manually provided origin.* See also Sec. VII.A.5; Welch ¶200.

Third, Cheok discloses *said virtual direction on said virtual playfield corresponds to said physical direction on said physical playfield.* Welch ¶201. As

discussed for Ground 1, claim 11 and Ground 3, limitation 102[c], Cheok discloses that a user's wearable computer (head mounted display) includes a dead-reckoning module (i.e., Inertiacube2 from InterSense [InterSense01]) that is used for tracking a user's physical direction. *See* Secs. VII.A, VII.B.2., IX.A.4; *see also* EX1006, 109. Moreover, Cheok discloses that this real-time tracking of a player's movement in the physical world is “**reflected in the virtual Pac-World in real time...**in the corresponding location.” *Id.*, 112. Indeed, as shown below in Figure 10, when a player turns in certain directions (i.e., pointing with their head) in the real world, such as when exploring an area to find an ingredient, the player's Pacman virtual character also points itself and turns in corresponding directions in the virtual world, such that the real world and virtual view correspond to one another at all times.



Figure 10: Sequence of pictures showing the collection of an ingredient

Id., FIG. 10; Welch ¶201.

X. GROUND 4: NAKAMURA IN VIEW OF BENINI RENDERS OBVIOUS CLAIMS 1, 4, 11, 16, AND 30

A. Claim 1

1. Preamble

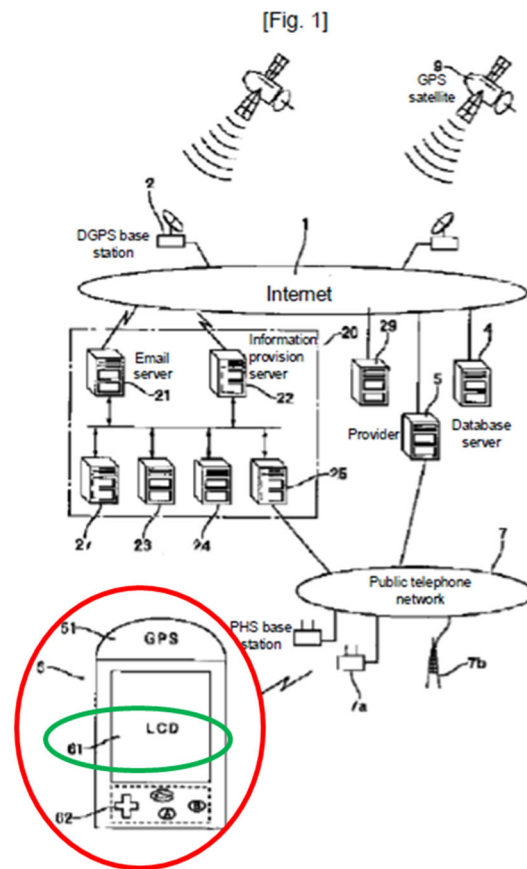
To the extent limiting, Nakamura discloses the preamble. Welch ¶¶205-206; EX1007, Abstract (“A game system (10) is provided that displays and controls the current location and displacement in the real world—obtained from GPS, PHS, CDMA-based mobile phones, or similar sources—as the virtual position and virtual displacement on the screen (virtual world) presented in a role-playing game”).

2. 1[a]

Nakamura discloses this limitation. Welch ¶207. Nakamura discloses that the game system for displaying virtual world information is installed on a mobile terminal (*wireless communication device*), which may be equipped with a wireless communication means (**communication means for connecting to a server system via wireless**, PHS, mobile phones, dial-up Internet, or other computer networks”) to enable communication with a server system. EX1007, ¶[0012] (“[I]t is desirable to include means or steps for obtaining virtual world information via **communication with a server system through wireless or computer networks.**”; *see also* [0016], [0018]).

3. 1[a.1]

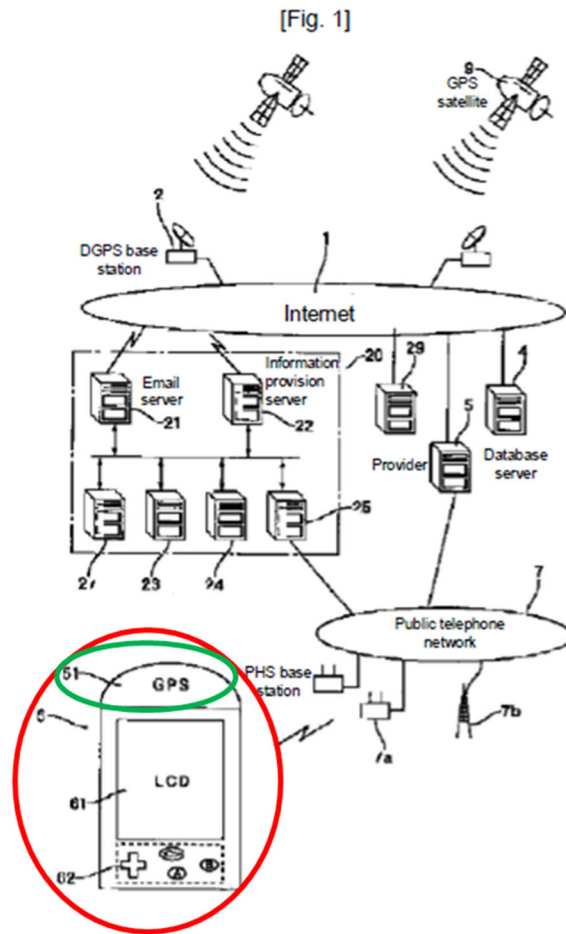
Nakamura discloses this limitation. Welch ¶208. Nakamura discloses that the mobile terminal (*wireless communication device*) further has an “LCD” display (*a display*) and an operational panel with a touch panel or pointing device and switches. EX1007, ¶¶[0018], [0022]; Fig. 1. Nakamura explains that the mobile terminal’s game system operates using a “display control unit 30 for displaying the virtual world, and this display control unit 30 has several functions” for operating the game system in conjunction with the display. *Id.*, ¶[0024]; *see also id.*, ¶¶[0024]-[0031] (describing functions). Figure 1 below shows the mobile terminal (in red) having an LCD *display* (in green).



Id., FIG. 1 (annotated); Welch ¶208.

4. 1[a.2]

Nakamura discloses this limitation. Welch ¶¶209-210. As shown in Figure 1 below, Nakamura discloses that the “mobile terminal” (in red) has a “GPS unit” (*a locating device*) (in green) which determines the location of the GPS “**system for obtaining data indicating its current location**” (*to determine the physical location of said locating device*), and thus the location of the user’s mobile terminal in which the GPS is found. EX1007, ¶¶[0016], [0019], [0022].

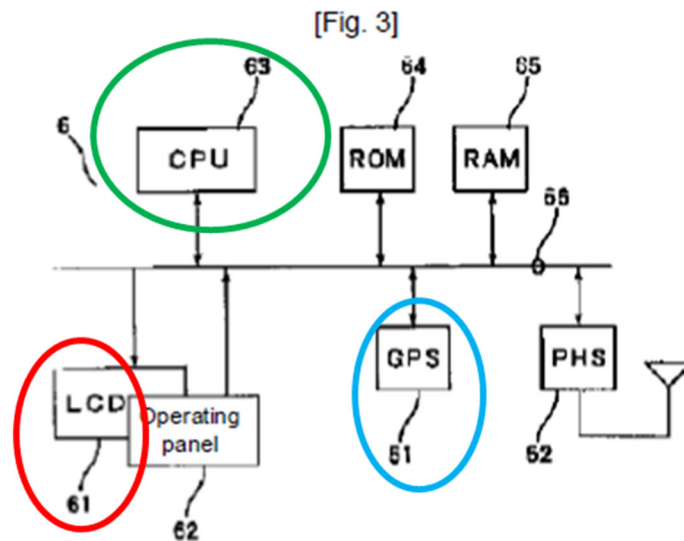


Id., FIG. 1 (annotated). The mobile terminal's GPS is used to track a user's movement through the real world (*on a physical playfield*), which is "summed up by the [GPS] distance counter 12, provided to the display control unit 30, and **displayed as the position (virtual position) and displacement (virtual displacement) in the virtual world** of the role-playing game on the LCD 61." *Id.*, ¶¶[0006], [0023], [0039]. Based on, for example, "initial settings," "the position icon 113 on the screen moves in accordance with the changes in the actual location or movement (actual displacement) provided by the GPS unit 51." *Id.*, ¶[0039].

5. 1[a.3]

Nakamura in view of Benini renders obvious this limitation. Welch ¶¶211-234; *see also* Sec. X.B.

First, Nakamura discloses *a processor coupled to said display and said locating device*. Welch ¶212. As shown in Figure 3 below, the mobile terminal includes a central processing unit (“CPU”) (*a processor*) (in green) which is *coupled to* the LCD (*said display*) (in red) and the GPS (*said locating device*) via an internal bus. EX1007, ¶[0030].



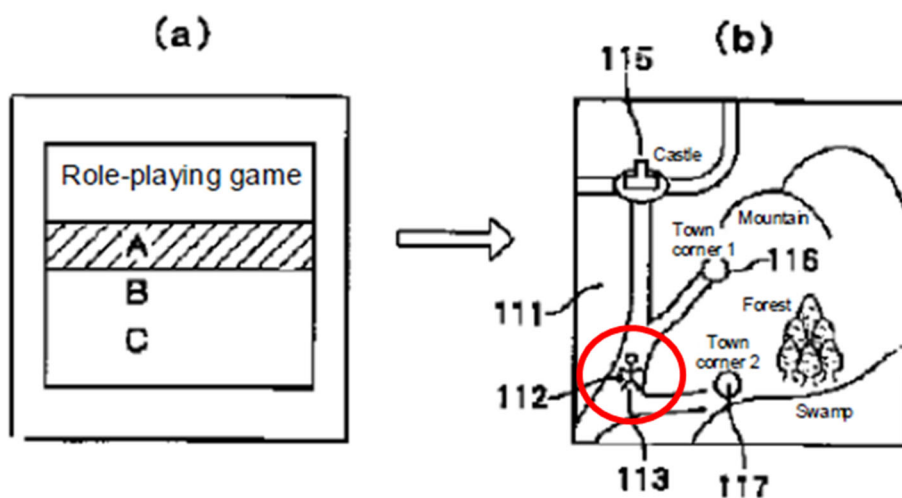
Id., FIG. 3 (annotated); Welch ¶212.

Second, Nakamura discloses *wherein said processor is operable to provide a video game comprising a virtual character with a virtual location on a virtual playfield*. A POSITA would have understood that the CPU (*processor*) is *operable to provide a video game* comprising the features of Nakamura’s location-based game

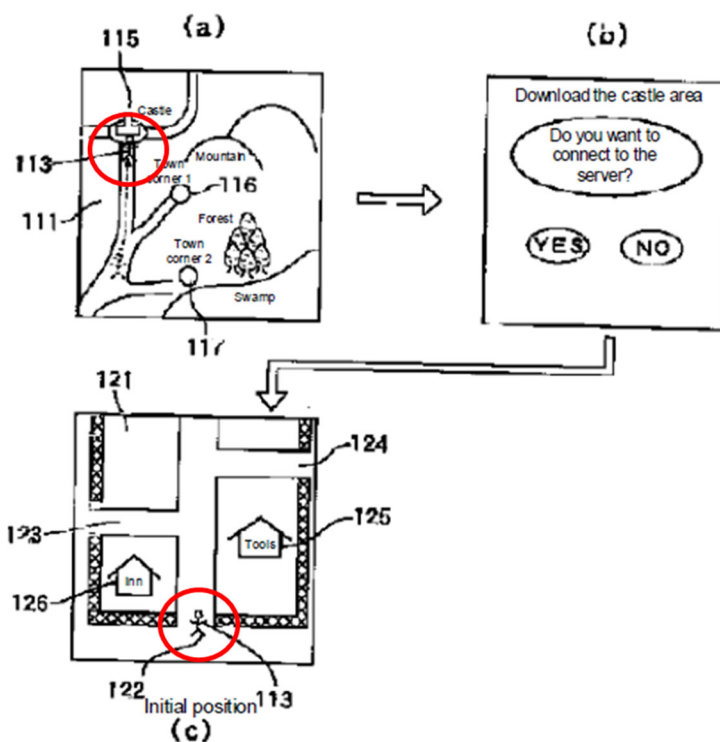
discussed below. Welch ¶213. Indeed, Nakamura discloses that the “role-playing game can be provided by pre-recording the software onto the ROM of the mobile terminal,” and such software (application program) can be executed on an information processing terminal...which includes a CPU....”. EX1007, ¶[0030]. The game also provides for a position icon that could “be an icon in the shape of a human figure or even an icon representing the user's face” (*virtual character*) that has a virtual position (*virtual location*) in the virtual world (*virtual playfield*). *Id.*, ¶[0035]; Welch ¶214.

Third, Nakamura discloses *said virtual character is displayed on said display*. Welch ¶215. As discussed above, Nakamura discloses a *virtual character* that is position icon in the form of a human figure or face (EX1007, ¶[0035]) and that a “function 32...displays the position icon 113 corresponding to the current location at the initial position 112 of the screen 111” (*said virtual character is displayed on said display*). *Id.* Indeed, Figures 9 through 13 below show position icon 113 representing a human figure displayed on the mobile terminal's during gameplay. EX1007, ¶¶[0033]-[0036] (describing FIG. 9 displays), [0041]-[0045] (describing FIG. 10 displays), [0046]-[0054] (describing FIG. 11 displays), [0051]-[0052] (describing FIG. 12 displays), [0054]-[0056] (describing FIG. 13 displays).

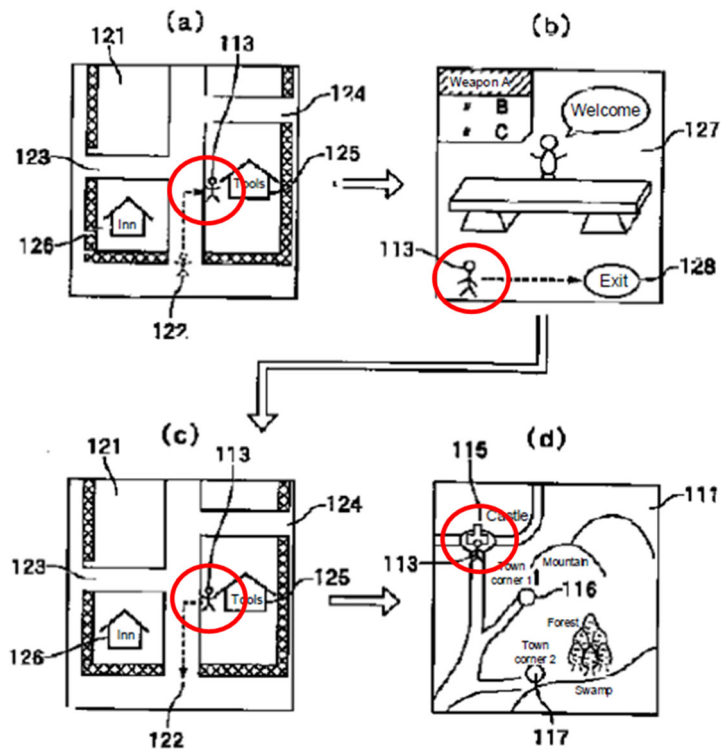
[Fig. 9]



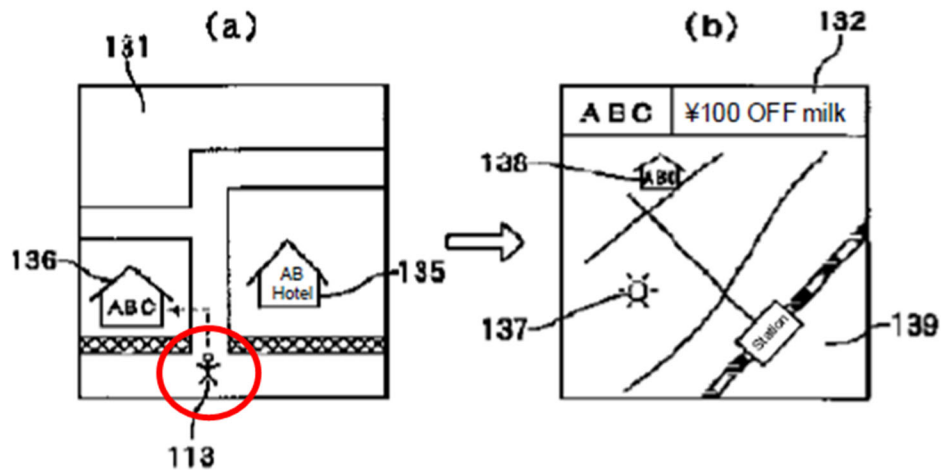
[Fig. 10]



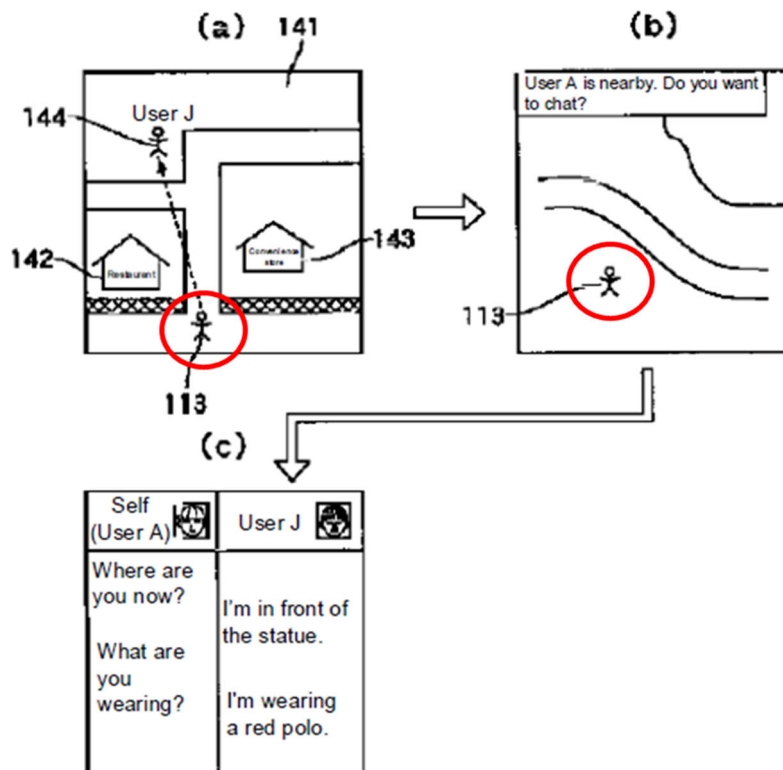
[Fig. 11]



[Fig. 12]



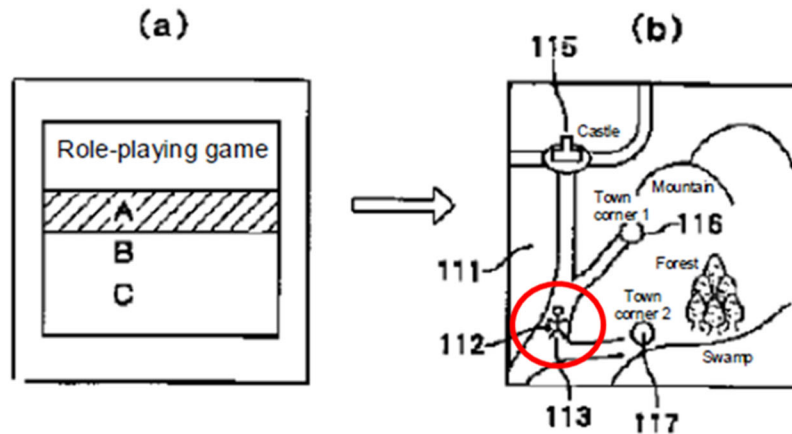
[Fig. 13]



Id., FIGs. 9-13 (annotated); Welch ¶215.

Fourth, Nakamura discloses *said virtual location on said virtual playfield corresponds to said physical location on said physical playfield*. Welch ¶216. As shown in Figure 9(b) below, which shows a mobile terminal display, the position icon (in red) is shown on the virtual world display (*said virtual location on said virtual playfield*) corresponding to the user's current location (*corresponds to said physical location on said physical playfield*). EX1007, ¶[0035].

[Fig. 9]



Id., FIG. 9 (annotated). Nakamura explains that during gameplay, the user’s “current location [in the real world] is acquired using the location acquisition function” which is “converted” to “virtual positions and virtual displacements on the screen” (*said virtual location on said virtual playfield*) such that “the position icon 113 on the screen moves in accordance with the changes in the actual location or movement (actual displacement) provided by the GPS unit 51” (*corresponds to said physical location on said physical playfield*). *Id.*, ¶[0039]; *see also id.*, ¶[0038]; Welch ¶217.

Fifth, Nakamura in view of Benini renders obvious *a direction of gameplay of said videogame is operable to be established by recording a manually provided direction in response to a prompt requesting said manually provided direction*. Welch ¶218. Nakamura discloses that the mobile terminal is a “device equipped with a direction sensor” where “it is possible to rotate the display of the virtual world so that the direction of real displacement aligns with the direction of virtual

displacement.” EX1007, ¶[0017]. Rotating the displayed virtual world allows for the “virtual displacement [to] always[] points upwards, based on the direction of movement (actual displacement) obtained from the GPS unit 51” (*a direction of gameplay of said videogame is operable to be established*). *Id.*, ¶[0024]. Thus, rotating a display to set the directions of real and virtual displacement in alignment with one another, establishes the direction of gameplay. Welch ¶218.

Although Nakamura does not explicitly disclose (as underlined) that *a direction of gameplay of said videogame is operable to be established by recording a manually provided direction in response to a prompt requesting said manually provided direction*, a POSITA would have been motivated and found it obvious to implement the underlined features in view of Benini. Welch ¶219.

a. Benini

Like Nakamura, Benini relates to the use of wireless portable devices for exploring virtual environments. *Id.* ¶220. For example, Benini discloses a “hardware/software system for PDA-based interaction with IVEs [(immersive virtual environments)]” for the “reconstruct[ion] [of] cultural heritage objects and environments” in an immersive virtual reality environment to, for example, allow people to explore an archaeological site or virtual museum. EX1009, 1, 2. As shown below in Figure 3, the system consists of portable terminals (e.g., “standard, consumer-market wearable interactive terminals, such as palmtop computers

(Pocket PC and PDAs)”) for interfacing with the virtual environment (e.g., a virtual theatre) over a wireless network, along with client-server software that runs on the terminals (client) and virtual reality engine (server). *Id.* at 1, 2, 4.

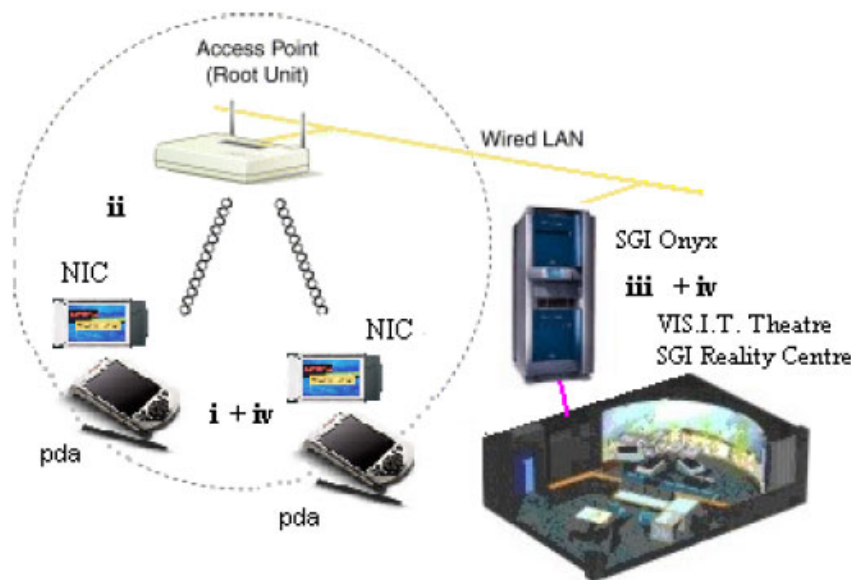


**Figure 3: Components of the interactive system:
portable terminals(i), wireless network(ii), virtual
theater (iii), client-server software (iv).**

Id., FIG. 3. Thus, Benini is similar to Nakamura. *See* Sec. IV.B. A POSITA would have therefore been motivated to consider the teachings of Benini when implementing the Nakamura system. Welch ¶220.

Benini additionally explains how portable palmtop computers / PDAs can be used to support the basic interaction tasks in the field of 3D user interfaces—navigation, selection/manipulation, and system controls. EX1009, 2-3. For example, a PDA may incorporate a “‘2D map’ in which the users visualize their

position and orientation in the virtual world,” to allow users to see “which regions can be reached by their current position,” augmented with various navigation controls,” including “eight arrows to more intuitively navigate in the environment.” *Id.*, 3. Figure 2 below shows an example PDA with arrows (in green) for visualizing position and direction in the virtual environment.

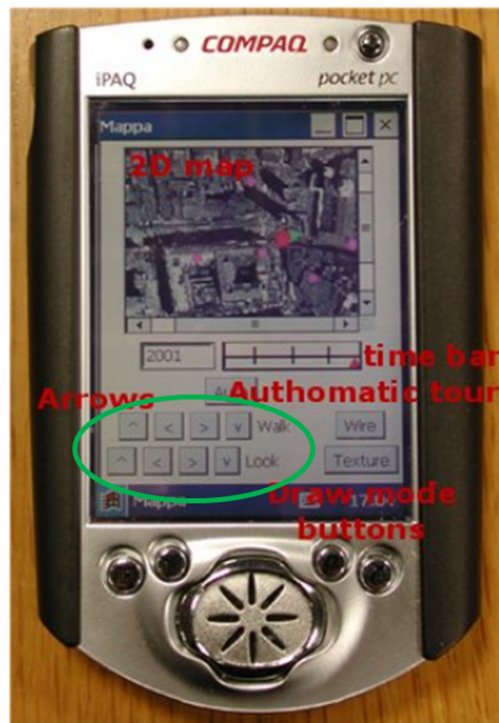


Figure 2: The User Interface developed for interacting via PDA with the Nu.M.E. VE

Id., FIG. 2 (annotated). “[F]our arrows realizes the metaphor of moving forward, backward, left and right the avatar in the VE as if it is walking into it; and four arrows are used to turn around and to look up and down....” *Id.*, 4. As shown above in green, the display asks a user to use four of the arrows to “walk,” i.e., change position

(*a prompt requesting said manually provided direction*), and four of the arrows to “look,” i.e., change orientation/direction (*manually provided direction*). *Id.*, FIG. 2; Welch ¶221. Benini further discloses that the user interface arrows can be used to “change [the] camera’s position and orientation (interacting with the 2D map or with the arrows),” thereby changing the view in the virtual environment (*direction of gameplay of said videogame*). EX1009, 5. When “requesting to change camera’s position and orientation” according to interaction with the map/arrows, the portable terminal (client) has to send to the server (virtual reality engine) “a 6-dimensional vector that includes world coordinates (x, y, z) and the three angles: heading – the rotation about the Z axis – pitch – the rotation about the X axis – and roll – the rotation about the Y axis.” Welch ¶222. This allows the server “to increment [the] current camera’s position and orientation” to show a new view in the virtual environment (*a direction of gameplay of said videogame is operable to be established*). *Id.* Benini thus discloses *a direction of gameplay of said videogame is operable to be established by recording a manually provided direction in response to a prompt requesting said manually provided direction*. Welch ¶223.

b. Motivation to Combine

When implementing Nakamura’s system, a POSITA would have been motivated to rely on Benini’s user interface features to enhance Nakamura. Welch ¶224. As discussed above, Nakamura discloses a rotation feature to align the

directions of real and virtual displacement so that virtual displacement always points upwards, based on the direction the user (and the user's device with a direction sensor) is moving. However, Nakamura does not disclose the specific processes for rotating the display of the virtual world. A POSITA would have thus been motivated to rely on the teachings of Benini's user interface with the 2D map, in which a user is prompted to use arrows to manually change the view of a virtual world map (e.g., to rotate the map) in order to establish a new viewing direction. Welch ¶224. A POSITA would have understood that the 2D map feature of Benini would have been a natural complement to and enhancement of Nakamura's system since both systems use a portable/mobile terminal to display a 2D map of a virtual world, as shown in green below in Nakamura's Figure 9, which shows a screen of Nakamura's mobile terminal shown in Figure 1, and Benini's Figure 2, which similarly shows a mobile terminal display screen. *Id.*

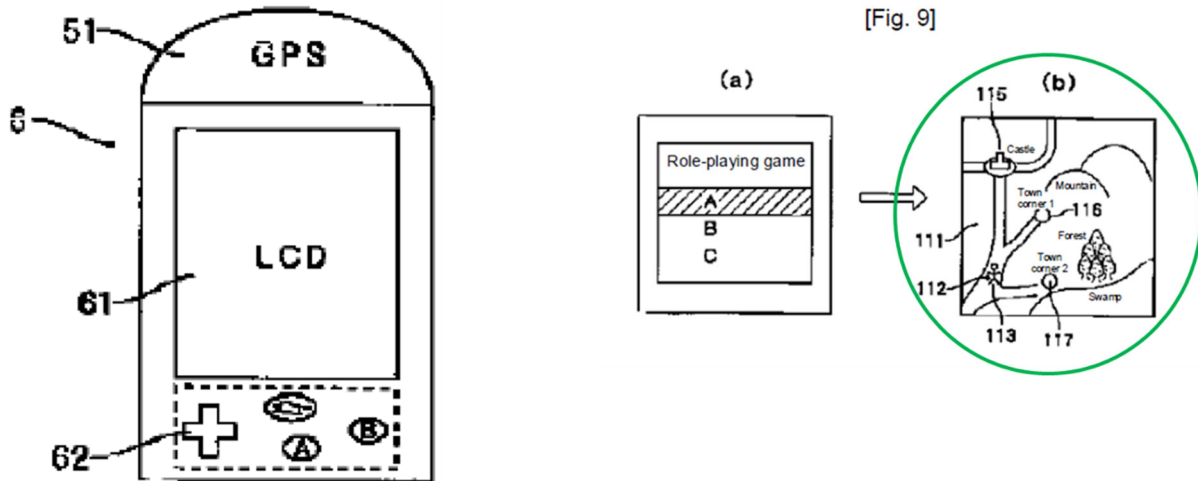


Figure 1 (excerpted)



Figure 2: The User Interface developed for interacting via PDA with the Nu.M.E. VE

EX1007, FIG. 1 (excerpted), FIG. 9 (annotated); EX1009, FIG. 2 (annotated); *see also* EX1007, ¶[0008] (“The first virtual world may simply be a world represented by a map corresponding to the real world (including deformed or stylized maps) that shows a destination or target area.”); EX1009, 3 (“The UI features a two-

dimensional map abstraction of the VR world....”). Moreover, as discussed above, Benini uses manual directional arrows to manipulate position and orientation on the map, similar to the prior art systems described in Nakamura, in which “players progress in the game by moving through the virtual world using directional buttons, joysticks, or other pointing devices.” EX1007, ¶[0005]. A POSITA would have thus understood that Nakamura’s system would have been easily improved by relying on Benini’s map user interface, since Benini uses components already disclosed by Nakamura. Welch ¶224.

For example, if a user using Nakamura’s system encounters a physical obstacle in the real world that is not represented in the virtual world, the user is unable to avoid the obstacle without the avoidance (e.g., turning around) being reflected in the virtual world. *Id.* ¶225. The combination with Benini improves and enhances Nakamura by permitting the user to adjust the virtual world map so that the avoidance of the physical obstacle is not reflected in the virtual world. *Id.* Similarly, a POSITA would understand the possibility that gameplay associated with that virtual position might not be compatible with the user’s real-world position. The combination with Benini improves and enhances Nakamura by permitting the user to adjust the virtual world map so that the direction of virtual game play is compatible with the directions the user is able to safely walk in the real world. *Id.* ¶226.

A POSITA would have further understood that a manual method to rotate the display, such as disclosed by Benini, would have been one of only several options available for displaying Nakamura's map display. Welch ¶229. Indeed, a POSITA would have understood that at the time of the alleged invention of the '821 Patent, virtual maps used for navigation in virtual environments could be displayed in either a north-up configuration, in which north is always at the top of the map ("*north-up*"), or a forward-up/track-up configuration, "which is always rotated so as to be congruent with the forward direction." EX1011, 2; EX1012, 2-3. A POSITA would have understood that Nakamura's rotated display feature, in which virtual displacement is always pointing up, would have corresponded to a forward-up map configuration. Welch ¶229. A POSITA would have also understood that at the time of the alleged invention of the '821 Patent, the alignment (e.g., forward-up) could be set automatically or could be updated manually by a user, and that it was beneficial to give a user a choice between automatic and manual modes. EX1012, 3 (describing alignment that is either "automatic" or "static until the user manually updates the map"); *id.* ("Our results showed that neither automatic nor manual mode should be preferred....Therefore, the users should be offered both methods."). Thus, manually aligning a display in a forward-up configuration, as contemplated by the Nakamura-Benini combination, would have been obvious because it would have been one of only several alignment options available (e.g., north-up or forward-up,

and further set manually or automatically), and thus one of a “finite number of identified, predictable solutions.” *Perfect Web Techs., Inc. v. InfoUSA, Inc.*, 587 F.3d 1324, 1331 (Fed. Cir. 2009).

Because Nakamura already includes the ability to rotate the virtual scene content by some specified angle (*id.*, [0017], [0024]), including the mathematical rotations of the coordinate frames, a POSITA would have understood that all they would need to add was some suitable input mechanism, such as the screen-based arrows disclosed by Benini, to let the user control the value of an angular offset to the existing Nakamura virtual scene rotation function. This ability to adjust the direction would nicely match the ability to adjust position as disclosed by Nakamura. *See, e.g.*, EX1007, [0035] (“This position icon 113, or position display icon, can be arranged according to the user's preference. It could be an icon in the shape of a human figure or even an icon representing the user's face.”). Welch ¶228; *see also* Sec. X.A.

c. Reasonable Expectation of Success

A POSITA would have also had a reasonable expectation of success combining the teachings of Nakamura and Benini. Welch ¶232. As discussed above, both references are in the same field of art. Furthermore, as discussed above, Nakamura and Benini have similar features, such as 2D maps on mobile terminals that have directional buttons, and thus a POSITA would have had a reasonable

expectation of success in combining these teachings. *Id.* A POSITA would have also had the skill to successfully implement such a combination, because it would have involved a combination of known technologies (e.g., known system of exploring and displaying virtual environments using a map on a mobile terminal and rotating the display to align real and virtual displacement (Nakamura)) according to known methods (e.g., known methods of rotating/changing the orientation of a map viewpoint on a mobile terminal in response to a prompt (Benini)) to yield the predictable result of a gaming system for exploring a virtual environment that includes a rotation feature to align real and virtual displacement (e.g. in a forward-up alignment) implemented by manually rotating the map (e.g., with directional buttons) to the appropriate orientation in response to a prompt. *KSR*, 550 U.S. at 416. By using the existing Nakamura virtual world rotation capabilities discussed above (*see* Sec. X.A.5.b), which already carries out the appropriate mathematical transforms, a POSITA would further increase their expectation of success in combining Nakamura and Benini. Welch ¶232.

B. Dependent Claims

1. Claim 4

Nakamura discloses this limitation. Welch ¶¶235-237. Nakamura discloses “means for displaying a second virtual world when the position within the first virtual world reaches a destination or target area.” EX1007, ¶[0005]. Specifically,

when a user moves their position icon (*user inputs*) such that their “virtual position overlaps with the event icon (indicating a match or entry into the predefined range),” (*perimeter*) a “position or area is set for transitioning to the next screen,” and “the next screen is obtained and displayed by the function 31 that retrieves and displays the virtual world.” EX1007, ¶[0026]. For example, when a user’s position icon overlaps with a predefined area or range established around, e.g., a castle event icon, the layout inside the castle gate is displayed as the new virtual world screen. *Id.*, ¶[0042]-[0044]. A POSITA would have understood that a predefined range (e.g., a radius) from a particular event icon is *a perimeter selected by user inputs* before gameplay occurs. Welch ¶236.

2. Claim 11

Nakamura discloses this limitation. Welch ¶238. As further discussed for Ground 4, limitation 1[a.3], Nakamura discloses that the “mobile terminal” (*said communication device*) may have a “direction sensor” (*a directional device*) that enables a user to “rotate the display of the virtual world so that the direction of real displacement aligns with the direction of virtual displacement.” EX1007, ¶[0017]; *see also* Sec. X.A.5. A POSITA would have understood that to align the direction of real displacement (i.e., displacement on the *physical playfield*) with the direction of virtual displacement, that the direction sensor (*directional device*) must be

operable to determine the physical direction of said directional device on said physical playfield. Welch ¶238.

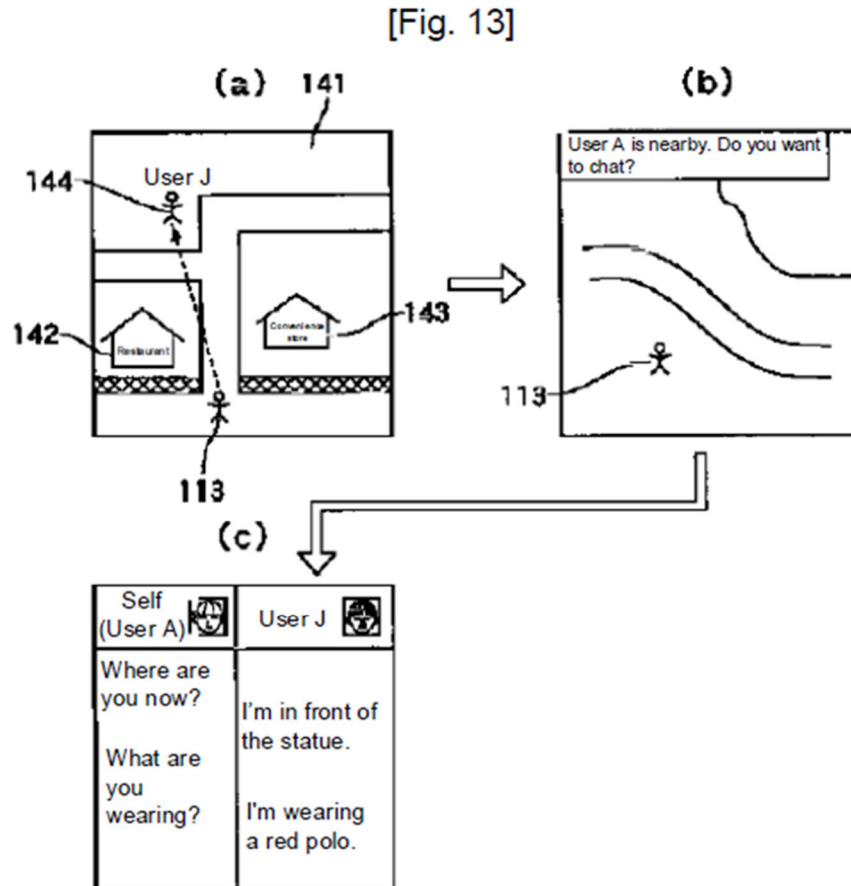
3. Claim 16

Nakamura discloses this limitation. Welch ¶239. Nakamura explains that its mobile terminal (*wireless communication device*) may be equipped with a “mobile phone unit” that can “connect[] to a public telephone network.” EX1007, ¶¶[0018], [0021], [0022]. A POSITA would have understood that the mobile terminal’s mobile phone unit would have contained *a speaker* and *a microphone* to enable communication through a public telephone network. Welch ¶239.

4. Claim 30

Nakamura discloses this limitation. Welch ¶240. As discussed for Ground 4, claim 16, each wireless mobile terminal (*wireless communications device*) is equipped with mobile phone technology and is thus a *wireless telephonic device*. See Sec. X.B.3; Welch ¶XX. Nakamura further discloses that each mobile terminal is equipped with “a connection [that] can be established with [] [another] user, allowing for communication (chat) through the screen ... as part of the features of the display control unit 30” which would allow a user to communicate with other users’ mobile terminals through an in-game chat function (*operable to provide human-communications to a second wireless telephonic device while said video game is being played*). EX1007, ¶[0029]). Figure 13 below shows the process by

which a user is alerted of a nearby user and asked if the user wants to chat (Figure 10(b)), and subsequently engages in a chat session with the other user (Figure 10(c)).



Id., FIG. 13; *see also id.*, ¶¶[0056]-[0057] (describing the detailed process for chat between two users). Welch ¶240.

XI. GROUND 5: NAKAMURA RENDERS OBVIOUS CLAIM 102

A. Independent Claim 102

1. Preamble

Nakamura discloses the preamble. *See* Sec. VII.A.1 (same preamble); Welch ¶241.

2. 102[a]

Nakamura discloses this limitation. Welch ¶242; *see also* Sec. VII.A.3 (for a *display*). A POSITA would have understood that an LCD screen of a mobile terminal (e.g., a mobile phone) is a *non-transparent display*. Welch ¶242.

3. 102[b]

Nakamura discloses this limitation. Welch ¶243. Nakamura discloses that the mobile terminal's GPS is *a locating device operable to determine the physical location of said locating device on a physical playfield* for the same reasons as discussed for Ground 4, limitation 1[a.2]. *See* Sec. X.A.4; Welch ¶243. Nakamura further discloses a location acquisition function which uses the mobile terminal's GPS (*locating device*) to determine the actual position (*determine said physical location*) of the user as the user (and their mobile terminal with GPS unit) changes position and moves through the real world, and another function that converts actual user movement measured by the GPS (*locating device comprises a movement measuring device*) to movement in the virtual world of the game. *See* Sec. IV.B; EX1007, ¶¶[0034], [0039].

4. 102[c]

Nakamura discloses this limitation for the same reasons as discussed for Ground 4, claim 11. *See* Sec. X.B.2; Welch ¶244.

5. 102[d]

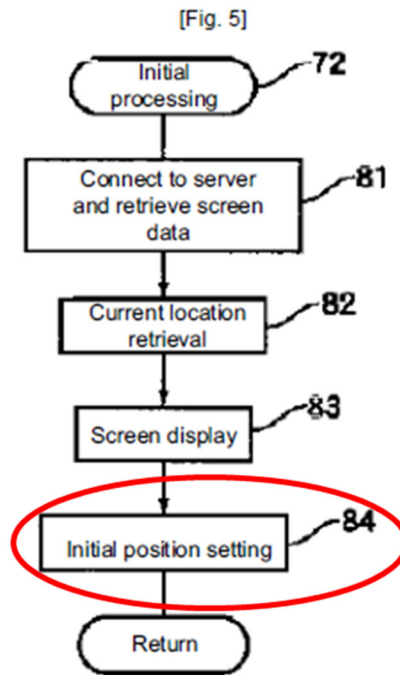
Nakamura renders obvious this limitation. Welch ¶¶245-253.

First, Nakamura discloses *a processor coupled to said display and said locating device, wherein said processor is operable to provide a video game comprising a virtual character with a virtual location and facing a virtual direction on a virtual playfield said virtual location on said virtual playfield corresponds to said physical location on said physical playfield* for the same reasons as discussed for Ground 4, limitation 1[a.3], which recites substantially similar limitations. See Sec. X.A.5; Welch ¶246.

Second, Nakamura renders obvious *an origin of gameplay of said videogame is operable to be established by recording a manually provided origin in response to a prompt requesting said manually provided origin*. Welch ¶247. As further discussed for Sec. IV.B and Ground 4, claim 1's preamble, Nakamura explains that new virtual worlds are displayed by tracking a user's current location information using technologies such as GPS. See Secs. IV.B, X.A.1; *see also* EX1007, ¶¶[0005], [0016], [0019]. Nakamura further explains that "initial settings [can] be configured to reflect movements in the real world within the virtual world." EX1007, ¶[0009]. Nakamura discloses that "it is desirable to perform an initial setup that defines the correspondence between the current location and the virtual position, as well as the ratio for converting actual displacement into virtual displacement, prior to starting the role-playing game." *Id.*, ¶[0025]. The "function 33 for performing the initial

setup is provided as one of the features of the display control unit 30, and the settings defined there are stored in a memory such as ROM or RAM.” *Id.*; Welch ¶247.

As part of this initial setup, “it is desirable to set the current location in the real world as a predetermined position (the initial value of the virtual position) within the first virtual world.” EX1007, ¶[0009]. The initial position may represent “the starting point of the game or, if the game was interrupted, the point where it was paused.” *Id.* While it is possible “to use the parameters that are set by default” (*id.*, ¶[0025]), it is also possible to manually set the initial position setting (*an origin of gameplay of said videogame is operable to be established by recording a manually provided origin*) in response to the display of a position icon that prompts the user to manually adjust the position icon on the display to a suitable initial position setting (*in response to a prompt requesting said manually provided origin*). For example, as shown in red in Figure 5 below, “[i]n step 84, the function 32 for displaying the virtual position and virtual displacement displays the position icon 113 corresponding to the current location at the initial position 112 of the screen 111,” where the position icon may be “an icon in the shape of a human figure or even an icon representing the user’s face.” *Id.*, ¶[0035].



Id., FIG. 5 (annotated). After the position icon is initially displayed on the screen, the “position icon 113, or position display icon, can be arranged according to the user's preference.” *Id.*, ¶[0035]. Once the user has chosen a suitable initial position, “the user can perform a suitable operation, and the initial setting function 33 will set that current location as the initial position 112 on the screen 111 and store it as the parameter 13” (*an origin of gameplay of said videogame is operable to be established by recording a manually provided origin*). *Id.*, ¶[0036]. The display of a movable position icon is a *prompt requesting said manually provided origin* because it indicates to a user that the user should either change the initial position setting or confirm that the current position is correct. Welch ¶247. Accordingly, Nakamura discloses *an origin of gameplay of said videogame is operable to be*

established by recording a manually provided origin in response to a prompt requesting said manually provided origin. Id.

To the extent Nakamura is found not to disclose that the manually provided origin is provided *in response to a prompt requesting said manually provided origin*, Nakamura renders this limitation obvious. Indeed, as discussed for Ground 3, limitation 102[d], Nakamura discloses that written prompts are provided on the mobile terminal in various scenarios to request manual user input. *See* Sec. IX.A.5; EX1007, ¶¶[0033], [0042]-[0044], [0056]; *see also id.*, FIGs. 9, 10, 13. A POSITA would have recognized the benefits of implementing such a prompt in similar scenarios in which a manual user input is desired, such as where a user is asked to move the position icon to a desired initial position to provide a *manually provided origin*. Welch ¶248. A POSITA would have understood that adding such a prompt would have increased clarity (e.g., by reducing confusion as to the next steps the user should take) and provided for a more seamless user experience at the start of gameplay. *Id.*

A POSITA would have also had a reasonable expectation of success in implementing these teachings to the Nakamura system. *Id.* ¶251. As discussed above, Nakamura already discloses using prompts for numerous scenarios in which manual user input is desired. Thus, a POSITA would have understood that the combination would have involved implementing the Nakamura system in a way that

Nakamura suggests is feasible. *Id.* A POSITA would have also had the skill to implement and reasonable expectation of success in achieving such a combination because it would have involved a combination of known technologies (e.g., known system that accepts manual input of an origin of gameplay) according to known methods (e.g., known methods of using prompts to request manual user input) to yield the predictable result of a system that provides a prompt to request that a user manually provide an origin of gameplay. *KSR*, 550 U.S. at 416; Welch ¶251.

Third, Nakamura discloses *said virtual direction on said virtual playfield corresponds to said physical direction on said physical playfield*. Welch ¶253. As further discussed for limitation 1[a.3], Nakamura discloses a feature in which the virtual world display is rotated such that the direction of virtual displacement in the virtual world (*said virtual direction on said virtual playfield*) is aligned with (*corresponds to*) the direction of real displacement in the real world (*said physical direction on said physical playfield*). EX1007, ¶¶[0017], [0024].

XII. SECONDARY CONSIDERATIONS

There are no secondary considerations known to Petitioner that affect, let alone overcome—this strong case of obviousness. Should PO proffer any relevant evidence of secondary considerations, Petitioner reserves its rights to address.

XIII. THE BOARD SHOULD REACH THE MERITS

A. Institution is appropriate under § 325(d)

Institution is appropriate under § 325(d) because substantially the same art and arguments have never been presented to or considered by the Office. *Advanced Bionics, LLC v. MED-EL Elektromedizinische Geräte GmbH*, IPR2019-01469, Paper 6 at 6-11 (Feb. 13, 2020) (precedential). Specifically, Nakamura, Cheok, and Foxlin077 were not considered during prosecution, and therefore, these combinations were never before the Office.

B. Institution is appropriate under § 314(a)

Should PO seek denial under *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar. 11, 2020) (precedential), Petitioner will seek permission to reply to address the facts and law as they stand at the time.

XIV. MANDATORY NOTICES

A. Real Parties-in-Interest

The real party-in-interest is Meta Platforms, Inc.

B. Related Matters

U.S. Patent Office records indicate that the '821 Patent is assigned to Mullen Industries, LLC ("PO"), which is currently asserting the '821 Patent in the following concurrent litigation filed on April 4, 2024: *Mullen Industries LLC v. Meta Platforms, Inc.*, 1:24-cv-00354-DII (W.D. Tex).

Petitioner will file petitions for *inter partes* review against U.S. Patent No. 10,967,270, U.S. Patent No. 8,585,476, U.S. Patent No. 9,744,448, U.S. Patent No. 10,179,277, U.S. Patent No. 10,828,559, U.S. Patent No. 11,376,493, U.S. Patent No. 11,904,243, U.S. Patent No. 11,947,716, U.S. Patent No. 12,019,791, U.S. Patent No. 9,662,582, and U.S. Patent No. 10,974,151.

C. Notice of Counsel and Service Information

Meta provides the following designation of counsel:

Lead Counsel	Lisa K. Nguyen (Reg. No. 58,018) Paul Hastings LLP 1117 S. California Avenue Palo Alto, CA 94303 Telephone: 650.320.1800 Fax: 650.320.1900 Email: PH-Meta-MullenIPRS@paulhastings.com
Back-Up Counsel	David M. Tennant (Reg. No. 48,362) Paul Hastings LLP 2050 M St., N.W. Washington, DC, 20036 Telephone: 202.551.1700 Fax: 202.551.1705 Email: PH-Meta-MullenIPRS@paulhastings.com
Back-Up Counsel	Kamilah Alexander (Reg. No. 57,210) Paul Hastings LLP 1117 S. California Avenue Palo Alto, CA 94303 Telephone: 650.320.1800 Fax: 650.320.1900 Email: PH-Meta-MullenIPRS@paulhastings.com
Back-Up Counsel	Alexa J. Lowman (<i>pro hac vice</i> to be filed)

	Paul Hastings LLP 2050 M St., N.W. Washington, DC, 20036 Telephone: 202.551.1700 Fax: 202.551.1705 Email: PH-Meta-MullenIPRS@paulhastings.com
--	---

Pursuant to 37 C.F.R. § 42.10(b), a Power of Attorney accompanies this petition. Petitioner consents to electronic service by e-mail.

D. Fee for *Inter Partes* Review

The Director is authorized to charge the fee specified by 37 C.F.R. § 42.15(a) to Deposit Account 50-2613.

E. Grounds for Standing

The '821 Patent is available for *inter partes* review, and Petitioner is not barred or estopped.

XV. CONCLUSION

For these reasons, Petitioner respectfully requests institution.

Dated: March 25, 2025

Respectfully submitted,

By: /Lisa K. Nguyen/
Lisa K. Nguyen (Reg. No. 58,018)
PAUL HASTINGS LLP
1117 S. California Avenue
Palo Alto, CA 94304
Telephone: 650-320-1800
lisanguyen@paulhastings.com

Counsel for Petitioner
META PLATFORMS, LLC

CLAIM LISTING APPENDIX

The following claim listing adds letters ([a], [b], etc.) and numbers (-1, -2, etc.) to the independent claims for clarity:

1. Preamble: “A system comprising:”

1[a]: “a wireless communication device, wherein said wireless communication device comprises:”

1[a.1]: “a display,”

1[a.2]: “a locating device operable to determine the physical location of said locating device on a physical playfield; and,”

1[a.3]: “a processor coupled to said display and said locating device, wherein said processor is operable to provide a video game comprising a virtual character with a virtual location on a virtual playfield, said virtual character is displayed on said display, said virtual location on said virtual playfield corresponds to said physical location on said physical playfield, and a direction of gameplay of said videogame is operable to be established by recording a manually provided direction in response to a prompt requesting said manually provided direction.”

4. “The system of claim 1, wherein said video game utilizes a perimeter selected by user-inputs.”

11. “The system of claim 1, wherein said communication device further comprises a directional device, wherein said directional device is operable to determine the physical direction of said directional device on said physical playfield.”
16. “The system of claim 1, wherein said wireless communication device further comprise: a speaker; and a microphone.”
30. “The system of claim 1, wherein said wireless communications device is operable to provide human-communications to a second wireless telephonic device while said video game is being played.”
102. Preamble: “A system comprising:”
 - 102[a]: “a non-transparent display;”
 - 102[b]: “a locating device operable to determine the physical location of said locating device on a physical playfield, wherein said locating device comprises a movement measuring device operable to be utilized, at least in part, to determine said physical location;”
 - 102[c]: “a directional device operable to determine the physical direction of said directional device on said physical playfield; and”

102[d]: “a processor coupled to said display and said locating device, wherein said processor is operable to provide a video game comprising a virtual character with a virtual location and facing a virtual direction on a virtual playfield said virtual location on said virtual playfield corresponds to said physical location on said physical playfield, an origin of gameplay of said videogame is operable to be established by recording a manually provided origin in response to a prompt requesting said manually provided origin, and said virtual direction on said virtual playfield corresponds to said physical direction on said physical playfield.”

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that foregoing
**PETITION FOR INTER PARTES REVIEW OF U.S. PATENT NO.
11,033,821** exclusive of the parts exempted as provided in 37 C.F.R. §42.24(a),
contains 13,575 words and therefore complies with the type-volume limitations of
37 C.F.R. §42.24(a).

Dated: March 25, 2025

Respectfully submitted,

By: /Lisa K. Nguyen/
Lisa K. Nguyen (Reg. No. 58,018)
PAUL HASTINGS LLP
1117 S. California Avenue
Palo Alto, CA 94304
Telephone: 650-320-1800
lisanguyen@paulhastings.com

Counsel for Petitioner
META PLATFORMS, LLC

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing **PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,033,821 AND EXHIBITS EX1001-1039** are being served on March 25, 2025, via Federal Express overnight mail on counsel of record for U.S. Patent No. 11,033,821 as addressed below:

JEFFREY D. MULLEN
2212 Hassinger Lane
Glenshaw, PA 15116

A courtesy copy is also being served on counsel for the patent holder in the pending litigation on:

Stafford Davis
THE STAFFORD DAVIS FIRM, PC
815 South Broadway Avenue
Tyler, Texas 75701
sdavis@stafforddavisfirm.com

Dated: March 25, 2025

Respectfully submitted,

By: /Lisa K. Nguyen/
Lisa K. Nguyen (Reg. No. 58,018)
PAUL HASTINGS LLP
1117 S. California Avenue
Palo Alto, CA 94304
Telephone: 650-320-1800
lisanguyen@paulhastings.com

Counsel for Petitioner
META PLATFORMS, LLC