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Paper 45
Entered: September 17, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

KEYNETIK, INC.,
Patent Owner.

IPR2018-00986
Patent 8,370,106 B2

Before LYNNE E. PETTIGREW, IRVIN E. BRANCH, and
STACEY G. WHITE, *Administrative Patent Judges.*

BRANCH, *Administrative Patent Judge.*

JUDGMENT
Final Written Decision on Remand
Determining All Challenged Claims Unpatentable
35 U.S.C. §§ 144, 318

I. INTRODUCTION

We address this case after a decision by the United States Court of Appeals for the Federal Circuit in *KEYnetik, Inc. v. Samsung Electronics Co., Ltd.*, 841 F. App'x 219 (Fed. Cir. 2021) (hereinafter "*KEYnetik*"), affirming in part and vacating in part our Final Written Decision and remanding for further proceedings.

A. Procedural History

Samsung Electronics Co., Ltd. ("Petitioner") filed a Petition (Paper 1, "Pet.") requesting an *inter partes* review of claims 1–20 of U.S. Patent No. 8,370,106 B2 (Ex. 1001, "the '106 patent"). KEYnetik, Inc. ("Patent Owner") filed a Preliminary Response. Paper 6. On November 7, 2018, we entered a Decision on Institution (Paper 7, "Inst. Dec." or "Institution Decision") instituting *inter partes* review of all challenged claims on all asserted grounds (Inst. Dec. 37), as summarized below:

Claims Challenged	35 U.S.C. §	References
1, 3, 6, 10–12, 14, 17	103[1]	Linjama[2] and Lehrman[3]
2, 5, 8, 9, 13, 16, 19, 20	103	Linjama, Lehrman, Marvit[4]

[1] The claims at issue have an effective filing date prior to March 16, 2013, the effective date of the revisions to 35 U.S.C. § 103 in the Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284 (2011) ("AIA"), and we apply the pre-AIA version of § 103.

[2] U.S. Patent Publication No. 2008/0229255 A1 to Linjama, *et al.*, published Sept. 18, 2008 (Ex. 1005, "Linjama").

[3] U.S. Patent No. 6,703,939 B2 to Lehrman, *et al.*, issued Mar. 9, 2004 (Ex. 1006, "Lehrman").

[4] U.S. Patent No. 7,180,500 B2 to Marvit, *et al.*, issued Feb. 20, 2007 (Ex. 1008, "Marvit").

Claims Challenged	35 U.S.C. §	References
1, 3, 4, 6, 7, 10–12, 14, 15, 17, 18	103	Linjama, Lehrman, Tosaki[5]
2, 5, 8, 9, 13, 16, 19, 20	103	Linjama, Lehrman, Tosaki, Marvit

After institution of trial, Patent Owner filed a Patent Owner Response (Paper 13, "PO Resp."), Petitioner filed a Reply (Paper 19, "Pet. Reply"), and Patent Owner filed a Sur-Reply (Paper 25, "PO Sur-Reply"). To support its arguments, Petitioner relied on the testimony of Dr. Gregory D. Abowd (*see* Exs. 1002, 1014); Patent Owner relied on testimony from Dr. Prasant Mohapatra (*see* Ex. 2005).

Oral argument was held on August 6, 2019, in Alexandria, Virginia, and a transcript of the hearing is included in the record. Paper 37.

On December 18, 2019, we issued a Final Written Decision (Paper 41, "Final Dec.") finding that Petitioner had demonstrated by a preponderance of the evidence that all challenged claims are unpatentable on at least one asserted ground. On December 6, 2019, Petitioner filed a Notice of Appeal (*see* Paper 40).

The Federal Circuit affirmed our claim construction, determination of motivation to combine *Linjama* and *Tosaki*, and obviousness determination as to claims 1–3, 5–6, 8–14, 16–17, and 19–20. *KEYnetik*, 841 F. App'x at 228. It also vacated the portion of our decision regarding reasonable expectation of success and our obviousness determination as to claims 4, 7, 15, and 18. *Id.* In light of those determinations, the Federal Circuit

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[5] U.S. Patent No. 6,312,335 B1 to Tosaki, *et al.*, issued Nov. 6, 2001 (Ex. 1009, "Tosaki").

remanded this proceeding to the Board to make a determination of reasonable expectation of success as to the combination of *Linjama* and *Tosaki*. *Id.*

On April 20, 2021, the parties sent an email to the Board jointly requesting a briefing schedule to address the issues on remand. Ex. 3004. We agreed that additional briefing was warranted and authorized Petitioner to file a 5-page Opening Brief and Patent Owner to file a 5-page Response, the briefs addressing whether there would have been a reasonable expectation of success in combining *Linjama* and *Tosaki*. Paper 42. Petitioner filed its Opening Brief on July 7, 2021 (Paper 43, "Pet. Remand Br."), and Patent Owner filed its Response on August 3, 2021 (Paper 44, "PO Remand Br.").

Having analyzed the record anew in light of our reviewing court's directives, we conclude that Petitioner has shown by a preponderance of the evidence that there would have been a reasonable expectation of success in combining the teachings of *Linjama* and *Tosaki*. As such, Petitioner has shown by a preponderance of the evidence that claims 4, 7, 15, and 18 of the '106 patent, the only claims at issue at this point in the proceeding, are unpatentable.

B. Related Proceedings

We have been informed that the '106 patent is asserted in *KEYnetik, Inc. v. Samsung Electronics Co., Ltd.*, No. 2-17-cv-02794 (D.N.J.). Pet. 1; Paper 4, 2.

C. The '106 Patent

The '106 patent involves a motion-based system that acquires movement and orientation data from sensors, maintains a sequence of detected conditions, produces a profile description based on the detected sequence, and outputs a corresponding event. Ex. 1001, Abstract. In an exemplary application, the system is usable in a hand-held mobile device, such as a mobile phone, wherein the system detects and processes a user's gestures as the user responds to an incoming call. *Id.* at 6:56–7:30. This sequence is depicted in Figure 3, reproduced below.

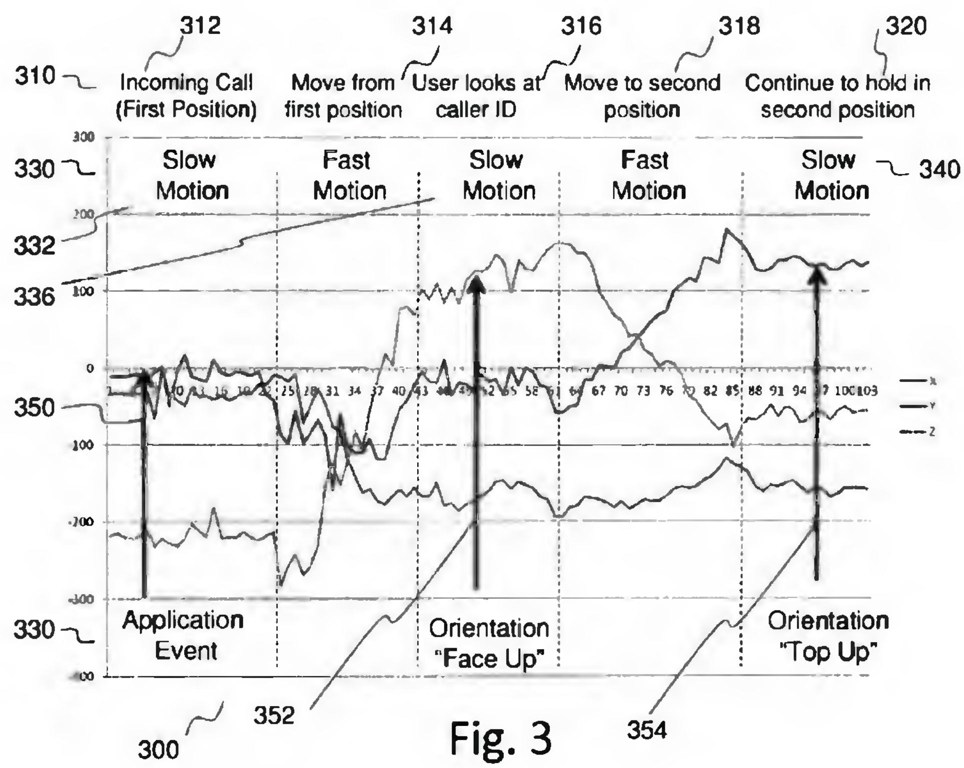

Fig. 3

Figure 3 depicts a graph of detected motion along three axes—x, y, and z—against a timeline as a user responds to an incoming call. *Id.* At 312, the incoming call initiates the process as an application event (300). The system detects fast motion as the user moves the phone (314) to a position to look at the caller ID (316). At 316, the system detects slow motion and a "Face Up" orientation as the user observes the caller ID. The system again detects fast motion (318) as the user positions the device to receive the incoming call. At 320, the system again detects slow motion and also detects that the device is oriented "Top Up." This sequence of detected movement and orientation is interpreted as a user answering a call. *Id.*

Figure 1, reproduced below, depicts a block diagram of the system architecture.

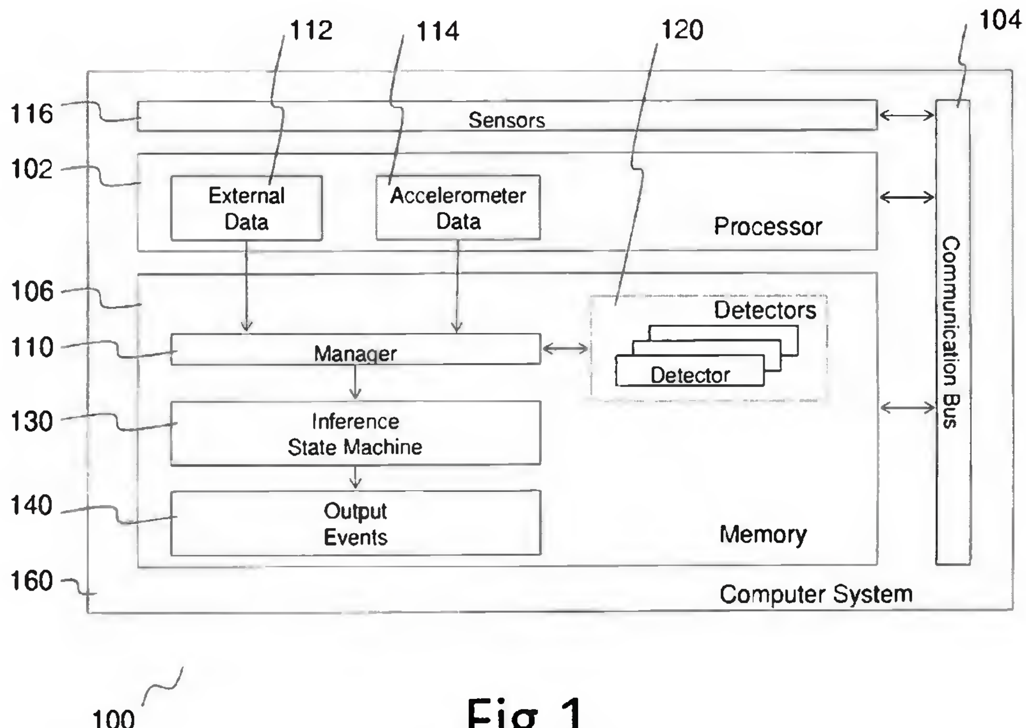

Fig.1

As shown in Figure 1, processor (102), memory (106), and sensors (116) communicate over bus (104). Processor (102) provides data to manager (110) in memory (102), "including external data (112) received from one or more client applications, the operating system and one or more non-motion sensors, and accelerometer data (114) received from one or more inertial motion sensors (116)." *Id.* at 4:40–56. "The manager (110) communicates the received data to an application detector (120) . . . for processing, and once processed, the manager (110) communicates the processed data to an inference state machine (130)." *Id.* at 4:56–60. "The inference state machine (130) maintains a sequence of the detected motion conditions[,] produces a profile description for the detected motion[, and, b]ased upon matching the profile description, the inference state machine (130) communicates an event (140) that corresponds to the profile description." *Id.* at 4:66–5:4.

Figure 2, reproduced below, depicts state diagram (200) that shows client application (210) in communication with motion detector (224) and orientation detector (226) of manager (22).

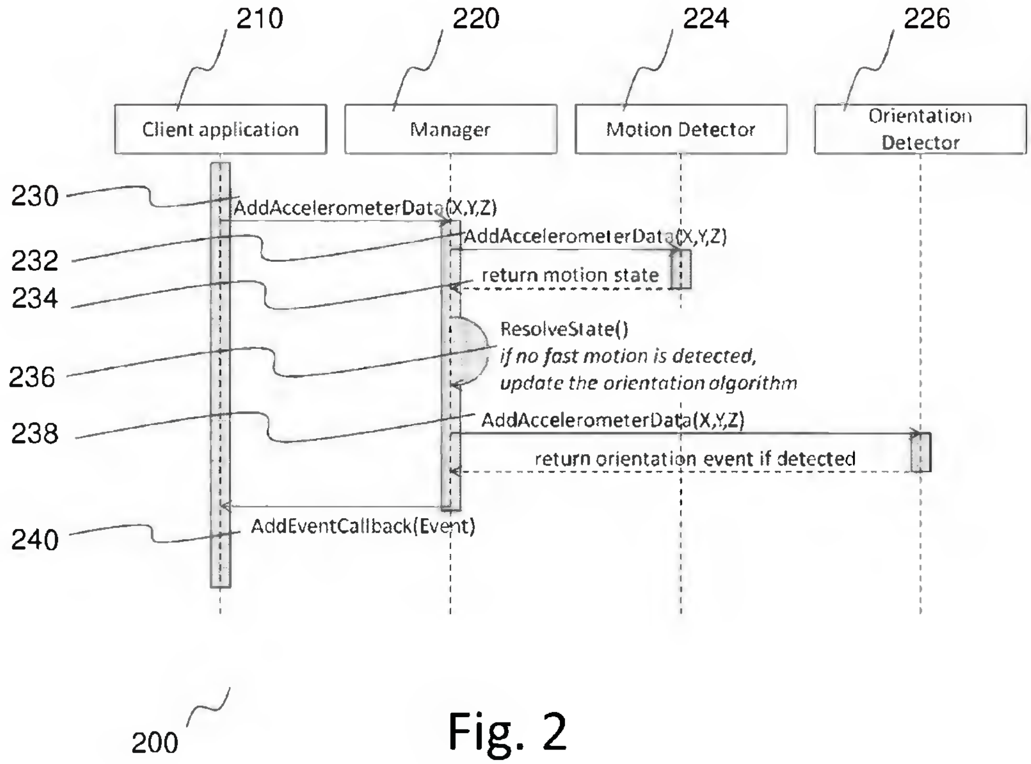

Fig. 2

The Specification of the '106 patent describes Figure 2 as follows:

> Initially, the manager (220) receives motion data and/or external data (230) from a client application (210), and communicates the received motion data (232) to the motion detector (224) for processing. The motion detector (224) processes the received data and returns motion state data (234) to the manager (220). If the motion detector (224) does not detect fast motion (236), the manager is sending the motion data (238) to the orientation detector (226). Similarly, if a fast motion is detected (240), the motion data is not communicated (and therefore not shown) to the orientation detector (226) for processing. In one embodiment, the manager (220) can communicate an output event (240) to the client application if such an event is programmed in the inference state machine (not shown).

Id. at 6:42–55.

D. The Decision of the Federal Circuit and Issue on Remand

With respect to the claims at issue on remand, namely claims 4, 7, 15, and 18 of the '106 patent, our Final Written Decision held that Petitioner had established, by a preponderance of the evidence, that these claims would have been obvious over *Linjama*, *Lehrman*, and *Tosaki*. *See* Final Dec. 59–69. Specifically, we determined that Petitioner had established a sufficient rationale to combine the teachings of *Linjama* and *Lehrman* with *Tosaki*, at least because Petitioner's "power saving" motivation (Pet. 69–70) is unrebutted and Dr. Abowd's testimony is convincing. Final Dec. 66; *see generally* PO Resp. 56–69; Pet. Reply 20; Ex. 1002 ¶ 153. The Federal Circuit affirmed our decision with respect to motivation to combine these references. *KEYnetik*, 841 F. App'x at 227–28.

In our Final Written Decision, we also rejected Patent Owner's argument that "Petitioner ignore[d] its burden to show that a [person of ordinary skill in the art] POSITA 'would have had a reasonable expectation of success in combining the references.'" PO Sur-Reply 25 (citing *Arctic Cat Inc. v. Bombardier Recreational Prod. Inc.*, 876 F.3d 1350, 1360–61 (Fed. Cir. 2017), *cert. denied*, 139 S. Ct. 143 (2018)). We concluded "Petitioner has no such 'burden' to show that a POSITA would have had a reasonable expectation of success in combining the references." Final Dec. 67. The Federal Circuit rejected our conclusion, determining that we "erred in assigning no burden to Samsung and making no finding as to reasonable expectation of success in combining the contested references." *KEYnetik*, 841 F. App'x at 227–28. The Federal Circuit vacated our final determination of obviousness as to claims 4, 7, 15, and 18, and remanded to the Board to make a determination of whether there was reasonable expectation of success in combining *Linjama* and *Tosaki*. *Id.*

Accordingly, on remand, we are tasked with determining whether there would have been a reasonable expectation of success in combining *Linjama* and *Tosaki*, which is material to whether claims 4, 7, 15, and 18 would have been obvious.[6] Whether the subject references teach or suggest the limitations of the claims and whether there would have been a motivation to combine the references have been resolved in the affirmative. *KEYnetik*, 841 F. App'x at 227–28.

E. Remanded Claims

Claims 4 and 7 depend from independent claim 1. Claims 15 and 18 depend from independent claim 12. Claims 1 and 4 are illustrative of the subject matter relevant to our task and are reproduced below:

> 1. A motion based input system comprising:
> a processor in communication with a memory;
> a motion sensor in communication with the processor;
> the processor to acquire movement data from the motion sensor;
> a manager configured to execute on the processor and to control motion and orientation detectors, including:
> a motion detector to detect motion, including identification of a fast motion phase and a slow motion phase, wherein the motion is classified as slow and fast

[6] *Lehrman* relates to detecting acceleration of a body and evaluating movement of a body relative to an environment. Ex. 1006, Abstract. *Lehrman* discloses identifying "dynamic acceleration" by comparing the combined acceleration of the accelerometers to one "g," which is acceleration due to gravity. *Id.* at 14:58–15:3. The Federal Circuit did not disturb our findings with respect to *Lehrman*. *KEYnetik*, 841 F. App'x at 227–28.

> based upon comparing a magnitude of a motion vector with a magnitude of gravity; and
>
> an orientation detector to detect orientation towards gravity for each slow motion phase; and
>
> an inference state machine in communication with the manager configured to:
>
> maintain a sequence of the detected orientations towards gravity, each orientation in the sequence being limited to a slow motion phase;
>
> produce a profile description for the sequence of the detected orientations; and
>
> output an event corresponding to the profile description.

Ex. 1001, 12:31–51.

> 4. The system of claim 1, further comprising instructions to avoid detecting orientation during a fast motion condition.

Id. at 12:61–62.

II. ANALYSIS

A. Person of Ordinary Skill in the Art

In our Final Written Decision, we determined

> A [POSITA] relevant to the '106 Patent, in the 2007–2009 time frame, would have been someone familiar with the various motion-sensing technologies by way of experience and/or schooling. That person would likely have earned a bachelor's degree in electrical engineering, computer science or another related field, and have at least two years of experience with motion-sensing technologies. More education can substitute for practical experience and vice versa.

Final Dec. 10–11. Because this determination remains uncontested, we apply it here.

B. Overview of *Linjama*

Linjama relates to "sens[ing] orientations or sequence of orientations, i.e.[,] gestures, of mobile devices. The orientation or sequence of orientations control components and/or functions of the mobile device." Ex. 1005, Abstract. Figure 1 of *Linjama* is reproduced below.

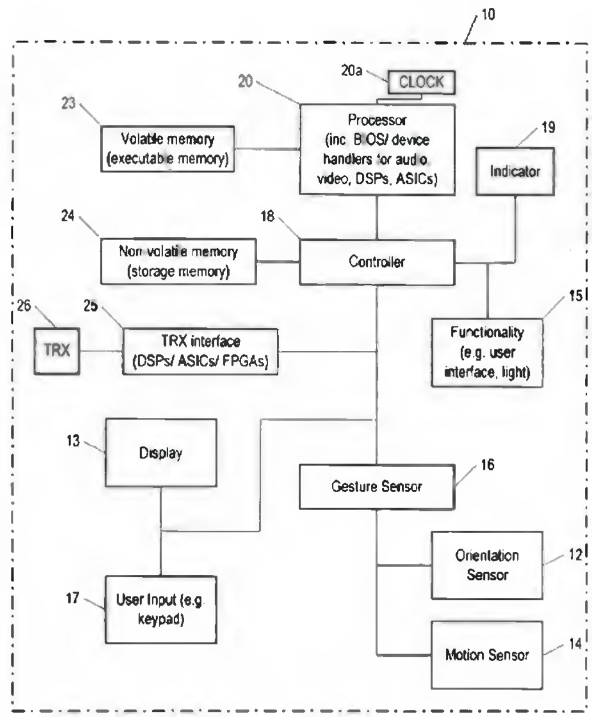

Fig. 1

Figure 1 of *Linjama* depicts mobile device 10 having motion, orientation, and gesture sensors 12, 14, and 16. *Linjama* discloses the following exemplary embodiment:

> [T]he motion sensor 14 may determine that the mobile terminal is substantially stationary, and may provide a signal indicating that the mobile terminal is substantially stationary to the gesture detector 16. At approximately the same time, the gesture detector 16 receives from the orientation sensor 12 a signal or signals indicating that the mobile terminal is in a downward orientation. This combination of substantially stationary and downward orientation may correspond to a predefined gesture, and therefore the gesture detector 16 may provide a control signal indicating that the predefined gesture has occurred to the controller 18. For example, the predefined gesture may

> correspond to a control signal activation or inactivating one or more of the components, i.e. functionalities of the mobile terminal 10. For example, the control signal for the predefined gesture discussed above may correspond to inactivating the audible sounds of the mobile terminal 10, by placing the mobile terminal 10 in a silent mode.

Id. ¶ 52.

C. Overview of *Tosaki*

Tosaki discloses "an input device used in a game which simulates fishing, or the like." Ex. 1009, 1:8–9. *Tosaki*'s device includes an acceleration sensor, which selectably operates in two detection modes, detecting either strength of movement or orientation of the device. *Id.* at 7:11–20 ("[B]y selecting the program processing method for the game processing device 2, [the acceleration sensor] can be set to operate as movement detecting means which detects the strength of movement, or to operate as movement detecting means which detects the orientation of the input device."). Figure 4 of *Tosaki* is reproduced below.

FIG.4

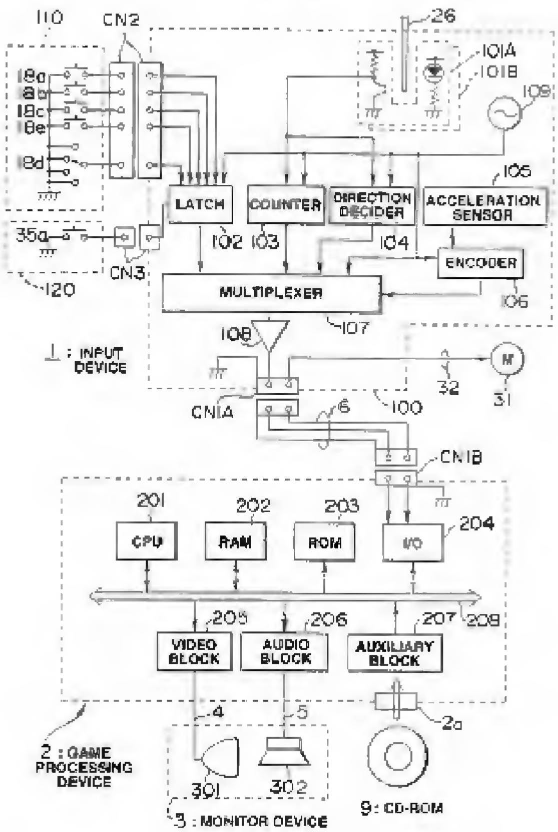

Figure 4 depicts a block diagram of input device 1 and game processing device 2, to which it is connected. Input device 1 contains acceleration sensor 105.

Notably, *Tosaki* discloses the following:

> changing between the two detection modes can be set and altered according to the aims of the program. For example, it may be set such that whilst the trigger button is being depressed *35a*, or for a prescribed period of time after the trigger button *35a* has been depressed, the strength of movement is detected, and at other times, the inclination of the input device is detected. . . .
>
> This clear distinction between an acceleration detection mode and an inclination detection mode is made in order to eliminate the instability arising when the system detects

> inclination at all times, whereby even the smallest movements made by the player holding the rod are detected and these are reflected in the game processing, leading to processing [] that is not intended by the player.

Id. at 7:20–39.

D. Discussion

Our reviewing court has tasked us with making a finding as to whether Petitioner has properly established a reasonable expectation of success in combining the teachings of *Linjama* and *Tosaki*. *KEYnetik*, 841 F. App'x at 228. The reasonable expectation of success requirement "refers to the likelihood of success in combining references to meet the limitations of the claimed invention." *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016); *see also Allergan, Inc. v. Sandoz, Inc.*, 726 F.3d 1286, 1292 (Fed. Cir. 2013) ("[T]he person of ordinary skill need only have a reasonable expectation of success of developing the claimed invention."). Moreover, a reasonable expectation of success does not require "an absolute certainty for success." *Par Pharm., Inc. v. TWi Pharms., Inc.*, 773 F.3d 1186, 1198 (Fed. Cir. 2014). "[O]bviousness cannot be avoided simply by a showing of some degree of unpredictability in the art so long as there was a reasonable probability of success." *Pfizer, Inc. v. Apotex, Inc.*, 480 F.3d 1348, 1364 (Fed. Cir. 2007). A reasonable expectation of success is to be assessed from the perspective of one of ordinary skill in the art at the time the invention was made. *Life Techs., Inc. v. Clontech Labs., Inc.*, 224 F.3d 1320, 1326 (Fed. Cir. 2000).

Petitioner argues that we made an "implicit finding of reasonable expectation of success [and that implicit finding] should be maintained for two independently sufficient reasons." Pet. Remand Br. 1. First, Petitioner contends that Dr. Abowd's uncontested testimony is that only "simple software changes" would have been required to modify *Linjama* in light of the teachings of *Tosaki*. *Id.* Second, Petitioner asserts that Patent Owner "waived any argument as to lack of reasonable expectation of success by not raising it in the Patent Owner's Response." *Id.* We are persuaded by Petitioner's first argument so we need not address the argument concerning waiver.

According to Petitioner, the "proposed modifications of Linjama's mobile terminal 10 [required] to arrive at claims 4, 7, 15, and 18 involve changes to software code of Linjama's mobile terminal 10." Pet. Remand Br. 2. Dr. Abowd testified as follows in support of Petitioner's challenges:

> A POSITA would have also recognized that detecting orientation in only a slow motion phase would have allowed the mobile terminal 10 to save power because the orientation detection would not be conducted all the time. The power savings motivation is consistent with *Linjama*'s discussion in ¶ [46] where *Linjama* explains reducing signaling to reduce power consumption. (Ex. 1005 ¶ [46].)

Ex. 1002 ¶ 153.

Dr. Abowd then testified that

> [s]uch a modification of the combined *Linjama-Lehrman* system based on *Tosaki* would have been straightforward for a POSITA to implement. For instance, simple modifications would have been made to the software code for gesture detector 16 such that the orientation of mobile terminal 10 is only detected when the mobile terminal 10 is substantially stationary.

Id. at ¶ 154.

We are persuaded by Dr. Abowd's testimony that a POSITA as defined herein—"someone familiar with the various motion-sensing technologies . . . hav[ing] earned a bachelor's degree in electrical engineering, computer science . . . , and hav[ing] at least two years of experience with motion-sensing technologies"—would have found "simple modifications . . . to the software code for gesture detect[ion]" "straightforward . . . to implement." Ex. 1002 ¶ 154; Pet. 70.

Patent Owner's argument and evidence on the issue does not overcome Petitioner's persuasive showing, including Dr. Abowd's testimony. *See, e.g.*, PO Remand Br.; Ex. 2005 ¶¶ 117–126; Ex. 1015, 93–97. For instance, Patent Owner's expert, Dr. Mohapatra, did not dispute Dr. Abowd's testimony that simple modifications to the software code would have been the only necessary changes. Ex. 2005 ¶¶ 117–126. Dr. Mohapatra did not testify that a POSITA would have been incapable of making such modifications, or that the modifications would have been problematic to implement. *Id.*

We also disagree with Patent Owner's argument that Petitioner's evidence is unavailing. *See generally* PO Remand Br. For instance, we disagree with Patent Owner that Petitioner's evidence is "vague and conclusory." *Id.* at 2. An expert opinion is conclusory if it "cannot reasonably be assessed for reliability." Comm. Note to Fed. R. Evid. 702 (2000). Dr. Abowd provided an explanation as to the knowledge base of the person of ordinary skill in the art (Ex. 1002 ¶¶ 16–17), he gave a sufficient explanation as to his background to allow us to assess whether he would be able to reliably testify as to the knowledge of that ordinarily skilled artisan (*id.* ¶¶ 3–11), and he explained how one of ordinary skill in the art would have understood the teachings of the references in question (*see e.g.*, *id.* ¶¶ 46–48, 61–64). Thus, on the record before us, we are persuaded that we have a sufficient basis to assess whether Dr. Abowd could provide credible testimony as to what one of ordinary skill in the art would have found to be a "simple" and "straightforward" implementation. Further, we are persuaded that "simple modifications . . . to the software code for gesture detect[ion]" (Ex. 1002 ¶ 154) is at least as clear as the '106 patent with respect to software (*see, e.g.*, Ex. 1015, 93–97 (Patent Owner's expert testifying that software instructions are "obvious" in the '106 patent, even in the absence of a reference to code or instructions)).

We also disagree with Patent Owner's logic that the Federal Circuit "rejected" the substance of Petitioner's evidence in refusing to find harmless our failure to apply it to the question of reasonable expectation of success. PO Remand Br. 1. We see no such "rejection" in the decision of our reviewing court. We also do not find reason to believe that "Dr. Abowd copied his conclusory assertion verbatim from the Petition" rather than testify as to his opinion. *Id.*; *see* Ex. 1002 ¶ 12. Patent Owner points to no evidence in the record to support this assertion. Further, upon questioning from Patent Owner's counsel, Dr. Abowd testified that the opinions expressed in the declaration were his own. Ex. 2061, 6:3–5 ("Q. Did you form the opinions in the declaration yourself? A. Yes.").

Thus, based on the complete record, we conclude Petitioner has demonstrated by a preponderance of the evidence that a POSITA would have had a reasonable expectation of success combining *Linjama* and *Tosaki* and that Petitioner has met its burden to show that claims 4, 7, 15, and 18, of the '106 patent are unpatentable as obvious over *Linjama*, *Lehrman*, and *Tosaki*.

III. CONCLUSION

Based on the arguments in the Petition, Patent Owner Response, Reply, Sur-Reply, Petitioner's Opening Brief on Remand, and Patent Owner's Response Brief on Remand, as well as the evidence of record, we determine that Petitioner has demonstrated by a preponderance of the evidence that claims 4, 7, 15, and 18, of the '106 patent would have been obvious. The following table summarizes our determinations.

Claims	35 U.S.C §	References/Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
4, 7, 15, 18	103(a)	Linjama, Lerhman, Tosaki	4, 7, 15, 18	

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has proved by a preponderance of the evidence that claims 4, 7, 15, and 18 of the '106 patent are unpatentable; and

FURTHER ORDERED that, because this is a final written decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

KEYNETIK, INC.,
Appellant

v. **No. 22-1127**

SAMSUNG ELECTRONICS CO., LTD.,
Appellee

Proceeding No.: IPR2018-00986

NOTICE FORWARDING CERTIFIED LIST

Notice of Appeal to the United States Court of Appeals for the Federal Circuit was timely filed by the Appellant on November 5, 2021 in the United States Patent and Trademark Office in connection with the above identified *Inter Partes Review* proceeding. Pursuant to 35 U.S.C. § 143 Certified List is this day being forwarded to the Federal Circuit.

Respectfully submitted,

Under Secretary of Commerce for Intellectual
Property and Director of the United States
Patent and Trademark Office

Date: December 20, 2021

By: */s/ Natasha M. Brotten*
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CERTIFICATE OF SERVICE

The undersigned hereby certifies that a true and correct copy of the foregoing has been served on Appellant and Appellee this 20th day of December, 2021, as follows:

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U.S. DEPARTMENT OF COMMERCE
United States Patent and Trademark Office

December 20, 2021
(Date)

THIS IS TO CERTIFY that the attached document is a list of the papers that comprise the record before the Patent Trial and Appeal Board (PTAB) for the *Inter Partes Review* proceeding identified below.

SAMSUNG ELECTRONICS CO. LTD,
Petitioner

v.

KEYNETIK, INC.,
Patent Owner

Case: IPR2018-00986
Patent 8,370,106 B2

By authority of the

DIRECTOR OF THE UNITED STATES
PATENT AND TRADEMARK OFFICE

/s/ Natasha M. Brotten

Certifying Officer

Prosecution History IPR2018-00986

Date	Document
04/27/2018	Petitioner's Power of Attorney
04/27/2018	Petition for Inter Partes Review of U.S. Patent No. 8,370,106
05/09/2018	Notice of Accord Filing Date
05/18/2018	Patent Owner's Mandatory Notices
05/18/2018	Patent Owner's Power of Attorney
08/09/2018	Patent Owner's Preliminary Response
11/07/2018	Order Instituting Inter Partes Review
11/07/2018	Scheduling Order
01/08/2019	Motion for Admission Pro Hac Vice of Mark W. Halderman
01/08/2019	Declaration of Mark W. Halderman
01/08/2019	Patent Owner's Notice of Deposition of Dr. Gregory D. Abowd
01/23/2019	Order - Patent Owner's Motion for Pro Hac Vice Admission of Mark W. Halderman
02/06/2019	Patent Owner's Response
02/06/2019	Patent Owner's Motion to Seal
02/13/2019	Petitioner's Objections to Patent Owner's Exhibits
04/10/2019	Petitioner's Notice of Deposition of Dr. Prasant Mohapatra
04/10/2019	Petitioner's Notice of Deposition of David W. Wood
04/30/2019	Order - Patent Owner's Motion to Seal
05/06/2019	Petitioner's Reply Brief
05/06/2019	Petitioner's Current List of Exhibits
05/07/2019	Patent Owner's Motion to Seal
05/24/2019	Patent Owner's Updated Mandatory Notices
05/24/2019	Patent Owner's Power of Attorney
05/24/2019	Patent Owner's Notice of Deposition of Dr. Gregory Abowd
06/06/2019	Patent Owner's Sur-Reply
07/03/2019	Patent Owner's Request for Oral Argument
07/08/2019	Petitioner's Request for Oral Argument
07/08/2019	Petitioner's Motion to Exclude Evidence
07/15/2019	Patent Owner's Response in Opposition to Petitioner's Motion to Exclude Evidence
07/17/2019	Patent Owner's Corrected Response in Opposition to Petitioner's Motion to Exclude Evidence
07/17/2019	Order - Oral Hearing
07/22/2019	Petitioner's Reply in Support of Motion to Exclude Evidence
08/02/2019	Petitioner's Current List of Exhibits
08/02/2019	Patent Owner's Current List of Exhibits
08/02/2019	Patent Owner's Current List of Exhibits
08/09/2019	Order - Conduct of the Proceeding
11/01/2019	Hearing Transcript
11/06/2019	Notice of Disposition of Sealed Final Written Decision
12/18/2019	Final Written Decision

07/07/2021	Conduct of the Proceeding on Remand
07/20/2021	Petitioner's Brief on Remand
08/03/2021	Patent Owner's Opposition to Petitioner's Brief on Remand
09/17/2021	Final Written Decision On Remand

US008370106B2

(12) **United States Patent**
Shkolnikov et al.

(10) **Patent No.: US 8,370,106 B2**
(45) **Date of Patent: Feb. 5, 2013**

(54) **SPATIALLY AWARE INFERENCE LOGIC**

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(73) Assignee: **Keynetik, Inc.**, Herndon, VA (US)

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(51) **Int. Cl.**

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G01C 17/00	(2006.01)
G01C 19/00	(2006.01)

(52) **U.S. Cl.** **702/153**; 702/150

(58) **Field of Classification Search** 702/92, 702/94, 145, 150, 151, 152, 153, 155; 700/302

See application file for complete search history.

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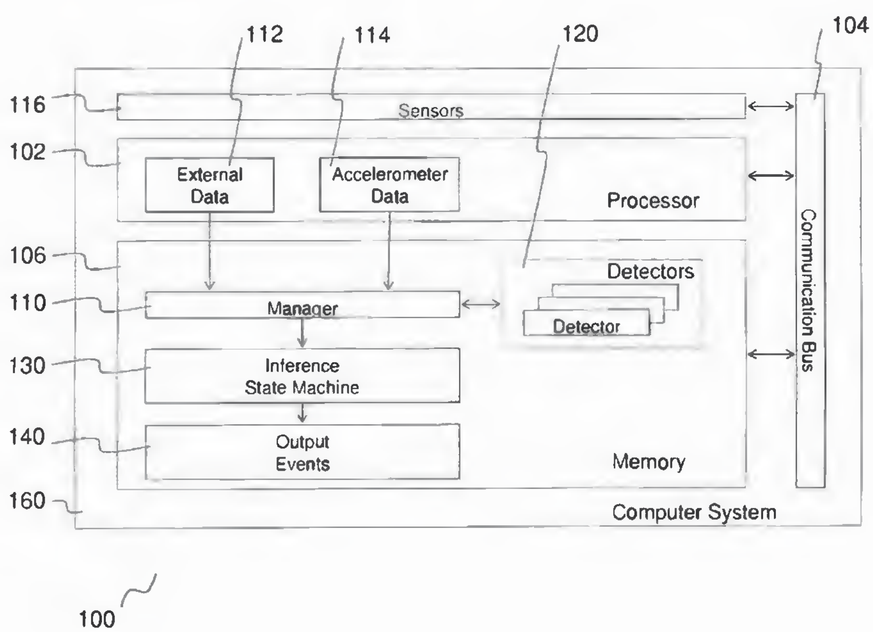
(57) **ABSTRACT**

A method, system, and article to support a motion based input system. Movement data is acquired from a motion sensor. An orientation detector detects orientation towards gravity from a rest position, and a motion detector detects motion, including movement and rest. In addition, an inference state machine in communication with the orientation and motion detectors maintains a sequence of the detected motion conditions, and produces a profile description for the sequence of the detected motion conditions. An output event corresponding to the profile description is generated based upon the profile.

20 Claims, 9 Drawing Sheets



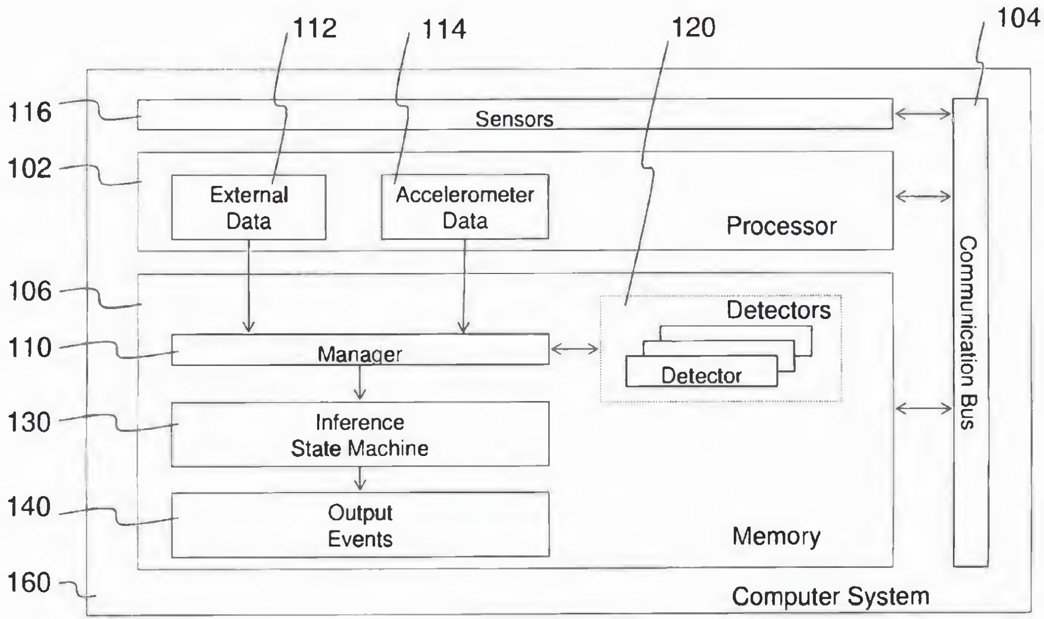
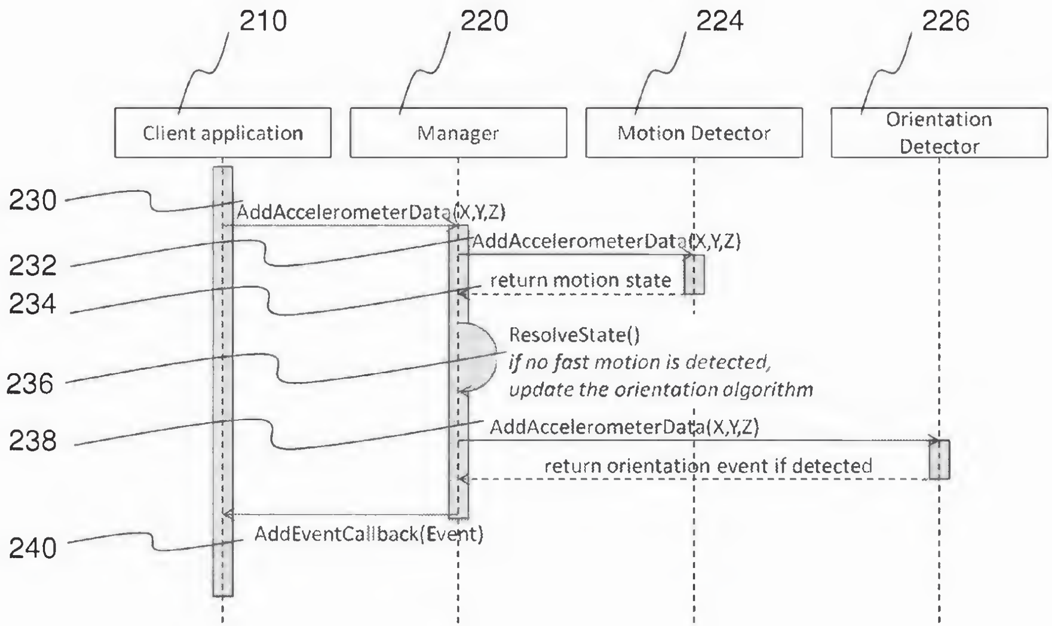
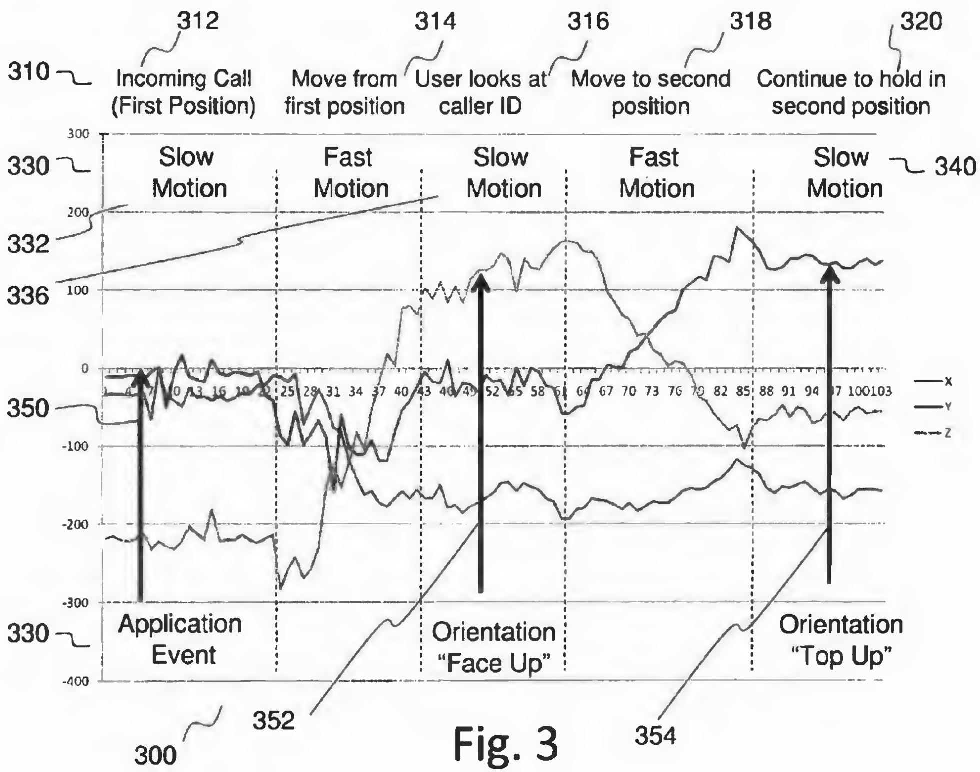

112
114
120
104
116
Sensors
102
External Data
Accelerometer Data
Processor
106
Detectors
110
Manager
Detector
130
Inference State Machine
Communication Bus
140
Output Events
Memory
160
Computer System
100

Fig.1


210
220
224
226
Client application
Manager
Motion Detector
Orientation Detector
230
AddAccelerometerData(X,Y,Z)
232
AddAccelerometerData(X,Y,Z)
234
return motion state
236
ResolveState()
if no fast motion is detected, update the orientation algorithm
238
AddAccelerometerData(X,Y,Z)
return orientation event if detected
240
AddEventCallback(Event)

200

Fig. 2



310
312
Incoming Call (First Position)
Move from first position
314
User looks at caller ID
316
Move to second position
318
Continue to hold in second position
320
330
Slow Motion
Fast Motion
Slow Motion
Fast Motion
Slow Motion
340
332
336
350
300
200
100
0
-100
-200
-300
-400
X
Y
Z
Application Event
Orientation "Face Up"
Orientation "Top Up"
330
352
354
300

Fig. 3

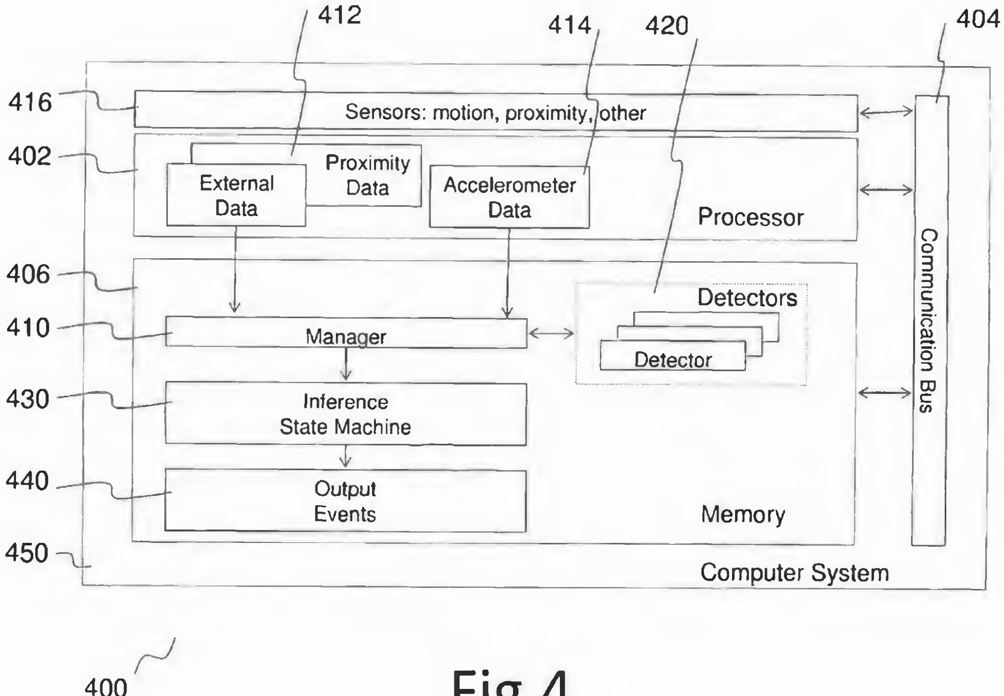

412
414
420
404
416
402
406
410
430
440
450
Sensors: motion, proximity, other
Proximity Data
External Data
Accelerometer Data
Processor
Detectors
Manager
Detector
Inference State Machine
Output Events
Memory
Communication Bus
Computer System
400

Fig.4

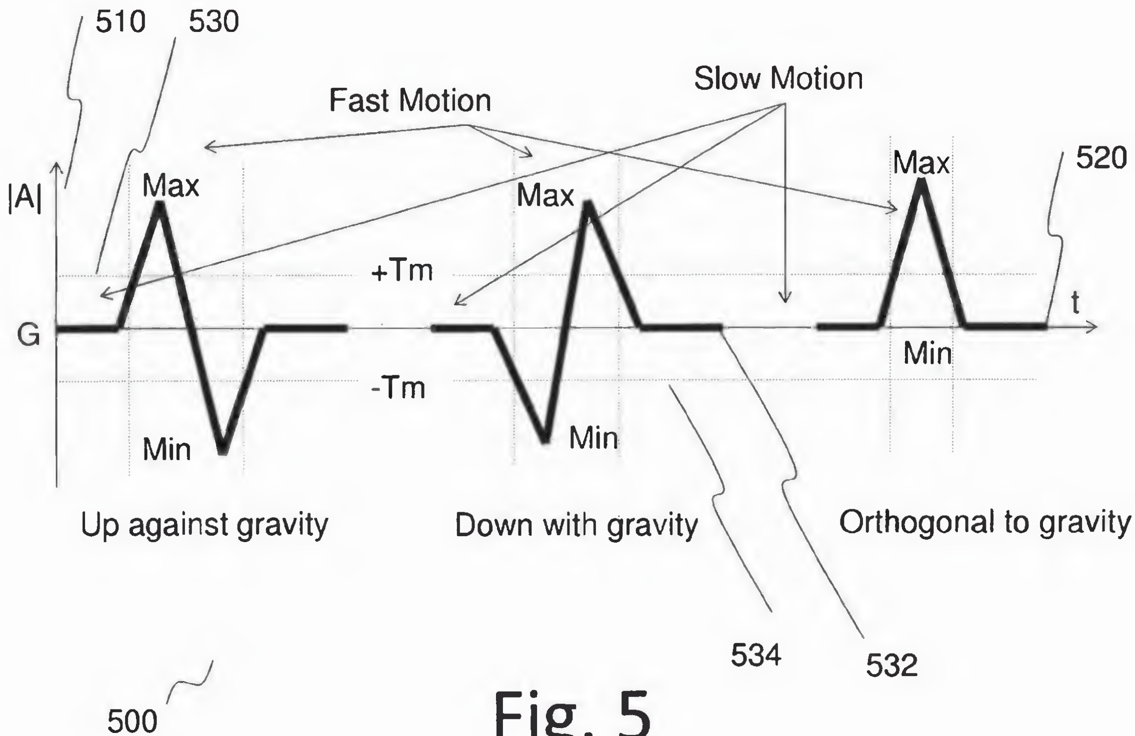

510
530
Fast Motion
Slow Motion
520
|A|
Max
Max
Max
+Tm
G
t
-Tm
Min
Min
Min
Up against gravity
Down with gravity
Orthogonal to gravity
534
532
500

Fig. 5

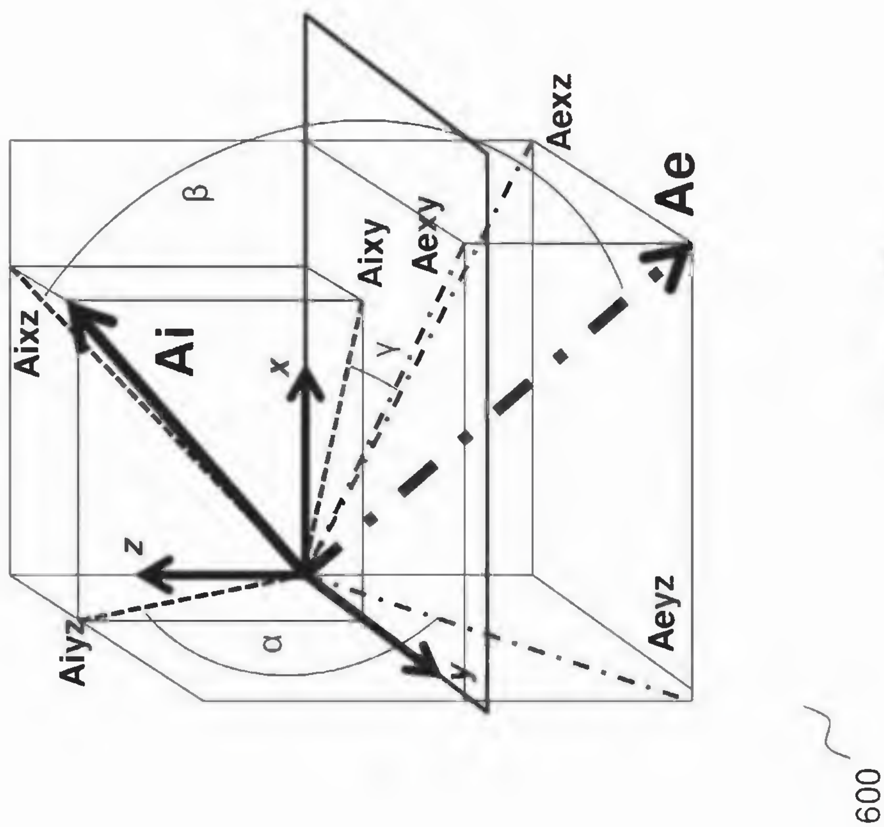
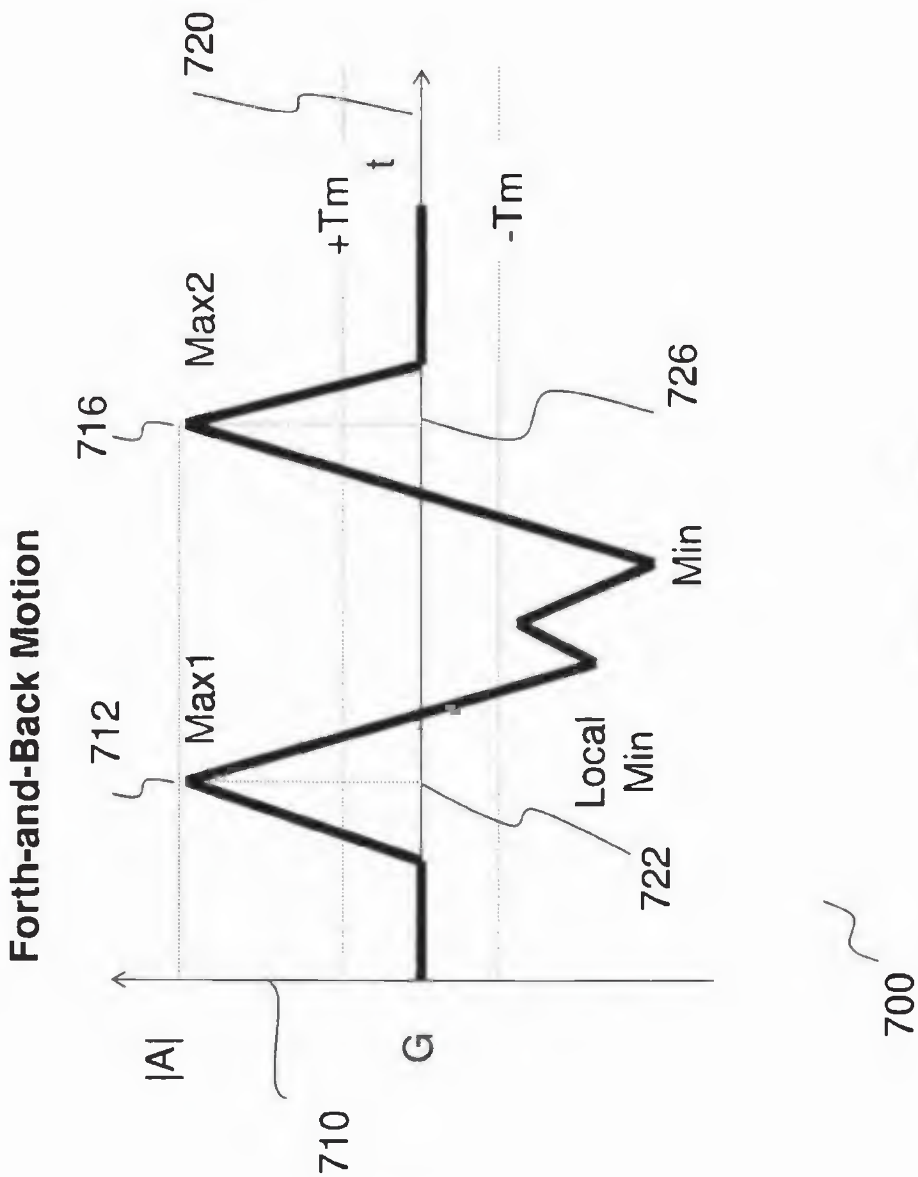


Fig. 6



Forth-and-Back Motion
|A|
G
t
+Tm
-Tm
Max1
Max2
Min
Local Min
700
710
712
716
720
722
726

Fig. 7

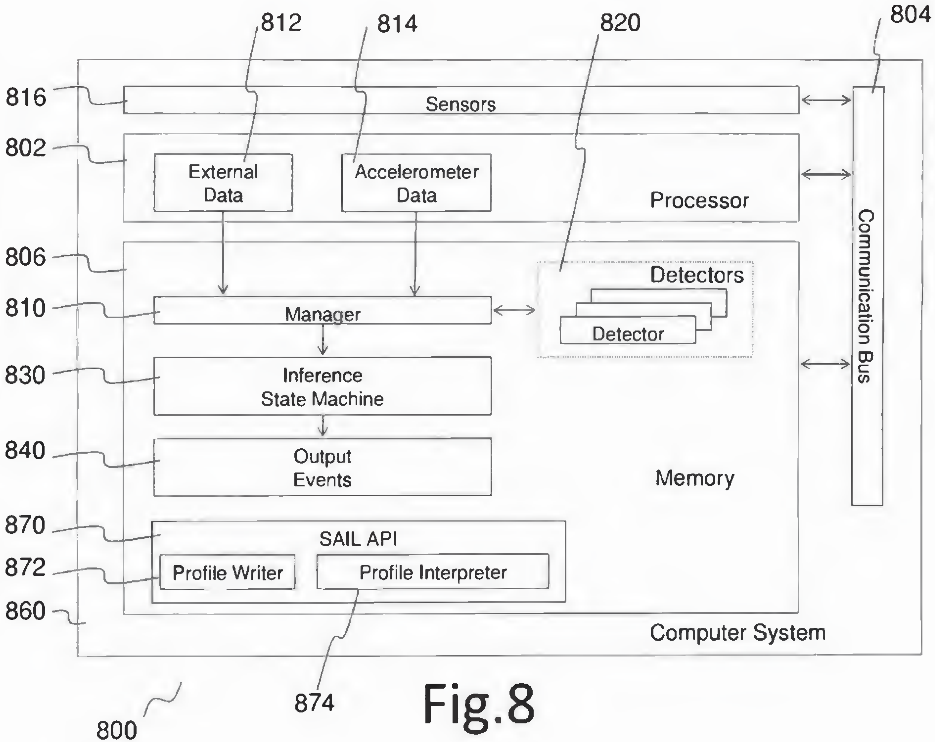

812
814
820
804
816
Sensors
802
External Data
Accelerometer Data
Processor
806
Detectors
810
Manager
Detector
Communication Bus
830
Inference State Machine
840
Output Events
Memory
870
SAIL API
872
Profile Writer
Profile Interpreter
860
Computer System
800
874

Fig.8

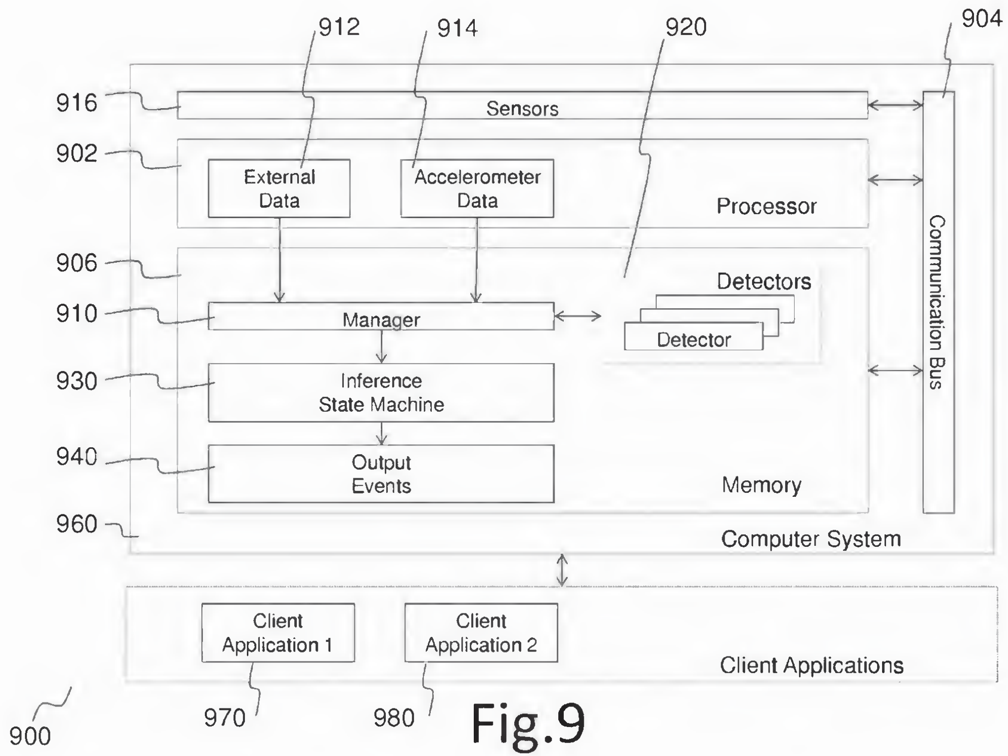

912
914
920
904
916
Sensors
902
External Data
Accelerometer Data
Processor
906
Detectors
910
Manager
Detector
930
Inference State Machine
Communication Bus
940
Output Events
Memory
960
Computer System
Client Application 1
Client Application 2
Client Applications
970
980
900

Fig.9

SPATIALLY AWARE INFERENCE LOGIC

CROSS REFERENCE TO RELATED APPLICATION(S)

The present application is a non-provisional utility patent application claiming the benefit of U.S. Provisional Patent Application Ser. No. 61/078,638, filed on Jul. 7, 2008 and titled "Spatially Aware Inference Logic for Devices with Motion Sensors," now pending, and U.S. Provisional Patent Application Ser. No. 61/113,738, filed on Nov. 12, 2008 and titled "System for Motion Signal Processing with Inferential Signal Interpolation", both of which are hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Technical Field

This invention relates to a motion based input component to classify disparate sequential data sets. More specifically, inference logic is employed to utilize gravitational reference to classify the data sets and to identify and bind the data sets to external data.

2. Description of the Prior Art

It is known in the art to employ one inertial motion sensor such as an accelerometer in a portable computing device to support various motion sensor functions for the portable device. The sensor measures linear accelerations in up to three orthogonal dimensions. A continuous stream of analog or digitized data from the motion sensor is processed to build a trajectory and/or signature of the motion, and to compare the signature to patterns of motion. However, data from a single inertial motion sensor has limitations. One of the drawbacks includes the inability to ascertain when a change of motion data is caused by uniform accelerated lateral motion or uniform rotation. Another drawback is the inability for the single inertial sensor to differentiate the force of gravity from inertia.

Even with the limitations of the single inertial sensor, the prior art systems employ signal processing with mathematical processing to sense and predict movement of the device, also known as gesture recognition. However, with the physical limitations of the sensor, the mathematical process is complex and utilizes computing power, which adds to the drainage of power from the battery of the device.

Accordingly, there is a need for a motion based system which utilizes gravitational reference to classify disparate sequential data sets from one or more inertial motion sensors. Such a system may also employ inference logic to bind the data sets with external data for identification purposes.

SUMMARY OF THE INVENTION

This invention comprises a system, method, and article for processing motion.

In one aspect of the invention, a motion based input system is provided. The system includes a processor in communication with memory, and a motion sensor in communication with the processor. The processor is employed to acquire movement data from the motion sensor and to control motion and orientation detectors. More specifically, a set of detectors is provided and configured to execute on the processor to detect a motion condition. There are different motion conditions that can be detected, including detecting orientation towards gravity from a rest position, and detecting motion such as movement and rest. A manager is provided in communication with the detectors, with the manager functioning to control the detectors. In addition, a tool in the form of an inference state machine maintains a sequence of the detected motion conditions, produces a profile description for the sequence of the detected motion, and outputs an event corresponding to the profile description.

In another aspect of the invention, a method is provided for processing motion data. More specifically, data is acquired from an inertial motion sensor of a host device, and classification of sequential motion data sets from the acquired data. The classified motion data sets are bound with external data from the host device. A profile of motion disambiguated by employment of the external data is produced, together with an output event corresponding to the profile.

In yet another aspect of the invention, an article is provided with a computer-readable carrier including computer program instructions configured process motion data. A processor is provided in communication with memory, and a motion sensor is provided in communication with the processor, with the processor acquiring movement data from the motion sensor. The computer readable carrier is provided with computer program instructions configured to detect both a motion condition and an orientation condition. More specifically, instructions are provided to detect orientation towards gravity from a rest position, to detect motion, including movement and rest, to maintain a sequence of the detected motion conditions, to produce a profile description for the sequence of the detected motion, and to output an event corresponding to the profile description.

Other features and advantages of this invention will become apparent from the following detailed description of the presently preferred embodiment of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings referenced herein form a part of the specification. Features shown in the drawing are meant as illustrative of only some embodiments of the invention, and not of all embodiments of the invention unless otherwise explicitly indicated. Implications to the contrary are otherwise not to be made.

FIG. 1 is a block diagram of a system architecture showing a minimum quantity of components to support the motion based input system to output an event corresponding to a profile description, according to the preferred embodiment of this invention, and is suggested for printing on the first page of the issued patent.

FIG. 2 is a state diagram illustrating the interworking of the motion detector with a client application.

FIG. 3 is a block diagram illustrating a mapping of the motion data with motion conditions.

FIG. 4 is a block diagram illustrating employment of one or more proximity sensors in communication with the handheld device.

FIG. 5 is a chart illustrating motion pattern of the handheld device pertaining to gravity.

FIG. 6 is an illustration of a vector diagram showing data from an initial acceleration vector position to an ending acceleration vector position.

FIG. 7 is a graphical representation of a motion pattern of a handheld device.

FIG. 8 is a block diagram of the system architecture showing a minimum quantity of components to support the motion based input system to output an event corresponding to a profile description together with an application programming interface.

FIG. 9 is a block diagram of the system architecture showing multiple client applications to support the motion based input system to output an event corresponding to a profile description together with an application programming interface, wherein the system support simultaneous running applications.

DESCRIPTION OF THE PREFERRED EMBODIMENT

It will be readily understood that the components of the present invention, as generally described and illustrated in the Figures herein, may be arranged and designed in a wide variety of different configurations. Thus, the following detailed description of the embodiments of the apparatus, system, and method of the present invention, as presented in the Figures, is not intended to limit the scope of the invention, as claimed, but is merely representative of selected embodiments of the invention.

The functional units described in this specification have been labeled as detector(s), a manager, and an inference state machine. A manager, an inference state machine and/or detector(s) may be implemented in programmable hardware devices such as field programmable gate arrays, programmable array logic, programmable logic devices, or the like. The functional units may also be implemented in software for execution by various types of processors. An identified manager, inference state machine and detector(s) of executable code may, for instance, comprise one or more physical or logical blocks of computer instructions which may, for instance, be organized as an object, procedure, function, or other construct. Nevertheless, the executables of the functional units need not be physically located together, but may comprise disparate instructions stored in different locations which, when joined logically together, comprise the manager, inference state machine and detector(s) and achieve the stated purpose of the functional units.

Indeed, the executable code of the functional units could be a single instruction, or many instructions, and may even be distributed over several different code segments, among different applications, and across several memory devices. Similarly, operational data may be identified and illustrated herein within the manager and/or detector, and may be embodied in any suitable form and organized within any suitable type of data structure. The operational data may be collected as a single data set, or may be distributed over different locations including over different storage devices, and may exist, at least partially, as electronic signals on a system or network.

Reference throughout this specification to "a select embodiment," "one embodiment," or "an embodiment" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrases "a select embodiment," "in one embodiment," or "in an embodiment" in various places throughout this specification are not necessarily referring to the same embodiment.

Furthermore, the described features, structures, or characteristics may be combined in any suitable manner in one or more embodiments. In the following description, numerous specific details are provided, such as examples of managers, detectors, logic, etc., to provide a thorough understanding of embodiments of the invention. One skilled in the relevant art will recognize, however, that the invention can be practiced without one or more of the specific details, or with other methods, components, materials, etc. In other instances, well-known structures, materials, or operations are not shown or described in detail to avoid obscuring aspects of the invention.

The illustrated embodiments of the invention will be best understood by reference to the drawings, wherein like parts are designated by like numerals throughout. The following description is intended only by way of example, and simply illustrates certain selected embodiments of devices, systems, and processes that are consistent with the invention as claimed herein.

Overview

A motion processing component capable of classifying motion data sets from a tri-axis inertial motion sensor is provided for a mobile device. The motion data sets are acquired and then identified from a set of available commands. More specifically, an interface to a device is configured to provide an output event corresponding to a profile from acquired motion sensor data, which addresses issues pertaining to motion and orientation of the device. More specifically, one or more detectors provide motion detection, including detecting orientation of the device from a rest position towards gravity, and detecting motion of the device, including both movement and rest. Interworking of the detectors is controlled by a manager, which can start and stop individual detectors and can poll external data sources. Inference logic maintains a profile description for one or more detected conditions, and creates an output event corresponding to a profile for the acquired data.

Technical Details

In the following description of the embodiments, reference is made to the accompanying drawings that form a part hereof, and which shows by way of illustration the specific embodiment in which the invention may be practiced. It is to be understood that other embodiments may be utilized because structural changes may be made without departing form the scope of the present invention.

FIG. 1 is a block diagram (**100**) of the system architecture showing a minimum quantity of components to support the motion based input system to output an event corresponding to a profile description. More specifically, a computer system (**160**), herein referred to as a system, is provided with a processing unit (**102**) in communication with memory (**106**) across a bus (**104**). Although only one processing unit (**102**) is shown herein, in one embodiment, the system may be expanded to include multiple processing units. A manager (**110**) is provided local to memory (**106**) and in communication with the processing unit (**102**). The manager (**110**) functions to control motion detection components. More specifically, the manager (**110**) receives data from multiple sources, including external data (**112**) received from one or more client applications, the operating system and one or more non-motion sensors, and accelerometer data (**114**) received from one or more inertial motion sensors (**116**). The manager (**110**) communicates the received data to an application detector (**120**), hereinafter referred to as a detector, for processing, and once processed, the manager (**110**) communicates the processed data to an inference state machine (**130**). More specifically, the detector (**120**) processes the data received from the manager (**110**) and upon completion of the processing returns the processed data to the manager (**110**). Once the data is received from the detector (**120**), the manager (**110**) forwards the processed data to the inference state machine (**130**). The inference state machine (**130**) maintains a sequence of the detected motion conditions and produces a profile description for the detected motion. Based upon matching the profile description, the inference state machine (130) communicates an event (140) that corresponds to the profile description.

As noted above, the inference state machine (130) is employed to store motion conditions, acquire and bind external data with those conditions, produce motion profile and identify the profile with an output event. In one embodiment, the detector (120) is provided local to the system (160) to support local processing of local data. However, in another embodiment, the detector (120) may be remote from the system (160) so that the processing does not utilize resources of the system (160). Similarly, the manager (110) and the inference state machine (130) are shown as software tools local to or in communication with memory (106). However, in one embodiment, the manager (110) and/or the inference state machine (130) may be hardware tools embedded within the system (160) and external to memory (106) to support the functionality of the motion based input system. Accordingly, the manager (110) and inference state machine (130) herein may be configured as software tools, hardware tools, or a combination thereof.

Embodiments within the scope of the present invention also include articles of manufacture comprising program storage means having encoded therein program code. Such program storage means can be any available media which can be accessed by a general purpose or special purpose computer. By way of example, and not limitation, such program storage means can include RAM, ROM, EEPROM, CD-ROM, or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to store the desired program code means and which can be accessed by a general purpose or special purpose computer. Combinations of the above should also be included in the scope of the program storage means.

The medium can be an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system (or apparatus or device). Examples of a computer-readable medium include a semiconductor or solid state memory, magnetic tape, a removable computer diskette, random access memory (RAM), read-only memory (ROM), a rigid magnetic disk, and an optical disk. Current examples of optical disks include compact disk B read only (CD-ROM), compact disk B read/write (CD-R/W) and DVD.

A data processing system suitable for storing and/or executing program code will include at least one processor coupled directly or indirectly to memory elements through a system bus. The memory elements can include local memory employed during actual execution of the program code, bulk storage, and cache memories which provide temporary storage of at least some program code in order to reduce the number of times code must be retrieved from bulk storage during execution.

Input/output or I/O devices (including but not limited to keyboards, displays, pointing devices, etc.) can be coupled to the system either directly or through intervening I/O controllers. Network adapters may also be coupled to the system to enable the data processing system to become coupled to other data processing systems or remote printers or storage devices through intervening private or public networks.

The software implementation can take the form of a computer program product accessible from a computer-useable or computer-readable medium providing program code for use by or in connection with a computer or any instruction execution system.

Prior to explaining how the motion detector functions with the inference state machine, the motion condition that are to be assessed are defined. In one embodiment, the inertial sensor employed is a tri-axis accelerometer, which acquires data over the x-axis, y-axis, and z-axis. Based upon the sensor data, an orientation condition refers to sustained values of the x, y, and z, sensor data within certain limits over a predefined length of time. Similarly, a fast motion condition pertains to a certain change of the values of x, y, and z, sensor data, or a combination of x, y, and z sensor data, within a predefined length of time. Examples of fast motion condition include, but are not limited to, predominant movement in the Z direction, such as a push and/or pull condition, a predominant intense movement in the x or y direction(s), such as a shake condition, a predominant non-intense movement in the x or y direction(s) such as a tilt condition, and a predominant movement in the x or y direction and the z direction, such as a rotational condition.

There is a plurality of embodiments that may be employed with a motion detection algorithm. In one embodiment, a stream of motion data is processed through a function, and a condition is detected when the sum of motion vector amplitudes within the function exceeds a threshold. In one embodiment, motion data is normalized by gravity, with the following formula:

$$(\mathrm{sum}(|A_i|:|A_{i+w-1}|)/w-G)/G>Tm$$

where |A|=square root $(X^2+Y^2+Z^2)$, X, Y, and Z are acceleration components measured along x, y, and z axis, respectively, A_i is a first sample in the window, i is a number of a sample, w is a number of readings in the window, A_{i+w-1} is the last sample in the window, G is magnitude of the gravity, and Tm is a threshold. Complementary to the motion detection algorithm, an orientation algorithm may be implemented as a comparison of x, y, and z components of the vector to determine which side of the device is up, a straight forward recording and storing x, y, and z values, computing direction cosines towards gravity, etc.

FIG. 2 is a state diagram (200) illustrating the inter-working of the detectors with a client application. More specifically, the state diagram (200) shows a client application (210) in communication with a manager (220), which is further parsed to show a motion detector (224) and an orientation detector (226). Initially, the manager (220) receives motion data and/or external data (230) from a client application (210), and communicates the received motion data (232) to the motion detector (224) for processing. The motion detector (224) processes the received data and returns motion state data (234) to the manager (220). If the motion detector (224) does not detect fast motion (236), the manager is sending the motion data (238) to the orientation detector (226). Similarly, if a fast motion is detected (240), the motion data is not communicated (and therefore not shown) to the orientation detector (226) for processing. In one embodiment, the manager (220) can communicate an output event (240) to the client application if such an event is programmed in the inference state machine (not shown).

FIG. 3 is a block diagram (300) illustrating a mapping of the motion data with motion conditions. More specifically, the mapping shown in this figure pertains to a handheld portable device in the form of a mobile telephone, or a personal digital assistant that supports telecommunication. As shown at (310), there are five states reflected in the process of answering an incoming call and/or message, including client application event/notification of an incoming call or message (312), a user moving the handheld from it's prior position (314), a user looking at a visual display of the handheld (316), a user moving the handheld to a second position to response to the received call or message (318), and a user continuing to hold the handheld in the second position (**320**). Similarly, as shown at (**330**) that are motion states the reflect each of the five states reflected at (**310**). More specifically, an application event receipt (**312**), looking at the visual display, and retaining the handheld in the second position are each considered to be slow motion states (**332**), (**336**), and (**340**). At all slow motion states (**332**), (**336**), and (**340**), the orientation of the device towards gravity will be determined. When a telephone call is received by the handheld, an application event (**350**) is detected. Similarly, there are two orientation conditions detected, included viewing the visual display (**352**), and maintaining the handheld in the final position (**354**). The motion profile depicted in FIG. **3** is as follows: Rest, Motion, Rest, Orientation Face Up, Motion, Rest, Orientation Top Up. From a motion evaluation perspective, the gesture of answering a call received by the handheld is complex as the motion states change at least four times in the sequence.

More specifically, as an incoming telephone call is received, the handheld device can be in any position. During the incoming sequence processing, the user can move the handheld in any way, and the signal processing will identify the gesture as long as two orientation conditions intermitted by motion conditions are met. As the call is received the signal processing to search for a sequence of conditions is started. By using a sequence of orientation conditions of the handheld device, the signal processing generates a fault resilient command absent complex analysis during periods of fast motion. The presence of one or more periods of fast motion serves as confirmation that the sequence is a product of intentional user action(s).

In one embodiment, a proximity sensor may be employed for processing accelerometer data. FIG. **4** is a block diagram (**400**) illustrating employment of one or more proximity sensors in communication with the handheld device. As shown, a computer system (**450**) is provided with a processing unit (**402**) in communication with memory (**406**) across a bus (**404**). Although only one processing unit (**402**) is shown herein, in one embodiment, the system may be expanded to include multiple processing units. A manager (**410**) is provided local to memory (**406**) and in communication with the processing unit (**402**). The manager (**410**) functions to control flow of data. More specifically, the manager (**410**) receives data from multiple sources, including one or more proximity sensor(s) (**412**) and accelerometer data (**414**) received from an inertial motion sensor (**416**). The manager (**410**) communicates the received data to detectors (**420**) for processing, and to an inference state machine (**430**) for inferring an output event. More specifically, the detectors (**420**) process the data received from the manager (**410**) and upon completion of the processing returns the processed data to the manager (**410**). Once the data is received from the detectors (**420**), the manager (**410**) forwards the processed data to the inference state machine (**430**). The inference state machine (**430**) maintains a sequence of the detected motion and produces a profile description for the detected motion. Based upon matching the profile description, the inference state machine (**430**) communicates an event (**440**) that corresponds to the profile description.

The signal processing application may poll the proximity sensor(s) (**412**) when required. In one embodiment, when a telephone call is received by the handheld device, the signal processing application may poll the proximity sensor(s) (**412**) at both the second and third rest positions. At the first rest position, the user of the device would be looking at the visual display, and the corresponding proximity sensor signal would communicate that the signal is open, and at the second rest position, the device would be remaining in a listen position and the corresponding proximity sensor signal would communicate that the signal is in a closed position. The motion profile for this scenario is as follows:

Application event:	incoming call
Motion Profile:	Rest, Motion, Rest (orientation face up, proximity open), Motion, Rest (orientation top up, proximity closed)

The command for this motion profile is set to an answer of the call for the handheld device. Accordingly, by adding two external conditions to the sequence as received from the proximity sensor(s) reduces the probability of receiving a false positive evaluation of the gestures.

In one embodiment the system may incorporate one or more additional detectors to detect specific sub-conditions associated with fast motion of the handheld device, including a weighing algorithm to detect if the motion is going against gravity, with gravity, or orthogonal to gravity. FIG. **5** is a chart (**500**) illustrating motion pattern of the handheld device pertaining to gravity. As shown, the vertical axis (**510**) represents acceleration defined as:

$$|A|=\text{square root}(X^2+Y^2+Z^2),$$

where X, Y, and Z are acceleration components measured along x, y, and z axis, respectively and the horizontal axis (**520**) represents time, t. There are three horizontal lines shown in the chart. The first line (**530**) represents a positive threshold value with respect to gravity, the second line (**532**) represents gravity, and the third line (**534**) represents a negative threshold value with respect to gravity. In one embodiment, the rules for implementing the weighing algorithm are as follows:

if −Tm<|Amin|<+Tm, then the motion is substantially orthogonal to gravity

if |Amax| is first in time and |Amin| is second in time, then the device is up against gravity

if |Amin| is first in time and |Amax| is second in time, then the device is down with gravity

Furthermore, in one embodiment, the weighing algorithm may be enhanced by measuring symmetry of |Amin| and |Amax| against gravity as follows:

$$(|A\text{max}|-G)/(G-|A\text{min}|)=Smm,$$

where Smm is the symmetry of the signal spread over gravity. More specifically, symmetry of the signal is approximately one for up and down motion along gravity, and symmetry of the signal is greater than one for motion that is orthogonal to gravity. In one embodiment, use of the symmetry factor enhances resolution of the weighing algorithm.

In a further embodiment, a rotation algorithm is employed to enhance granular sensing of movement of the device. As discussed above, orientation data obtained in a rest position is accurate, as the device is in a stationary position. When the device is subject to motion, the orientation data becomes less accurate. The level of motion can be measured relative to gravity with the use of the following motion detection algorithm:

$$(\text{Sum}(|A_i|:|A_{i+w-1}|)/w-G))/G<T$$

where A_i is a first sample in the window; i is a number of a sample A_{i+w-1} is the last sample in the window, T is a threshold. For example, in one embodiment the value of T may be set at five degree to set the orientation accuracy error to be within five degrees.

As described above, acceleration vector data obtained from one or more accelerometers in the device is employed for signal processing. FIG. 6 is an illustration of a vector diagram (600) showing data from an initial acceleration vector position Ai to an ending acceleration vector position Ae. In one embodiment, both Ai and Ae are obtained at two adjacent in time stationary positions. Projections of the acceleration vectors on the YY, XZ, and YZ planes are shown as Aiyy, Aeyy, Aixz, Aexz, Aiyz, and Aeyz. Using the Xi, Yi, Zi components of the initial accelerometer data, and the Xe, Ye, Ze components of the ending accelerometer data, various rotation angles may be computed. For example, roll, pitch, and yaw angles over the X, Y, and Z axes may be computed using the following vector dot product formulas:

$$\alpha = \arccos((YiYe+ZiZe)/\mathrm{sqrt}((YiYi+ZiZi)(YeYe+ZeZe)))$$

$$\beta = \arccos((XiXe+ZiZe)/\mathrm{sqrt}((XiXi+ZiZi)(XeXe+ZeZe)))$$

$$\gamma = \arccos((XiXe+YiYe)/\mathrm{sqrt}((XiXi+YiYi)(XeXe+YeYe)))$$

where α represents the roll angle, β represents the pitch angle, and γ represents the yaw angle. In one embodiment, the rotation algorithm employed to answer a handheld telephone can compute angles of rotation between two rest positions, as identified in FIG. 3. A rotation condition can be set for this angle to about ninety degrees, which is consistent with moving a handheld telephone from your face to your ear. Accordingly, by setting the rotation condition, the performance of the inference recognition for the fact pattern is enhanced.

When the weighing algorithm determines that the motion is substantially orthogonal to gravity, inference logic can employ an additional algorithm to determine direction of motion relative to a device reference frame and/or an initial position towards gravity. In one embodiment, the additional algorithm may detect a prevailing X, Y, Z component of a motion vector. Similarly, in another embodiment, the additional algorithm may compute angle between orientation at rest and motion vector, or between projections on physical device planes or virtual ones. For example, if the interference logic has detected that a motion is a start-stop motion providing a maximum acceleration value, Amax, and a minimum acceleration value, Amin, are obtained. In addition, two motion vectors may be employed, including a motion vector for a rest position, Arest, and a motion vector for the maximum acceleration value, Amax. Taking the motion vector at rest Arest(Xr, Yr, Zr) and the motion vector at maximum acceleration Amax(Xmax, Ymax, Zmax), a differential motion vector can be employed to compute the angle between the full three dimensional vectors, as well as various angles between their projections. In one embodiment, these angles are direction angles of accelerating force. Similarly, in one embodiment, the angle between the motion vectors at two different rests positions can be computed.

The angle between an orientation vector Ar (Xr, Yr, Zr) and a motion vector Amax (Xmax, Ymax, Zmax), can be calculated as a vector dot product between Ar and Amx as follows:

$$\delta = \arccos((Ar \cdot Amax)/(|Ar|\,|Amax|))$$

Similarly, in one embodiment, the angle between the orientation vector and the motion vector is used to computer directional angle between a motion vector and an accelerometer reference frame, wherein the angles are computed as follows:

$$\alpha_x = \arccos(Xmax/\text{square root}(Xmax^2+Ymax^2+Zmax^2))$$

$$\alpha_y = \arccos(Ymax/\text{square root}(Xmax^2+Ymax^2+Zmax^2))$$

$$\alpha_z = \arccos(Zmax/\text{square root}(Xmax^2+Ymax^2+Zmax^2))$$

Not all motion sequences are predictable for a handheld device. It is known that motion can follow a back and forth pattern with a stop in the middle, wherein the stop happens fast and is difficult to be detected and classified as a legitimate rest condition by the motion detection algorithm. FIG. 7 is a graphical representation (700) of such a motion pattern of a handheld device. As shown, acceleration (710) is represented on the vertical axis, and time (720) is represented on the horizontal axis. In one embodiment, the axis representation may be inverted, and as such, the invention should not be limited to the representation shown herein. There are is a first maximum detected acceleration value (712) at time (722) and a second maximum detected acceleration value (716) at time (726). Accordingly, a simple forth-and-back detection condition can be formulated as follows: a maximum acceleration followed by a minimum acceleration and then followed by another maximum acceleration.

Complex motion signal processing is replaced by monitoring for a defined set of motion conditions. A profile of a motion is written in terms of motion condition primitives. The motion pattern may be matched to the profile through inference logic when the match occurs. FIG. 8 is a block diagram (800) of the system architecture showing a minimum quantity of components to support the motion based input system to output an event corresponding to a profile description together with an application programming interface. A computer system (860), hereinafter referred to as a system, is provided with a processing unit (802) in communication with memory (806) and sensors (816) across a bus (804). Although only one processing unit (802) is shown herein, in one embodiment, the system may be expanded to include multiple processing units. A manager (810) is provided local to memory (806) and in communication with the processing unit (802). The manager (810) functions to control motion detection components. More specifically, the manager (810) receives data from two sources, including external data (812) received from one or more client applications, the operating system and one or more non-motion sensors, and accelerometer data (814) received from one or more inertial motion sensors (not shown). The manager (810) communicates the received data to an application detector (820), hereinafter referred to as a detector, for processing, and once process, the manager (810) communicates the processed data to an inference state machine (830). More specifically, the detector (820) processes the data received from the manager (810) and upon completion of the processing returns the processed data to the manager (810). Once the data is received from the detector (820), the manager (810) forwards the processed data to the inference state machine (830). The inference state machine (830) maintains a sequence of the detected motion conditions and produces a profile description for the detected motion. Based upon matching the profile description, the inference state machine (830) communicates an event (840) that corresponds to the profile description.

As noted above, an application programming interface (870) is provided in communication with the system (860). The application programming interface (870) includes a profile writer (872) and a profile interpreter (874). The profile writer (872) supports creation of motion profiles for use by the inference state machine (830), and the profile interpreter (874) supports parsing the written profile into the inference state machine (830). In one embodiment, the profile writer contains one or more templates to facilitate integration of motion into an end user application. Accordingly, application programming interface (870) functions as a tool to enhance the profiling abilities of the inference state machine.

The inference state machine described above may be employed to provide a motion command for a single application, or may be expanded to provide motion for multiple applications running in a simultaneous manner. FIG. 9 is a block diagram (900) of the system architecture showing multiple client applications to support the motion based input system to output an event corresponding to a profile description together with an application programming interface, wherein the system support simultaneous running applications. A computer system (960) is provided with a processing unit (902) in communication with memory (906) across a bus (904). Although only one processing unit (902) is shown herein, in one embodiment, the system may be expanded to include multiple processing units. A manager (910) is provided local to memory (906) and in communication with the processing unit (902). The manager (910) functions to control motion detection components. More specifically, the manager (910) receives data from two sources, including external data (912) received from one or more client applications, the operating system and one or more non-motion sensors, and accelerometer data (914) received from one or more inertial motion sensors (916). The manager (910) communicates the received data to an application detector (920), hereinafter referred to as detector, for processing, and once process, the manager (910) communicates the processed data to an inference state machine (930). More specifically, the detector (920) processes the data received from the manager (910) and upon completion of the processing returns the processed data to the manager (910). Once the data is received from the detector (920), the manager (910) forwards the processed data to the inference state machine (930). The inference state machine (930) maintains a sequence of the detected motion conditions and produces a profile description for the detected motion. Based upon matching the profile description, the inference state machine (930) communicates an event (940) that corresponds to the profile description.

As noted above, at least two client applications (970) and (980) are provided in communication with the system (960). Each of the application (970) and (980) supports different motion and gesture functionality of the handheld device. For example, in one embodiment, client application (970) may support the functionality of a pedometer and client application (980) may support the functionality of answering a received call. In one embodiment, other functionality may be supported by the client applications, or additional client applications may be provided to support additional functionality. As such, the embodiments of the client applications described herein are merely exemplary and are not considered limiting. Specific rules are employed to manage external events associated with each of the client applications (970) and (980). For example, with respect to client application (970) this can be initiated by activating a key or visual display. The activation will then send a corresponding application event to the inference state machine (930) to start step counting and distance calculation. Step detection will employ a weighing algorithm which differentiates steps up from steps down so that they can be separately counted. Similarly, with respect to client application (980) running simultaneous with client application (970), an incoming call will present an external event which will send an output event to client application (970) to cease step counting and for the second application (980) to seek a call answering gesture. Once the incoming call is disconnected, an event is communicated to the first application (970) to resume step counting. Accordingly, two or more applications may run simultaneously to support gesture and motion detection while mitigating complex mathematical processing.

Alternative Embodiments

It will be appreciated that, although specific embodiments of the invention have been described herein for purposes of illustration, various modifications may be made without departing from the spirit and scope of the invention. In particular, the sensor data may be acquired from one or more sensors present in a portable computing, or one or more sensors placed in the device. For example, along with a proximity sensor it is possible to use a pressure sensor to use a change in atmospheric pressure to disambiguate motion up and down along gravity or a magnetic sensor to enhance orientation at rest and/or slow motion conditions. Similarly, in one embodiment the system may incorporate one or more additional detectors to detect specific sub-conditions associated with fast motion of the handheld device, including a weighing algorithm to detect if the motion is going against gravity, with gravity, or orthogonal to gravity. Accordingly, the scope of protection of this invention is limited only by the following claims and their equivalents.

We claim:

1. A motion based input system comprising:

a processor in communication with a memory;

a motion sensor in communication with the processor;

the processor to acquire movement data from the motion sensor;

a manager configured to execute on the processor and to control motion and orientation detectors, including:

a motion detector to detect motion, including identification of a fast motion phase and a slow motion phase, wherein the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity; and

an orientation detector to detect orientation towards gravity for each slow motion phase; and

an inference state machine in communication with the manager configured to: maintain a sequence of the detected orientations towards gravity, each orientation in the sequence being limited to a slow motion phase;

produce a profile description for the sequence of the detected orientations; and

output an event corresponding to the profile description.

2. The system of claim 1, wherein the detectors and the manager are configured to receive data from at least one client application and use this data to interpret the profile, wherein the profile descriptions are bound with external data from the at least one client application.

3. The system of claim 1, further comprising instructions to detect orientation change for adjacent motion phases selected from the group consisting of: a rest and a defined slow motion phase.

4. The system of claim 1, further comprising instructions to avoid detecting orientation during a fast motion condition.

5. The system of claim 1 wherein the fast motion phase detected by the motion detector is classified as one selected from the group consisting of: motion up against gravity, motion down with gravity, and motion orthogonal to gravity, said classified fast motion phase added to the profile.

6. The system of claim 1, wherein the motion condition detection by the motion detector detects direction of motion when the motion is orthogonal to gravity.

7. The system of claim 1, wherein the fast motion detection by the motion detector includes instructions to compute and add to the profile a rotation angle required to transfer from a first motion phase to a second motion phase based on orientation at the first and second motion phases, the first and second motion phases selected from the group consisting of: slow motion and rest.

8. The system of claim 1, wherein the motion condition detection by the detector includes instructions selected from the group consisting of: detecting start and stop motion, and detecting back-and-forth motion.

9. The system of claim 1, further comprising the detector and the manager to poll data from non-motion sensors, to fuse the polled data with motion data, and add the data to the profile.

10. The system of claim 1, wherein the orientations detected by the orientation detector are classified in terms corresponding to a particular part of a host device being up or down.

11. the system of claim 1, wherein the profile is configured as a sequence of orientations detected at slow motion phases separated by fast motion phases.

12. An article for processing motion data, comprising:

a processor in communication with memory; a motion sensor in communication with the processor;

the processor to acquire movement data from the motion sensor;

a computer readable storage device including computer program instructions configured to detect a motion condition and an orientation condition, the instructions comprising:

instructions to detect motion, including identification of a fast motion phase and a slow motion phase;

instructions to detect orientation towards gravity for each slow motion phase and absent detecting orientation towards gravity during fast motion phases, wherein the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity;

instructions to maintain a sequence of the detected orientations, each orientation towards gravity in the sequence being limited to a slow motion phase;

instructions to produce a profile description for the sequence of the detected orientations; and

instructions to output an event corresponding to the profile description.

13. The article of claim 12, further comprising instructions to receive data from at least one client application and use this data to interpret the profile, wherein the profile descriptions are bound with external data from the at least one client application.

14. The article of claim 12, further comprising the instructions to detect orientation change for adjacent motions selected from the group consisting of: a rest and a defined slow motion condition.

15. The article of claim 12, further comprising instructions to avoid detecting orientation during a fast motion condition.

16. The article of claim 12 wherein the instructions to detect motion include a motion condition classification selected from the group consisting of: motion up against gravity, motion down with gravity, and motion orthogonal to gravity.

17. The article of claim 12, wherein the instructions to detect motion condition includes direction detection of motion when the motion is orthogonal to gravity.

18. The article of claim 12, wherein the instructions to detect motion condition compute and add to the profile a rotation angle required to transfer from a first motion phase to a second motion phase based on orientation at the first and second motion phases, the first and second motion phases selected from the group consisting of: slow motion and rest.

19. The article of claim 12, wherein the instructions to detect motion condition include instructions selected from the group consisting of: detecting start and stop motion, and detecting back-and-forth motion.

20. The article of claim 12, further comprising instructions to poll data from non-motion sensors and to fuse the polled data with motion data.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.
Petitioner

v.

KEYNETIK, INC.
Patent Owner

Patent No. 8,370,106

PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 8,370,106

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LIST OF EXHIBITS

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Ex. 1005	U.S. Patent Application Publication No. 2008/0229255 ("*Linjama*")
Ex. 1006	U.S. Patent No. 6,703,939 ("*Lehrman*")
Ex. 1007	RESERVED
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Ex. 1009	U.S. Patent No. 6,312,335 ("*Tosaki*")
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Ex. 1011	U.S. Patent Application Publication No. 2003/0085870 ("*Hinckley*")
Ex. 1012	U.S. Patent Application Publication No.2005/0219213 ("*Cho*")

I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner") requests *inter partes* review of claims 1-20 ("the challenged claims") of U.S. Patent No. 8,370,106 ("the '106 patent") (Ex. 1001), which, according to PTO records, is assigned to KEYnetik, Inc. ("Patent Owner"). For the reasons discussed below, the challenged claims should be found unpatentable and canceled.

II. MANDATORY NOTICES

Real Parties-in-Interest: Petitioner identifies the following as the real parties-in-interest: Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc.

Related Matters: The '106 patent is at issue in *KEYnetik, Inc. v. Samsung Electronics Co., Ltd.*, Case No. 2-17-cv-02794 (D.N.J.).

Counsel and Service Information: Lead counsel is Naveen Modi (Reg. No. 46,224), and Backup counsel are (1) Joseph E. Palys (Reg. No. 46,508), (2) Chetan R. Bansal (Limited Recognition No. L0667), and (3) Arvind Jairam (Reg. No. 62,759). Service information is Paul Hastings LLP, 875 15th St. N.W., Washington, D.C., 20005, Tel.: 202.551.1700, Fax: 202.551.1705, email: PH-Samsung-Keynetik-IPR@paulhastings.com. Petitioner consents to electronic service.

III. PAYMENT OF FEES

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. 50-2613.

IV. GROUNDS FOR STANDING

Petitioner certifies that the '106 patent is available for review and Petitioner is not barred or estopped from requesting review on the grounds identified herein.

V. PRECISE RELIEF REQUESTED AND GROUND RAISED

The challenged claims should be canceled as unpatentable based on the following grounds:

Ground 1: Claims 1, 3, 6, 10-12, 14, and 17 are unpatentable under pre-AIA 35 U.S.C. § 103(a) based on U.S. Patent Application Publication No. 2008/0229255 to Linjama *et al.* ("*Linjama*") (Ex. 1005) and U.S. Patent No. 6,703,939 to Lehrman *et al.* ("*Lehrman*") (Ex. 1006);

Ground 2: Claims 2, 5, 8, 9, 13, 16, 19, and 20 are unpatentable under 103(a) based on *Linjama*, *Lehrman*, and U.S. Patent No. 7,180,500 to Marvit *et al.* ("*Marvit*") (Ex. 1008);

Ground 3: Claims 1, 3, 4, 6, 7, 10-12, 14, 15, 17, and 18 are unpatentable under 103(a) based on *Linjama*, *Lehrman*, and U.S. Patent No. 6,312,335 to Tosaki *et al.* ("*Tosaki*") (Ex. 1009); and

Ground 4: Claims 2, 5, 8, 9, 13, 16, 19, and 20 are unpatentable under 103(a) based on *Linjama*, *Lehrman*, *Tosaki*, and *Marvit*.

The '106 patent issued from U.S. Application No. 12/498,111 filed on July 6, 2009 (Ex. 1001, Cover.) The '106 patent claims the benefit of U.S. Provisional Application Nos. 61/078,638 filed July 7, 2008 ("the '638 provisional"), and 61/113,738 filed November 12, 2008 ("the '738 provisional).

Linjama published on September 18, 2008 from U.S. Application No. 11/725,169 filed March 15, 2007. Even assuming that the claims of the '106 patent are entitled to the filing date of the '638 provisional, which Petitioner does not concede, *Linjama* is prior art under pre-AIA 35 U.S.C. §§ 102(a) and/or (e). *Lehrman* issued on March 9, 2004, *Tosaki* issued on November 6, 2001, and *Marvit* issued on February 20, 2007. Therefore, *Lehrman*, *Marvit*, and *Tosaki* are prior art under pre-AIA 35 U.S.C. § 102(b). *Linjama*, *Lehrman*, *Tosaki* and *Marvit* were not considered by the Patent Office during prosecution of the '106 patent. (Ex. 1001, Cover; Ex. 1004.)

VI. LEVEL OF ORDINARY SKILL

A person of ordinary skill in the art at the time of the alleged invention of the '106 patent ("POSITA") would have had at least a bachelor's degree in electrical engineering or a similar field, and at least two to three years of experience in motion sensing techniques and devices. (Ex. 1002, ¶¶16-17.)[1] More education can substitute for practical experience and vice versa.

VII. OVERVIEW OF THE '106 PATENT AND PRIOR ART

A. The '106 Patent

Figure 1 of the '106 patent "is a block diagram of a system architecture showing a minimum quantity of components to support the motion based input system to output an event corresponding to a profile description, according to the preferred embodiment" of the alleged invention of the '106 patent. (Ex. 1001, 2:43-47; *id.*, 4:40-6:36 (describing Figure 1); Ex. 1002, ¶¶35-36; *see also id.*, ¶¶18-34.)

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[1] Petitioner submits the declaration of Dr. Gregory Abowd (Ex. 1002), an expert in the field of the '106 patent. (Ex. 1002, ¶¶1-15; Ex. 1003.)

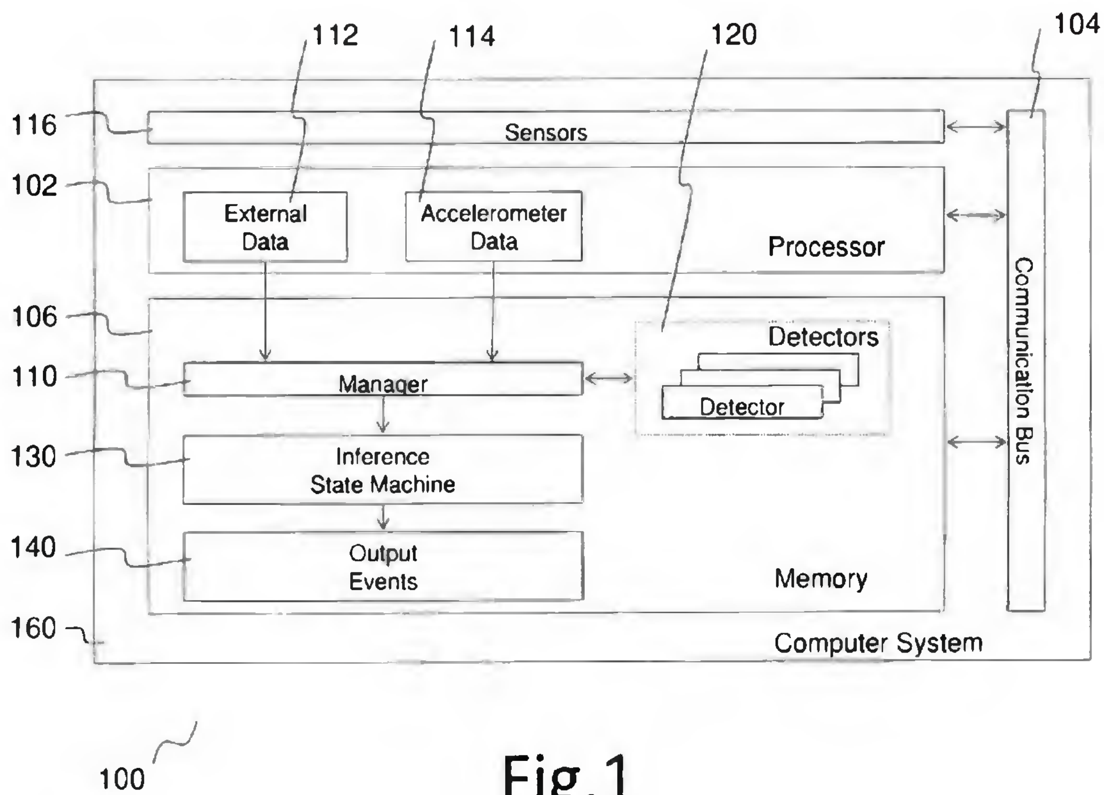

Fig.1

(Ex. 1001, FIG. 1.)

Figure 2 of the ’106 patent is “a state diagram (200) illustrating the inter-working of the detectors with a client application.” (Ex. 1001, 6:37-38; *see also id.*, 6:39-55 (describing Figure 2); Ex. 1002, ¶37-38.)

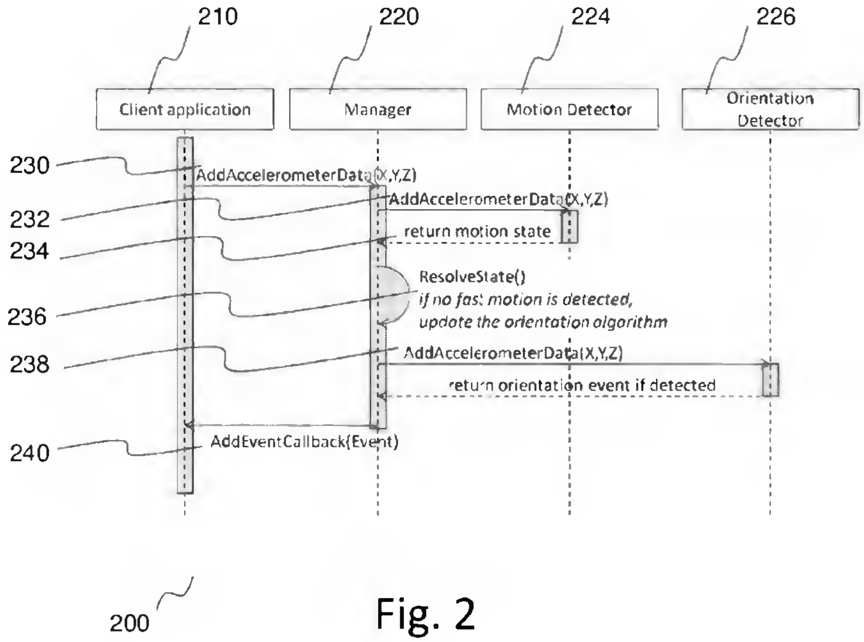

Fig. 2

(Ex. 1001, FIG. 2.)

According to the '106 patent, "[i]f the motion detector (224) does not detect fast motion (236), the manager is sending the motion data (238) to the orientation detector (226)," and "[i]f a fast motion is detected (240), the motion data is not communicated (and therefore not shown) to the orientation detector (226) for processing." (*Id.*, 6:47-52; *see also* Ex. 1002, ¶¶ 39, 40.)

B. Prosecution History of the '106 Patent

During prosecution of the '111 application, the Applicants amended pending independent claim 1 (and similarly the other pending independent claim) to add "a motion detector to detect motion, including identification of a fast motion phase and a slow motion phase, wherein the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity," and to recite that orientation towards gravity is detected "for each slow motion phase," with "each orientation in the sequence being limited to a slow motion phase." (Ex. 1004, 85, 87.) The Applicants represented that the cited prior art references do not "teach the aspect pertaining to classifying motion into fast and slow motion phases and calculating orientation towards gravity **only** for the slow motion phases" and that "[e]vent profiles of [the cited references] are based on all motion phases and are not limited to orientations for slow motion phases." (*Id.*, 93 (emphasis in original); *id.*, 92.) The Examiner subsequently allowed the '111 application. (*Id.*, 36-37.)

C. *Linjama*

Linjama "relates to user interface and control of mobile devices." (Ex. 1005, ¶[0002]; Ex. 1002, ¶46.) *Linjama* discloses that "apparatuses, methods, and computer program products are provided to sense orientations or [a] sequence of orientations, i.e.[,] gestures, of mobile devices." (Ex. 1005, ¶[0007]; *id.*, Abstract, Title.)

Linjama discloses a mobile terminal 10 including an "orientation sensor 12 [that] is configured to sense the orientation of the mobile terminal [10], and to provide signals that may be used to determine if a gesture has been made with respect to the mobile terminal 10." (*Id.*, ¶[0043], FIG. 1 (annotated below).)

Linjama also discloses a motion sensor 14 that "determine[s] whether the mobile terminal is moving." (*Id.*, ¶[0052], FIG. 1.) *Linjama* explains that "gesture means a motion and/or movement or combination of motions and/or movements, including but not limited to motions or movements that result in a particular orientation or orientations of a device for more than a transitory period of time." (*Id.*, ¶[0044].) Mobile terminal 10 includes a controller 18 that "receives a signal from the gesture detector 16 indicating a predefined gesture has occurred" and based on the predefined "gesture," controller 18 activates or inactivates a "function of the mobile terminal 10." (*Id.*, ¶[0047], FIG. 1.)

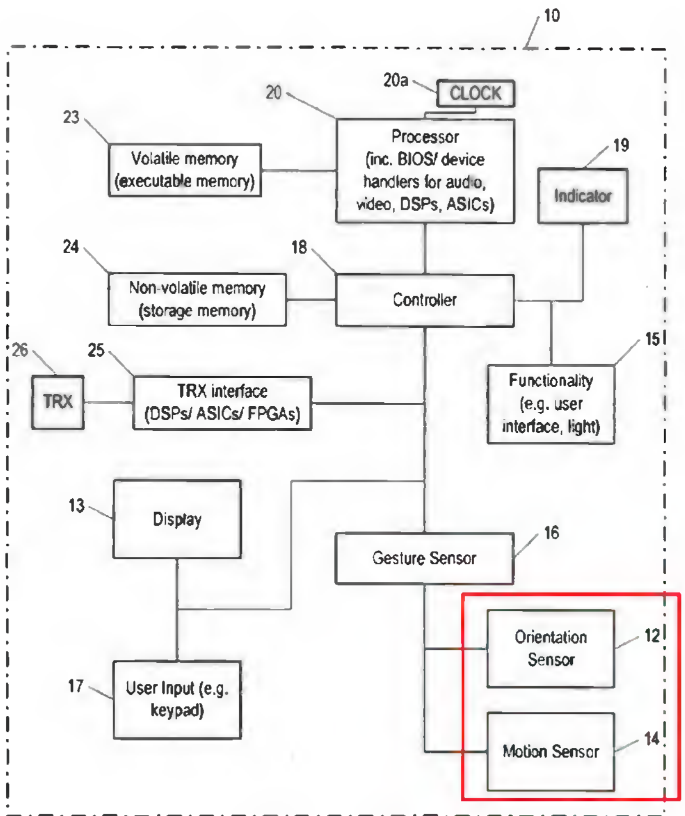

Fig. 1

(Ex. 1005, FIG. 1 (showing mobile terminal 10 with motion and orientation sensors annotated in red); Ex. 1002, ¶47.)

An example of control of the functions of the mobile terminal 10 based on a user "gesture" is explained in paragraph 52 of *Linjama*. (Ex. 1002, ¶48.) *Linjama* explains that the gesture detector 16 receives signals indicating that "the mobile terminal is substantially stationary" and "in a downward orientation." (Ex. 1005, ¶[0052].) Gesture detector 16 determines that "[t]his combination of substantially stationary and downward orientation" corresponds to a predefined gesture and provides an appropriate "control signal . . . to the controller 18," which inactivates "the audible sounds of the mobile terminal, by placing the mobile terminal 10 in a silent mode." (*Id.*)

VIII. CLAIM CONSTRUCTION

A claim in an unexpired patent that will not expire before a final written decision is issued in an IPR receives the "broadest reasonable construction in light of the specification of the patent in which it appears." 37 C.F.R. § 42.100(b). The '106 patent has not expired and will not expire before a final written decision will be issued. Thus, for purposes of this proceeding, the claims of the '106 patent should be given their broadest reasonable construction.

The Board, however, only construes the claims when necessary to resolve the underlying controversy. *Toyota Motor Corp. v. Cellport Sys., Inc.*, IPR2015-00633, Paper No. 11 at 16 (Aug. 14, 2015). Petitioner submits that for purposes of this proceeding, the terms of the challenged claims, other than the means-plus-function terms listed below, should be given their plain and ordinary meaning under the broadest reasonable interpretation (BRI) standard.[2] (Ex. 1002, ¶41.) Below, however, Petitioner addresses three terms that may require further consideration.

A. Means-Plus-Function Claim Terms

Absence of the word "means" in a claim limitation gives rise to a rebuttable presumption that means-plus-function treatment does not apply. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (en banc). The presumption may be overcome, however, if "the claim fails to 'recite sufficiently definite structure' or else recites 'function without reciting sufficient structure for performing that function.'" *Id.* (internal citations omitted). In determining whether a claim recites sufficient structure, the standard is "whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure." *Id.* at 1349. If the claim does not recite

[2] Because of the different claim interpretation standards used in this proceeding and in district courts, any claim interpretations submitted or implied herein for the purpose of this proceeding are not binding upon Petitioner in any litigation related to the '106 patent. Moreover, Petitioner does not concede that the challenged claims are not invalid under one or more sections of 35 U.S.C. § 112, which cannot be pursued in this proceeding under the Rules.

sufficiently definite structure, the written description of the specification must be consulted to identify the structure corresponding to the claimed function. *Id.* at 1351-52. If the claimed function requires a "special purpose computer," the specification must "disclose an algorithm for performing the claimed function," and the algorithm is the "corresponding structure" for the claimed function. *Id.* at 1352; *see also Nintendo of America Inc. v. Motion Games, LLC*, IPR2014-00164, Paper No. 12 at 6-7 (May 19, 2014); *Ex parte Lakkala*, No. 2011-001526, 2013 WL 1341108, at *6-7 (PTAB Mar. 11, 2013) (informative). Moreover, the structure disclosed in the specification qualifies as "corresponding structure" only "if the intrinsic evidence clearly links or associates that structure to the function recited in the claim." *Williamson*, 792 F.3d at 1352.

1. "Motion Detector"

Claim 1 recites "a motion detector" that performs the function of "detect[ing] motion, including identification of a fast motion phase and a slow motion phase, wherein the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity."

2. "Orientation Detector"

Claim 1 recites "an orientation detector" that performs the function of "detect[ing] orientation towards gravity for each slow motion phase."

3. "Inference State Machine"

Claim 1 recites "an inference state machine" that performs the function of "maintain[ing] a sequence of the detected orientations towards gravity, each orientation in the sequence being limited to a slow motion phase; produc[ing] a profile description for the sequence of the detected orientations; and output[ing] an event corresponding to the profile description."

Claim 1 does not recite any structure associated with the foregoing "motion detector," "orientation detector," or "inference state machine" or with the corresponding functions. Moreover, "detector" and "state machine" are generic terms that do not in and of themselves suggest any particular structure, and prepending "motion" or "orientation" to "detector" does not cure that problem. That the "inference state machine" limitation uses the term "configured to" instead of "to" does not result in a different conclusion. *See, e.g.*, *Fotolia LLC v. Uniloc USA*, IPR2015-00190, Paper No. 10 at 8-9 (May 22, 2015) (acknowledging that a "module configured to" may invoke § 112 ¶ 6). Accordingly, the above three limitations invoke § 112 ¶ 6 and the specification must be consulted to determine the corresponding structure for the claimed functions. But the specification of the '106 patent does not disclose and clearly *link* any structure or a specific algorithm associated with a computer or processor to perform the recited functions.

Since none of the functions associated with each of these means is a "generic function," the '106 patent does not properly describe appropriate "structure" corresponding to any of the claimed functions associated with the above "means." However, given that such issues cannot be raised in this proceeding, and for purposes of this proceeding, as required by 37 C.F.R. § 104(b)(3), Petitioner assumes that the corresponding structure for the above-identified functions is software executed by a processor that performs the identified function or equivalents thereof.[3]

To the extent the Board finds that the above claim terms are not to be interpreted as means-plus-function terms, Petitioner's analysis below also demonstrates how the prior art discloses the above-noted claim limitations as recited in the challenged claims under their plain and ordinary meaning. (*See infra* Sections IX.A-D.)

[3] Petitioner does not concede that such structure is adequate under 35 U.S.C. § 112, and reserves the right to pursue such issues in other proceedings.

IX. DETAILED EXPLANATION OF GROUNDS

A. Ground 1: *Linjama* in View of *Lehrman* Renders Obvious Claims 1, 3, 6, 10-12, 14, and 17

1. Claim 1

a) "A motion based input system comprising:"

To the extent the preamble is limiting, *Linjama* discloses the limitations therein. (Ex. 1002, ¶¶66-69.) *Linjama* discloses a mobile terminal 10 such as a cellular telephone device. (Ex. 1005, ¶[0043].) Mobile terminal 10 includes a controller 18 that "receives a signal from the gesture detector 16 indicating a predefined gesture has occurred" and, based on the predefined "gesture," controller 18 activates or inactivates a "function of the mobile terminal 10." (*Id.*, ¶[0047], FIG. 1.) *Linjama* explains that "gesture means a *motion and/or movement or combination of motions and/or movements*, including but not limited to motions or movements that result in a particular orientation or orientations of a device for more than a transitory period of time." (*Id.*, ¶[0044] (emphasis added).) Therefore, mobile terminal 10 is a "motion based input system" because various functions of mobile terminal 10 are controlled based on an input motion. (Ex. 1002, ¶67.)

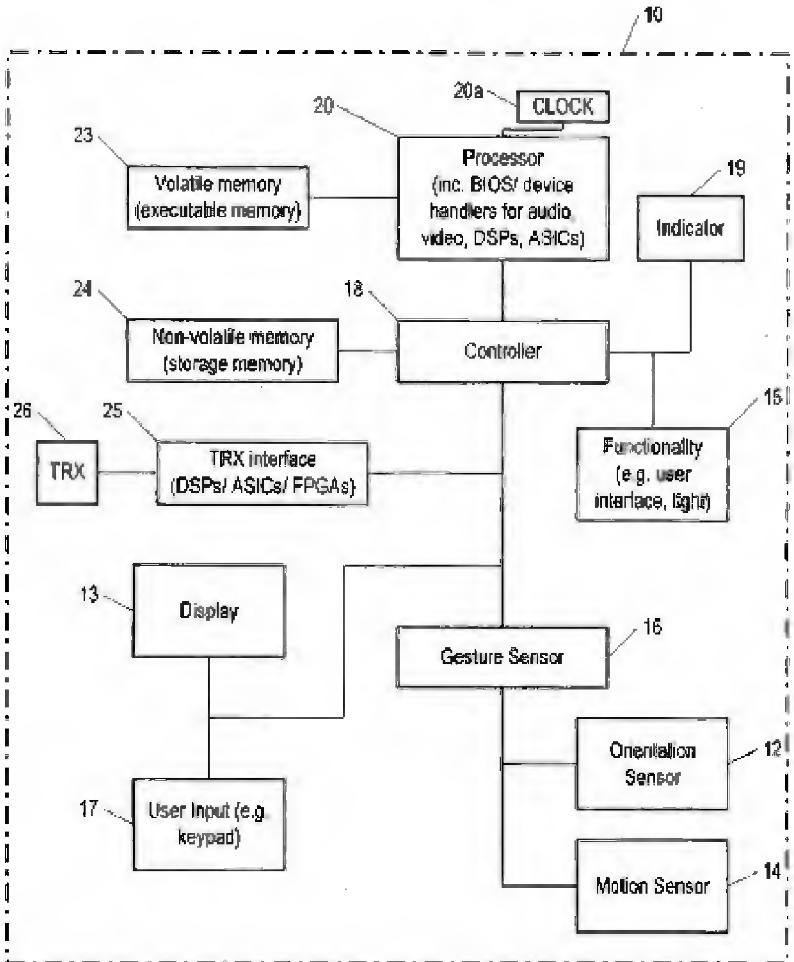

Fig. 1

(Ex. 1005, FIG. 1.)

An example of such control of the functions of the mobile terminal 10 based on a user "gesture" is explained in paragraph 52 of *Linjama*. (Ex. 1002, ¶68.) In this example, *Linjama* explains that the gesture detector 16 receives signals indicating that "the mobile terminal is substantially stationary" and "in a downward orientation." (Ex. 1005, ¶[0052].) Gesture detector 16 determines that "[t]his combination of substantially stationary and downward orientation" corresponds to a predefined gesture and provides an appropriate "control signal . . . to the controller 18," which inactivates "the audible sounds of the mobile terminal, by placing the mobile terminal 10 in a silent mode." (*Id.*)

(*See also infra* Sections IX.A.1(b)-(k) regarding the remaining elements of this claim.)

b) "a processor in communication with a memory;"

Linjama discloses this limitation. (Ex. 1002, ¶¶70-72.) For instance, as shown below in Figure 1, *Linjama* discloses a processor 20, controller 18, and gesture detector 16 that are collectively "a processor" as recited in claim 1. (Ex. 1005, FIG. 1.) *Linjama* discloses that "controller 18 either by itself or in conjunction with the processor 20 is responsible for carrying out the functions, i.e. controlling the components, of the mobile terminal 10." (Ex. 1005, ¶[0047].) *Linjama* further discloses that gesture detector 16 also performs a *processing* function based on data received from orientation sensor 12 and motion sensor 14. (*Id.*, ¶[0052].)

With respect to gesture detector 16, a POSITA would have understood that gesture detector 16 is associated with a processor because as discussed above gesture detector 16 performs a *processing* function based on data received from orientation sensor 12 and motion sensor 14. (Ex. 1002, ¶71.) *Linjama*'s discussion of Figure 2 supports this conclusion. For instance, "FIG. 2 is a flowchart illustrating exemplary steps in a method for controlling the functionality of a mobile terminal by predefined gestures." (Ex. 1005, ¶[0041].) Step S12 is a determination "whether the signals [representing motion and orientation] correspond to a predefined gesture" and step S14 provides "a control signal" if the signals correspond to a "predefined motion" (i.e., predefined gesture). (*Id.*,¶[0055].) Steps S12 and S14 therefore represent the functionality of "gesture detector 16." (*Id.*, ¶[0052].) The steps in Figure 2 correspond to software instructions for execution by a *computer processor*. (*Id.*, ¶[0056] ("a computer program product comprising a computer readable storage structure embodying *computer program code thereon for execution by a computer processor*, wherein the *computer program code comprising instructions* for performing at least the steps of the method according to the invention discussed above in relation to FIG. 2") (emphasis added).) Therefore, a POSITA would have understood that gesture detector 16 is associated with a processor and hence, a POSITA would have considered "gesture detector 16" as part of the claimed "processor." (Ex. 1002, ¶71.)

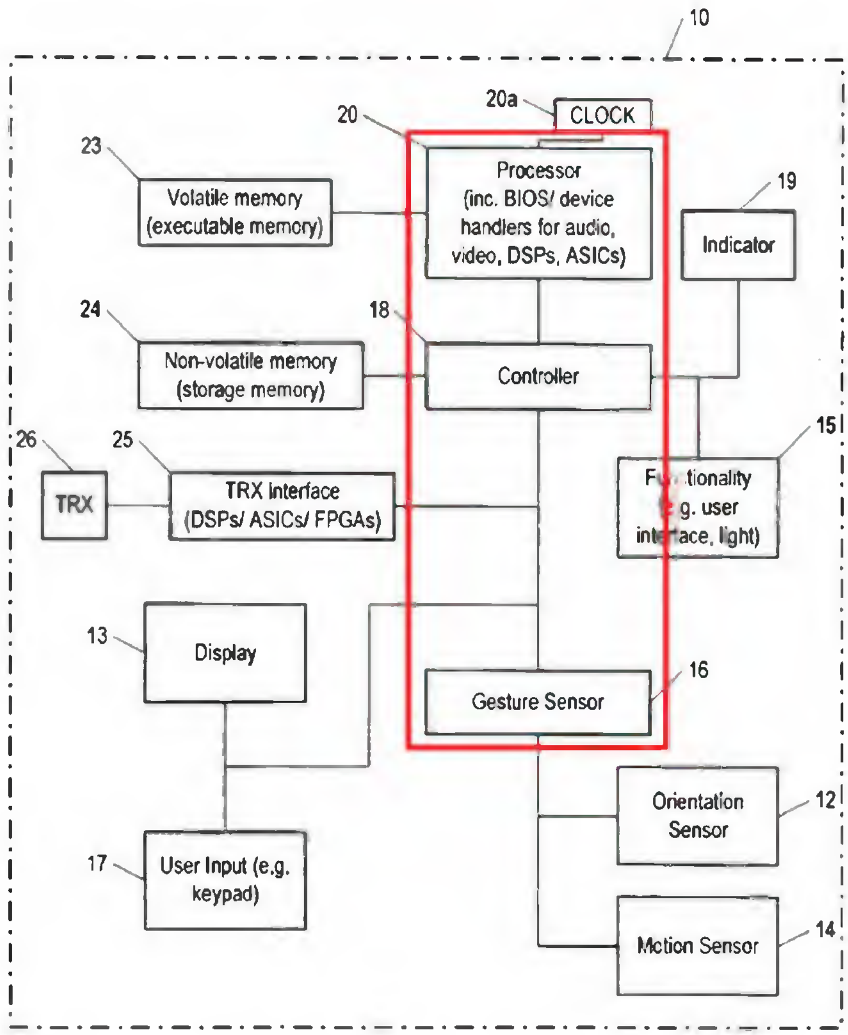

Fig. 1

(*Id.*, FIG. 1 (annotated); Ex. 1002, ¶71.)

Linjama further discloses that the "processor" as recited in claim element 1(b) is in communication with volatile memory 23 and non-volatile memory 24 (each of which is "a memory"). Specifically, *Linjama* discloses that "controller 18 is coupled to a processor 20 of the mobile terminal 10, to non-volatile memory 24 and volatile memory 23 as well." (Ex. 1005, ¶[0047].)

c) "a motion sensor in communication with the processor;"

Linjama discloses this limitation. (Ex. 1002, ¶¶73-74.) For instance, as shown in Figure 1, *Linjama* discloses a motion sensor 14 ("a motion sensor") (blue below) in communication with the claimed "processor" (processor 20, controller 18, and gesture detector 16) (red below). (Ex. 1005, FIG. 1; Ex. 1002, ¶73.)

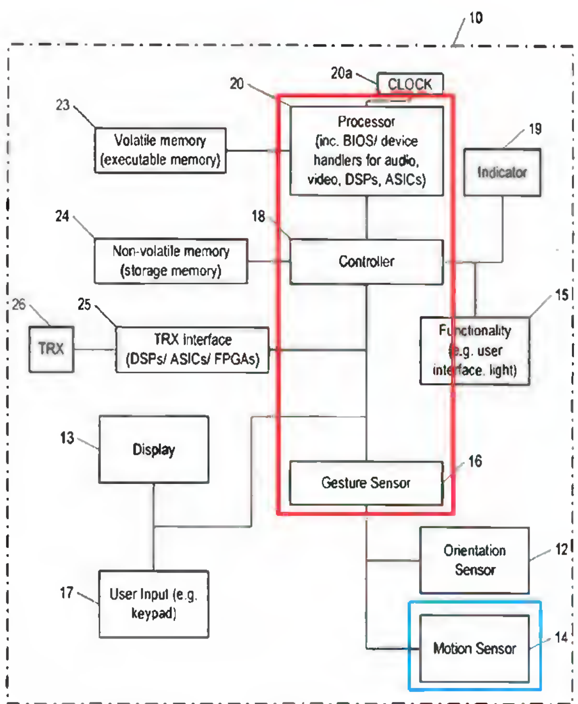

Fig. 1

(Ex. 1005, FIG. 1 (annotated); Ex. 1002, ¶73.)

Linjama discloses that motion sensor 14 "determine[s] whether the mobile terminal is moving." (Ex. 1005, ¶[0052].) *Linjama* explains that "[t]he motion sensor[] 14 may provide signals to the gesture detector 16 indicative of whether the mobile terminal is moving" and that this motion information "may be used by the gesture detector 16 either alone, or in combination with signals from the orientation sensor 12, to determine whether a predefined gesture has occurred." (Ex. 1005, ¶[0052].)

d) "the processor to acquire movement data from the motion sensor;"

Linjama discloses this limitation. (Ex. 1002, ¶75.) For instance, as explained below, *Linjama* discloses that the claimed "processor" (processor 20, controller 18, and gesture detector 16) acquires signals indicative of whether mobile terminal 10 is moving ("movement data") and these signals are generated based on signals provided by motion sensor 14. (*Id.*) Specifically, *Linjama* explains that "[t]he motion sensor[] 14 may provide signals to the gesture detector 16 indicative of whether the mobile terminal is moving" and that "the movement information related signals may be used by the gesture detector 16 either alone, or in combination with signals from the orientation sensor 12, to determine whether a predefined gesture has occurred." (Ex. 1005, ¶[0052].)

e) "a manager configured to execute on the processor and to control motion and orientation detectors, including:"

Linjama discloses this limitation. (Ex. 1002, ¶¶76-79.) As discussed above with respect to claim element 1(b), processor 20, controller 18, and gesture detector 16 are collectively the claimed "processor." As discussed below, *Linjama* further discloses that a "*manager*" is configured to execute on the combination of processor 20 and controller 18.

Linjama states that "controller 18 either by itself or in conjunction with the processor 20 is responsible for carrying out the functions, i.e. controlling the components, of the mobile terminal 10." (Ex. 1005, ¶[0047].) A POSITA would have understood that controller 18 and processor 20 execute software code (e.g., executable instructions) responsible for, among other things, controlling the components of mobile terminal 10. (*Id.*; Ex. 1002, ¶__.) For example, *Linjama* discloses that processor 20 is coupled to memory 23, which is described as being "executable memory," indicating that software code is executed by processor 20. (Ex. 1005, FIG. 1; Ex. 1002, ¶77.) *Linjama* also states that "FIG. 2 is a flowchart illustrating exemplary steps in a method for controlling the functionality of a mobile terminal by predefined gestures." (Ex. 1005, ¶[0041].) At step S14 "a control signal" is provided if the signals correspond to a "predefined motion" (i.e., predefined gesture), and "at step S16 at least one functionality of the mobile device is performed based on the control signal." (*Id.*, ¶[0055].) Step S16 therefore represents functionality of "controller 18" alone or in conjunction with "processor 20." (*Id.*, ¶¶[0047], [0052].) But all the steps in Figure 2 (including step S16, which as explained above corresponds to functions performed by controller 18 alone or in conjunction with processor 20) correspond to software instructions for execution by "a computer processor." (*Id.*, ¶[0056].) Accordingly, a POSITA would have understood that controller 18 in conjunction with processor 20 executes software code (e.g., executable instructions) responsible for controlling the components of mobile terminal 10. (Ex. 1002, ¶77.)

A POSITA would have understood that the software code that is executed by controller 18 and processor 20 and that controls the functions and components of mobile terminal 10 is a "manager," as recited in claim element 1(e). (*Id.*, ¶78.) For instance, such software ("manager") in *Linjama* would perform steps S10 and S11 (providing signals indicative of motion and orientation to gesture detector 16) in Figure 2. (Ex. 1005, FIG. 2, ¶¶[0055]-[0056].) Such software functionality is similar to that described as corresponding to the "manager" in the '106 patent. (*See* Ex. 1001 at FIG. 1, 4:48-5:21 (explaining that manager 110 receives data from sensors and communicates the received data to application detector (120) and that manager 110 is a software tool local to memory 106).)

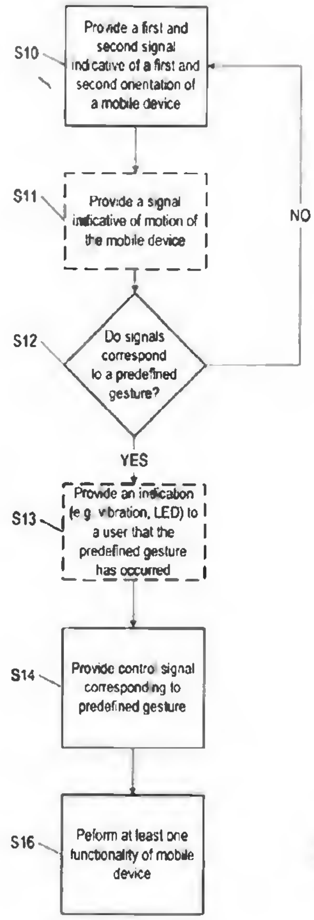

Fig. 2

(Ex. 1005, FIG. 2.)

Linjama further discloses that the software discussed above as the claimed "manager" controls "motion and orientation detectors," as recited in claim element 1(e). As discussed below with respect to claim elements 1(f) and 1(g), software that performs the functions corresponding to gesture detector 16 discloses the claimed "motion detector" and "orientation detector." (*See infra* Sections IX.A.1(f), (g).) Moreover, *Linjama* discloses that controller 18 and processor 20 execute software that *control* gesture detector 16 because *Linjama* discloses that "controller 18 either by itself or in conjunction with the processor 20 is responsible for carrying out the functions, i.e. *controlling the components, of the mobile terminal 10*." (Ex. 1005, ¶[0047] (emphasis added).) As seen from Figure 1, gesture detector 16 is a component of mobile terminal 10. (*Id.*, FIG. 1; *see also id.*, ¶[0055], "gesture detector may be a component of the mobile device.") Therefore, *Linjama* discloses that the above discussed software features that correspond to the claimed "manager" control software that performs the functions corresponding to "motion and orientation detectors," as recited in claim element 1(e). (Ex. 1002, ¶79.)

> f) "a motion detector to detect motion, including identification of a fast motion phase and a slow motion phase, wherein the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity; and"

Linjama in combination with *Lehrman* discloses or suggests this limitation.[4] (Ex. 1002, ¶¶80-93.) As discussed in detail below, *Linjama* discloses that the

[4] Claim elements 1(f) and 1(g) recite a motion detector and orientation detector. Patent Owner may argue that the motion and orientation detectors must be included in the manager given the claim language (a manager . . ., including a motion detector . . . .; and an orientation detector . . . .). But the more plausible reading of claim 1 is that the "including" is further defining the motion and

software that performs the functions corresponding to gesture detector 16 includes software ("motion detector") that detects motion, including an identification of whether the motion is a fast motion or a slow motion.

As an initial matter, a POSITA would have understood that the functions performed by gesture detector 16 would be implemented by way of software code.

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orientation detectors, and not the "manager." Indeed, such an interpretation is the only one that is supported by the specification of the '106 patent, which *consistently* discloses the motion and orientation detectors as being separate from the manager. (*See, e.g.,* Ex. 1001, FIGS. 1, 2, 4, 8, 9, 4:40-5:22, 6:37-52, 7:39-53, 10:41-58, 11:22-39.) Moreover, Patent Owner's interpretation is also not supported by claim 1 because claim element 1(e) states that the manager is configured to "control motion and orientation detectors," suggesting that the manager and the detectors are separate. Indeed, the plain language of claim 1 is ambiguous and the only reasonable reading of claim 1 in view of the specification is that the manager and detectors are separate. To the extent the Board agrees with Patent Owner's interpretation, *Linjama* still discloses motion and orientation detectors that are included in the "manager." (Ex. 1002, ¶¶80, n.2.)

(Ex. 1002, ¶81.) *Linjama*'s discussion of Figure 2 supports such a conclusion. (*Id.*) For instance, "FIG. 2 is a flowchart illustrating exemplary steps in a method for controlling the functionality of a mobile terminal by predefined gestures." (Ex. 1005, ¶[0041].) Step S12 is a determination of "whether the signals [representing motion and orientation] correspond to a predefined gesture" and step S14 provides "a control signal" if the signals correspond to a "predefined motion" (i.e., predefined gesture). (*Id.*, ¶[0055].) Steps S12 and S14 therefore represent the functionality of "gesture detector 16." (*Id.*, ¶[0052].) The steps in Figure 2, however, correspond to software instructions for execution by a computer processor. (*Id.*, ¶[0056].) Accordingly, a POSITA would have understood that the functions of gesture detector 16 are implemented as software code. (Ex. 1002, ¶81.)

Linjama's gesture detector 16 detects motion, including an identification of whether the motion is a fast motion or a slow motion. (*Id.*, ¶82.) *Linjama* discloses that the gesture detector 16 receives motion data from motion sensor 14 and an indication as to whether the mobile device is "moving" or "substantially stationary." (Ex. 1005, ¶[0052].) Thus, *Linjama* discloses identifying a moving phase ("fast motion phase") and a substantially stationary phase ("slow motion phase"). (Ex. 1002, ¶82.)

Notably, limitation 1(f) broadly recites "a fast motion phase" and "a slow motion phase" without imposing any requirement regarding how "fast" or "slow" those phases have to be with respect to each other—in other words, those phrases are only described in relative terms. A POSITA would have understood that because *Linjama*'s "substantially stationary" phase is "*substantially* stationary" as opposed to just "stationary," it encompasses some small amount of motion (e.g., otherwise, "substantially" would be meaningless). (Ex. 1002, ¶83.) A POSITA would have also understood that *Linjama*'s phase in which "the mobile terminal is moving" (which is described as being distinct from the "substantially stationary" phase) must be a *faster* motion phase than the "substantially stationary" phase, because if it were the same speed as the "substantially stationary" phase, then there would be no distinction between the two phases, which would be contrary to *Linjama*'s disclosure. (*Id.*)

Therefore, as discussed above, *Linjama's* gesture detector 16 performs the function of detecting motion, including an identification of whether the motion is a fast motion or a slow motion, as recited in claim element 1(f). But, as also discussed above, a POSITA would have understood that the functions of gesture detector 16 are implemented as software code. (Ex. 1002, ¶84.) Therefore, the software that performs the functions corresponding to gesture detector 16 includes software ("motion detector") that detects motion, including an identification of whether the motion is a fast motion or a slow motion. (*Id.*)

Claim element 1(f) also recites that the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity. *Linjama* does not explicitly disclose this feature because it does not disclose *how* to determine whether the mobile terminal is moving or instead substantially stationary (i.e., "fast" vs. "slow" motion phase). (*Id.*, ¶85.) Such features, however, would have been obvious in view of *Lehrman*. (*Id.*)

Similar to *Linjama*, *Lehrman* is directed to "detecting motions of a body" based on sensing acceleration. (Ex. 1006, 1:24-28, 2:23-27, 5:46-48; Ex. 1005, ¶[0059]; Ex. 1002, ¶__.) Therefore, a POSITA would have had reason to consider the teachings of *Lehrman* when implementing *Linjama*'s system. (Ex. 1002, ¶86.) *Lehrman* discloses a system 11 that includes a sensor 25 (red below) that detects acceleration. (Ex. 1006, 5:47-48, 8:40-41.)

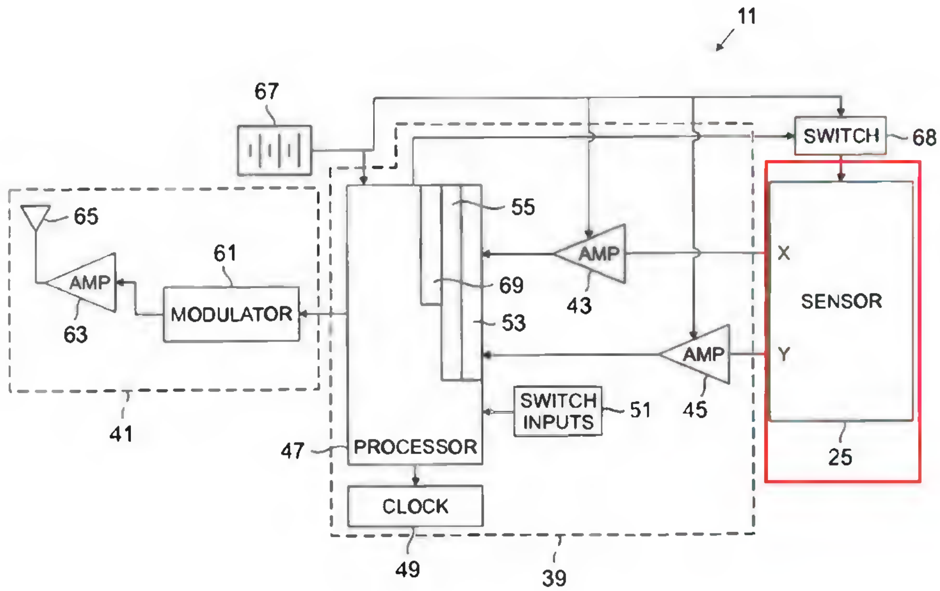


FIG. 2

(*Id.*, FIG. 2 (annotated); Ex. 1002, ¶86.)

Figure 9 of *Lehrman* discloses an exemplary implementation of sensor 25 that includes three accelerometers 910, 920, and 930. (Ex. 1006, 12:50-13:21, FIG. 9.) *Lehrman* discloses that the sum of accelerations experienced by accelerometers 910, 920, and 930 can be represented by a "vector R" and for a body *at rest*, the value of "vector R" will be equal to about 9.8 m/sec^2, which is referred to in the field as 1 "g" (pronounced "GEE"). (*Id.*, 14:20-59.) *Lehrman* explains that when the body is "at rest," "dynamic acceleration" experienced by the body is zero. (*Id.*)

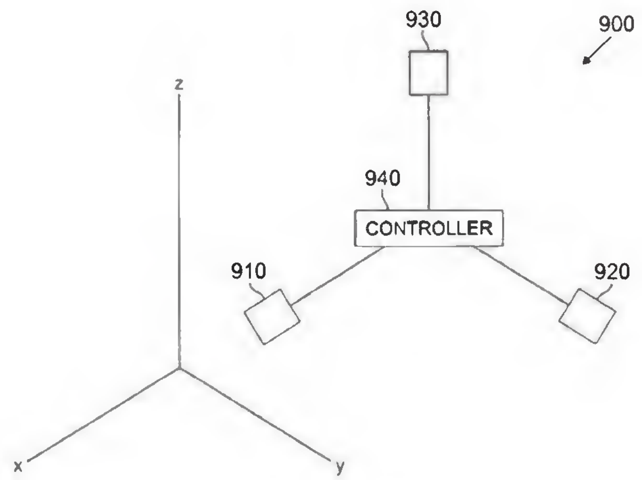


FIG. 9

(Ex. 1006, FIG. 9.)

Lehrman makes the simple observation that if the "total value of acceleration . . . exceeds one 'g,'" that must mean that the body is not at rest and is experiencing "dynamic acceleration" due to external forces. (Ex. 1002, ¶88; Ex. 1006, 14:66-15:22.) *Lehrman* discloses using this observation to trigger events. (Ex. 1002, ¶88.) For example, *Lehrman* discloses comparing a detected acceleration to a threshold and if the acceleration exceeds a threshold, signaling an alarm condition. (Ex. 1006, 14:50-57.) *Lehrman* describes detecting dynamic acceleration (i.e., acceleration that is not due to gravity) by comparing a magnitude of detected acceleration to a magnitude of gravity (which is 1 "g"). (*Id.*, 14:58-15:3.) *Lehrman* thus discloses determining whether the object is moving or at rest by "comparing a magnitude of a motion vector with a magnitude of gravity" because *Lehrman* determines whether the body is at rest or moving by comparing a magnitude of the vector R ("magnitude of a motion vector") with 1 "g" ("a magnitude of gravity"). (Ex. 1002, ¶88.)

A POSITA would have been motivated to take these teachings from *Lehrman* and apply them to *Linjama*'s system such that *Linjama*'s gesture detector 16 is able to distinguish between substantially stationary ("slow motion") and moving ("fast motion") phases of mobile terminal 10. (*Id.*, ¶89.) Specifically, a POSITA would have been motivated to configured *Linjama*'s gesture detector 16 (e.g., by modifying the software code that performs the functions of gesture detector 16) such that it is able to determine whether the mobile terminal 10 is "substantially stationary" or "moving" by comparing a magnitude of acceleration of mobile terminal 10 against a magnitude of gravity like in *Lehrman*. (*Id.*) While *Lehrman* discloses comparing the detected acceleration with 1 "g" to determine whether the body is at rest, a POSITA would have understood that 1 "g" is simply a threshold that can be modified based on the state of motion to be detected. (*Id.*) That is, the threshold could be set a little higher than 1 "g" in order to distinguish between "substantially stationary" and "moving." (*Id.*) Therefore, a POSITA would have been motivated based on *Linjama* and *Lehrman* to implement functionality in *Linjama* that determines whether the mobile terminal 10 is "substantially stationary" or "moving" by comparing a magnitude of the detected acceleration with a threshold that is some factor multiplied by gravity. (*Id.*) Such a combined system therefore would have software ("motion detector") that is configured such that "the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity," as recited in claim limitation 1(f).

A POSITA would have been motivated to configure *Linjama*'s gesture detector 16 (and in particular, the software code that implements the functions of gesture detector) as discussed above because such a skilled person would have recognized that *Lehrman*'s technique of comparing a magnitude of a detected acceleration with a magnitude of gravity (1 "g") would have allowed *Linjama*'s gesture detector 16 to determine whether the mobile terminal 10 is substantially stationary or instead is moving. (Ex. 1005, ¶[0052]; Ex. 1002, ¶90.) Given such teachings, a POSITA would have found the above modification to be a predictable approach that would have involved basic principles of physics regarding gravity and corresponding effects on systems like those disclosed by *Linjama* and *Lehrman*. (Ex. 1002, ¶90.)

Indeed, in the context of *Linjama*'s disclosure, comparing a magnitude of the motion vector with a threshold based on gravity would have been one of only a few available primary methods to determine whether the mobile terminal 10 is moving or substantially stationary. (Ex. 1002, ¶91.) Accordingly, a POSITA would have found it obvious to try *Lehrman*'s disclosed comparison of a magnitude of a motion vector with a magnitude of gravity for *Linjama*'s determination of moving vs. substantially stationary. (*Id.*) *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). Indeed, the use of *Lehrman*'s disclosed comparison of a magnitude of a motion vector with a magnitude of gravity for *Linjama*'s determination of moving vs. substantially stationary would have been nothing more than the application of a known technique (*Lehrman*'s comparison) to a known device (*Linjama*'s mobile terminal 10) ready for improvement that would have expectedly resulted in a mobile terminal 10, which detects whether it is moving or substantially stationary by comparing a magnitude of a motion vector with a magnitude of gravity. (Ex. 1002, ¶91.) *See KSR*, 550 U.S. at 415-421.

A POSITA would have had the knowledge and capability to implement the above-discussed configurations in the combined *Linjama-Lehrman* system. (*Id.*, ¶92.) For example, *Linjama* discloses suitable hardware and software infrastructure for implementing such a configuration—e.g., acceleration sensors for x-, y-, and z-axes (Ex. 1005, ¶¶[0045]-[0046]) and a processor and software for performing computations based on data from such sensors (*id.*, ¶¶[0047], [0056], FIG. 1). .

Moreover, to the extent that claim element 1(f) is not interpreted as a means-plus-function term, the above combined *Linjama-Lehrman* system discussed above also discloses claim element 1(f) under its plain and ordinary meaning because, as explained, the combination discloses a "motion detector" that performs the same functions recited in this claim element. (Ex. 1002, ¶93; *see also supra* Section VIII.A.)

g) "an orientation detector to detect orientation towards gravity for each slow motion phase; and"

The combined *Linjama-Lehrman* system discloses or suggests this limitation. (Ex. 1002, ¶¶94-96.) *Linjama*'s software that performs the functions corresponding to gesture detector 16 (*see supra* Section IX.A.1(f)) also performs functions corresponding to the claimed "orientation detector" because, as discussed below, gesture detector 16 detects orientation of mobile terminal 10 towards gravity for each slow motion –the function performed by the claimed "orientation detector." (Ex. 1002, ¶94; *see also supra* Section IX.A.1(e).) For instance, gesture detector 16 receives signals from orientation sensor 12, and determines the orientation of mobile terminal 10. (Ex. 1005, ¶[0047]; Ex. 1002, ¶94.) Gesture detector 16 determines that the display 13 of the mobile terminal 10 is in a "downwards" orientation when the "display 13 of the mobile terminal 10 [is] facing in a downwards direction." (Ex. 1005, ¶[0050].) A "downwards" orientation is an orientation "towards the direction of gravity." (*Id.*, ¶[0046].) Thus, a POSITA would have understood that the software that performs the functions corresponding to gesture detector 16 includes software ("orientation detector") that detects orientation *towards gravity* when it detects that the mobile terminal 10 is in a "downwards" orientation. (Ex. 1002, ¶94.)

Linjama further discloses that gesture detector 16 detects that the mobile device has a "downward orientation" while the mobile device is substantially stationary ("slow motion phase"), and thus discloses that orientation towards gravity (e.g., "downward orientation") is detected *for each slow motion phase*. (*Supra* Section IX.A.1(f); Ex. 1005, ¶[0052] ("For example, the motion sensor 14 may determine that the mobile terminal is substantially stationary, and may provide a signal indicating that the mobile terminal is substantially stationary to the gesture detector 16. At approximately the same time, the gesture detector 16 receives from the orientation sensor 12 a signal or signals indicating that the mobile terminal is in a downward orientation. This combination of substantially stationary and downward orientation may correspond to a predefined gesture . . . ."); Ex. 1002, ¶95.)

To the extent that this claim term is not interpreted as a means-plus-function term, the above combined *Linjama-Lehrman* system discussed above also discloses this claim element under its plain and ordinary meaning because, as explained, the combination discloses a "orientation detector" that performs the same functions recited in this claim element. (Ex. 1002, ¶96; *see also supra* Section VIII.A.)

h) "an inference state machine in communication with the manager . . . .;"

The *Linjama-Lehrman* combination discloses or suggests this limitation. (Ex. 1002, ¶¶97-100.) The '106 patent does not disclose any particular structure associated with the "inference state machine." (*Id.*, ¶97; *see* Ex. 1001.) Instead, the specification describes the "inference state machine" merely by the functions it performs, which tracks the functions recited in claim elements 1(i)-(k). (Ex. 1001, 4:66-5:4, 7:51-58.) *Linjama*'s software that performs the functions corresponding to gesture detector 16 (*see supra* Section IX.A.1(f)) also performs functions corresponding to the claimed "inference state machine" recited in claim elements 1(i)-(k). (*See infra* Sections IX.A.1(i)-(k).) Therefore, the software that performs the functions corresponding to gesture detector 16 includes software ("inference state machine") that performs functions corresponding to the claimed "inference state machine" recited in claim elements 1(i)-(k).

Moreover, a POSITA would have understood that the software that performs the function of claim elements 1(i), (j), and (k) discloses an "inference state machine" in the context of the '106 patent. (Ex. 1002, ¶98.) Specifically, gesture detector 16 draws an inference regarding *the state* of the mobile terminal 10 because it determines that the mobile terminal 10 is facing downwards and takes certain actions (e.g., sending a control signal to controller 18) based on the determined state. (Ex. 1005, ¶[0052].) Therefore, the software (*see supra* Section

IX.A.1(f) (explaining that software performs the functions of gesture detector 16)) that draws such an inference based on the *state* of the mobile terminal is an "inference state machine" in the context of the '106 patent. Indeed, the '106 patent provides no discussion regarding what a "state machine" is and simply discloses that "inference state machine" performs the same functions that are recited in claim elements 1(i)-(k). (Ex. 1001, 4:66-5:4, 7:53-58, FIG. 1.) Therefore, a POSITA would have understood that any software which performs the functions recited in claim element 1(i)-(k) is an "inference state machine" in the context of the '106 patent. (Ex. 1002, ¶98.)

Linjama also discloses that the "inference state machine" is "in communication with the manager." Specifically, as discussed below with respect to claim element 1(k), gesture detector 16 sends a control signal to controller 18 "indicating that the predefined gesture has occurred." (Ex. 1005, ¶[0052], FIG. 1.) As discussed above, claim element 1(k) would be performed by the software in *Linjama* that corresponds to the claimed "inference state machine." (*See also infra* Section IX.A.1(k).) Therefore, a POSITA would have understood that *Linjama* discloses that the software corresponding to the "inference state machine" sends the control signal to controller 18. But as discussed earlier, the software code that is executed by controller 18 and processor 20 and that controls the functions and components of mobile terminal 10 is a "manager." (*Supra* Section IX.A.1(e).)

Therefore, *Linjama* discloses that the "inference state machine" is "in communication with the manager" because the software in *Linjama* corresponding to the "inference state machine" sends the control signal to controller 18, and therefore to the "manager." (Ex. 1002, ¶99.)

As discussed above, the software that performs the functions corresponding to gesture detector 16 includes software ("inference state machine") that performs functions corresponding to the claimed "inference state machine" recited in claim elements 1(i)-(k). (*See also infra* Section IX.A.1(i)-(k).) To the extent that claim elements 1(h)-(k) are not interpreted as a means-plus-function term, the above combined *Linjama-Lehrman* system also discloses these claim elements under their plain and ordinary meaning because, as explained, the combination discloses a "an inference state machine" that performs the same functions recited in claim elements 1(i)-(k). (Ex. 1002, ¶100; *see also supra* Section VIII.A.)

i) "[the inference state machine] configured to: maintain a sequence of the detected orientations towards gravity, each orientation in the sequence being limited to a slow motion phase;"

The *Linjama-Lehrman* combination discloses or suggests this limitation. (Ex. 1002, ¶¶101-102.) *Linjama*'s software that performs the functions corresponding to gesture detector 16 (*see supra* Section IX.A.1(f)) also performs the function recited in claim element 1(i). For instance, *Linjama* discloses that "the gesture detector 16 receives from the orientation sensor 12 . . . signals indicating that the mobile terminal is in a downward orientation." (Ex. 1005, ¶[0052].) The "signals" disclose a "sequence of the detected orientations towards gravity" because each of the "signals" is a detection of downward orientation (*id.*, ¶[0048]) and as discussed above, a "downward orientation" is an "orientation[] towards gravity" (*supra* Section IX.A.1(g)). (*See also* Ex. 1005, Abstract ("Apparatuses, methods, and computer program products are provided to sense orientations or *sequence of orientations*, i.e. gestures, of mobile devices.") (emphasis added), ¶¶[0007] ("sequence of orientations"), [0051] ("When this *sequence of orientations* corresponds to a predefined gesture, the gesture detector 16 provides a control signal representing this predefined gesture to the controller 18.") (emphasis added).) Gesture detector 16 "maintain[s]" the sequence of detected downward orientations because it processes them to determine whether a predefined gesture has occurred. (Ex. 1005, ¶[0052].) A POSITA would have understood that gesture detector 16 would store ("maintain") the sequence of orientations in order to process them. (Ex. 1002, ¶101.)

Linjama discloses that the signals indicating the downward orientation of mobile terminal 10 are received by gesture detector 16 while mobile terminal 10 is substantially stationary, i.e., mobile terminal 10 is in a "slow motion phase." (*Supra* Section IX.A.1(g); Ex. 1005, ¶[0052].) Therefore, *Linjama* discloses that each orientation in the sequence is limited to the slow motion phase. (Ex. 1002, ¶102.)

j) "[the inference state machine configured to] produce a profile description for the sequence of the detected orientations; and"

The *Linjama-Lehrman* combination discloses or suggests this limitation. (Ex. 1002, ¶¶103-104.) *Linjama*'s software that performs the functions corresponding to gesture detector 16 (*see supra* Section IX.A.1(f)) also performs the function recited in claim element 1(j) as discussed below.

Claim 1 broadly claims a "profile description" without requiring any specific kind of description. The '106 patent specification does not provide much (if any) explanation as to what is meant by "produc[ing] a profile description" and the claims merely parrot language in the '106 patent specification. (*Id.*; Ex. 1001, 4:66-5:1, 7:53-55.) In any case, as explained below, *Linjama* discloses producing a profile corresponding to a sequence of orientations and therefore, discloses the claimed feature. (Ex. 1002, ¶103.) Specifically, gesture detector 16 determines that each of the "signals" received from the orientation sensor 12 indicates "that the mobile terminal is in a downward orientation." (Ex. 1005, ¶[0052].) Based on these "signals" ("sequence of the detected orientations"), gesture detector 16 determines that the mobile terminal 10 is in a "downward orientation." (*Id.*)

Gesture detector 16 also determines that the orientations were detected while the mobile terminal 10 was "substantially stationary." (*Id.*) "This *combination of substantially stationary and downward orientation* may correspond to a predefined gesture." (*Id.* (emphasis added).) Therefore, gesture detector 16 produces the claimed "profile description," which is the "combination of substantially stationary and downward orientation." The "combination of substantially stationary and downward orientation" would have been understood as a "profile description" in the context of the '106 patent because the only example of a "profile" in the '106 patent is a combination of orientation and motion conditions. (Ex. 1002, ¶104; Ex. 1001, 8:5-10.) Moreover, the matching of the profile ("combination of substantially stationary and downward orientation) against a predefined gesture in *Linjama* is similar to the profile matching disclosed in the '106 patent. (Ex. 1002, ¶104; Ex. 1001, 7:53-57.)

k) "[the inference state machine configured to] output an event corresponding to the profile description."

The *Linjama-Lehrman* combination discloses or suggests this limitation. (Ex. 1002, ¶105.) *Linjama*'s software that performs the functions corresponding to gesture detector 16 (*see supra* Section IX.A.1(f)) also performs the function recited in claim element 1(k). For example, *Linjama* discloses outputting a control signal ("event") corresponding to the profile description ("combination of substantially stationary and downward orientation"). *Linjama* explains that the gesture detector

16 receives signals indicating that "the mobile terminal is substantially stationary" and "in a downward orientation." (Ex. 1005, ¶[0052].) Gesture detector 16 determines that "[t]his combination of substantially stationary and downward orientation" corresponds to a predefined gesture and provides an appropriate "control signal . . . to the controller 18," which inactivates "the audible sounds of the mobile terminal, by placing the mobile terminal 10 in a silent mode." (*Id.*; Ex. 1002, ¶105.)

2. Claim 3

a) "The system of claim 1, further comprising instructions to detect orientation change for adjacent motion phases selected from the group consisting of: a rest and a defined slow motion phase."

Linjama in combination with *Lehrman* discloses or suggests this limitation. (Ex. 1002, ¶106.) For instance, *Linjama* discloses detecting a downward-facing orientation of mobile terminal 10, followed by detecting an upward-facing orientation of the mobile terminal. (Ex. 1005, ¶[0048] (disclosing that the "predefined gesture" "may include turning mobile terminal 10 to face downwards for a certain period of time, i.e. one or two seconds, and then turning the mobile terminal 10 to face upwards").) Because orientation is detected when the mobile terminal is "substantially stationary" (*supra* Section IX.A.1(g); Ex. 1005, ¶[0052]), *Linjama* discloses detecting orientation change for adjacent motion phases selected from the group consisting of: a rest and a defined slow motion phase. (Ex. 1002,

¶106.) By disclosing a software-implemented orientation detection (i.e., instructions executed by a processor), *Linjama* further discloses *instructions* to detect such orientation change as recited in claim 3. (*Supra* Section IX.A.1(f); Ex. 1005, ¶[0056]; Ex. 1002, ¶106.)

3. Claim 6

a) "The system of claim 1, wherein the motion condition detection by the motion detector detects direction of motion when the motion is orthogonal to gravity."

The *Linjama-Lehrman* combination discloses or suggests this limitation. (Ex. 1002, ¶107.) As discussed above, software that performs the functions of gesture detector 16 also includes software corresponding to the "motion detector" and such software detects the motion condition of mobile terminal 10. (*Supra* Section IX.A.1(f).) *Linjama* also discloses that gesture detector 16 receives "signals" that include "information related to the *direction* and magnitude of movement of the mobile terminal." (Ex. 1005, ¶[0052] (emphasis added).) Therefore, gesture detector 16 also "detects direction of motion" of the mobile terminal 10 as required by claim 6. While *Linjama* does not explicitly disclose that gesture detector 16 "detects direction of motion when the motion is orthogonal to gravity," *Linjama* does not place any restriction on when the gesture detector 16 detects "the *direction* and magnitude of movement of the mobile terminal." Therefore, *Linjama* discloses that software corresponding to the "motion detector" will detect the direction of motion of mobile terminal 10 "when the motion is orthogonal to gravity." (Ex. 1002, ¶107.)

4. Claim 10

a) "The system of claim 1, wherein the orientations detected by the orientation detector are classified in terms corresponding to a particular part of a host device being up or down."

The *Linjama-Lehrman* combination discloses or suggests this limitation. (Ex. 1002, ¶108.) Specifically, as discussed above, *Linjama* discloses that the sequence of orientations detected by gesture detector 16 correspond to a "downward" orientation. (*Supra* Section IX.A.1(i).) *Linjama* explains that "downward" orientation refers to a state in which the "face" of the mobile terminal 10 is facing down instead of facing up. (Ex. 1005, ¶¶[0048]-[0049].) Hence, *Linjama* discloses that gesture detector 17 classifies the detected orientation based on whether the face of the mobile terminal 10 ("particular part of a host device") is up or down.

5. Claim 11

a) "[T]he system of claim 1, wherein the profile is configured as a sequence of orientations detected at slow motion phases separated by fast motion phases."

The *Linjama-Lehrman* combination discloses or suggests this limitation. (Ex. 1002, ¶109.) As discussed above for limitations 1(g) and 1(i), *Linjama* discloses determining "whether the mobile terminal is moving" or "substantially stationary" (Ex. 1005, ¶[0052]), determining a sequence of orientations (*supra* Section IX.A.1(i)), and identifying "fast motion phases" (*supra* Section IX.A.1(f)). (Ex. 1002, ¶109.) A POSITA would have understood that *Linjama*'s substantially stationary phases at which orientations are determined (Ex. 1005, ¶[0052]) are separated by motion of mobile terminal 10 ("fast motion phases"). (Ex. 1002, ¶109.) For instance, *Linjama* discloses turning mobile terminal 10 to face downwards and then turning the mobile terminal 10 to face upwards. (Ex. 1005, ¶[0048].) In order to turn mobile terminal 10 from face downwards to face upwards, there will necessarily be motion and therefore, gesture detector will detect a sequence of orientations (face upwards and face downwards) that are separated in time by motion ("fast motion phase"). (Ex. 1002, ¶109.)

6. Claim 12

a) "An article for processing motion data, comprising:"

To the extent the preamble is limiting, *Linjama* discloses the limitations therein for at least similar reasons as those presented above for the preamble of claim 1. (*Supra* Section IX.A.1(a); Ex. 1002, ¶110; *see also infra* Sections IX.A.6(b)-(k) regarding the remaining elements of this claim.) For example, mobile terminal 10 is an "article for processing motion data." (*Supra* Section IX.A.1(a); Ex. 1002, ¶110; *see also infra* Sections IX.A.6(b)-(k) regarding the remaining elements of this claim.)

b) "a processor in communication with memory;"

Linjama discloses this limitation. (Ex. 1002, ¶111.) *Linjama* discloses a processor 20, controller 18, and gesture detector (collectively, "a processor") in communication with volatile memory 23 ("a memory"). (Ex. 1005, FIG. 1.) (*See supra* Section IX.A.1(b).)

c) "a motion sensor in communication with the processor;"

Linjama discloses this limitation. (*Supra* Section IX.A.1(c); Ex. 1002, ¶112.)

d) "the processor to acquire movement data from the motion sensor;"

Linjama discloses this limitation. (*Supra* Section IX.A.1(d); Ex. 1002, 113.)

e) "a computer readable storage device including computer program instructions configured to detect a motion condition and an orientation condition, the instructions comprising:"

Linjama discloses or suggests this limitation. (Ex. 1002, ¶¶114-116.) Each of claim elements 12(e)-12(j) recites instructions for performing certain functions. As discussed in this section and in sections IX.A.6(f)-(j), each of these functions is performed by gesture detector 16. But as previously discussed, a POSITA would have understood that the functions of gesture detector 16 (and therefore, the functions recited in claim elements 12(e)-12(j)) would be implemented / executed by way of software code / instructions. (*See supra* Section IX.A.1(f).) A POSITA would also have understood that these instructions would be stored on a "computer readable storage device." (Ex. 1002, ¶114.) *Linjama* confirms this. For instance, with respect to the algorithm of Figure 2, *Linjama* discloses "a computer program product comprising *a computer readable storage structure* embodying *computer program code thereon for execution by a computer processor*, wherein the *computer program code comprising instructions* for performing at least the steps of the method according to the invention discussed above in relation to FIG. 2." (Ex. 1005, ¶[0056] (emphasis added).) Steps S12 and S14 in figure 2 represent the functionality of "gesture detector 16." (*Id.*, ¶[0052]; *supra* Section IX.A.1(f).) This confirms the instructions / software code that implements the functions of gesture detector 16 would be stored on a computer readable storage device. (Ex. 1002, ¶114.)

Moreover, *Linjama* discloses "non-volatile memory 24" coupled to controller 18. (Ex. 1005, ¶[0047], FIG. 1.) A POSITA would have understood that "non-volatile memory 24" is a "computer readable storage device including computer program instructions." (Ex. 1002, ¶115.) In view of the above, a POSITA would have understood that non-volatile memory 24 in mobile terminal 10 would be one location where the instructions/ software code corresponding to the functions of gesture detector 14 would be stored. (*Id.*)

With regards to the instructions recited in claim element 12(e), *Linjama* discloses such instructions because it discloses that gesture detector 16 detects "a motion and an orientation condition" as recited in claim element 12(e). (Ex. 1002, ¶116.) Specifically, gesture detector 16 detects that mobile terminal 10 is "substantially stationary" and in a "downward" orientation. (Ex. 1005, ¶[0052].)

f) "instructions to detect motion, including identification of a fast motion phase and a slow motion phase;"

Linjama discloses this limitation at least for similar reasons as those presented above for limitation 1(f). (*Supra* Section IX.A.1(f); Ex. 1002, ¶117; *see also supra* Section IX.A.6(e) (explaining that the instructions are disclosed by the software that implements the functions of gesture detector 16).)

g) "instructions to detect orientation towards gravity for each slow motion phase and absent detecting orientation towards gravity during fast motion phases, wherein the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity;"

Linjama in combination with *Lehrman* discloses or suggests this limitation at least for reasons similar to those presented above for limitation 1(g). (*Supra* Section IX.A.1(g); Ex. 1002, ¶118; *see also supra* Section IX.A.6(e) (explaining that the instructions are disclosed by the software that implements the functions of gesture detector 16).) As discussed above for claim element 1(g), gesture detector 16 "detect[s] orientation towards gravity for each slow motion phase . . . wherein the motion is classified as slow and fast based upon comparing a magnitude of a motion vector with a magnitude of gravity." (*Supra* Section IX.A.1(g); Ex. 1005, ¶[0052].) While it is unclear what is meant by "instructions to . . . absent detecting orientation towards gravity during fast motion phases," the gesture detector 16 does not include instructions to detect orientation for a fast motion phase because gesture detector 16 detects that the mobile terminal 10 is in a downward orientation while the mobile terminal 10 is substantially stationary (i.e., "slow motion phase." (Ex. 1005, ¶[0052].) Therefore, to the extent that Patent Owner contends that this limitation simply means an absence of instructions to detect orientation towards gravity during fast motion phase, *Linjama* discloses this feature because *Linjama* does not disclose such instructions. (Ex. 1002, ¶118.)

h) "instructions to maintain a sequence of the detected orientations, each orientation towards gravity in the sequence being limited to a slow motion phase;"

Linjama in combination with *Lehrman* discloses or suggests this limitation at least for similar reasons as those presented above for limitation 1(i). (*Supra* Section IX.A.1(i); Ex. 1002, ¶119; *see also supra* Section IX.A.6(e) (explaining that the instructions are disclosed by the software that implements the functions of gesture detector 16).)

i) "instructions to produce a profile description for the sequence of the detected orientations; and"

Linjama in combination with *Lehrman* discloses or suggests this limitation at least for similar reasons as those presented above for limitation 1(j). (*Supra* Section IX.A.1(j); Ex. 1002, ¶120; *see also supra* Section IX.A.6(e) (explaining that the instructions are disclosed by the software that implements the functions of gesture detector 16).)

j) "instructions to output an event corresponding to the profile description."

Linjama in combination with *Lehrman* discloses or suggests this limitation at least for similar reasons as those presented above for limitation 1(k). (*Supra* Section IX.A.1(k); Ex. 1002, ¶121; *see also supra* Section IX.A.6(e) (explaining that the instructions are disclosed by the software that implements the functions of gesture detector 16).)

7. Claim 14

a) "The article of claim 12, further comprising the instructions to detect orientation change for adjacent motions selected from the group consisting of: a rest and a defined slow motion condition."

Linjama in combination with *Lehrman* discloses or suggests this limitation at least for reasons similar to those discussed above for claim 3. (Ex. 1002, ¶122; *supra* Section IX.A.2.)

8. Claim 17

a) "The article of claim 12, wherein the instructions to detect motion condition includes direction detection of motion when the motion is orthogonal to gravity."

Linjama in combination with *Lehrman* discloses or suggests this limitation at least for reasons similar to those discussed above for claim 6. (Ex. 1002, ¶123; *supra* Section IX.A.3.)

B. Ground 2: *Linjama* in View of *Lehrman* and *Marvit* Renders Obvious Claims 2, 5, 8, 9, 13, 16, 19, and 20

1. Claim 2

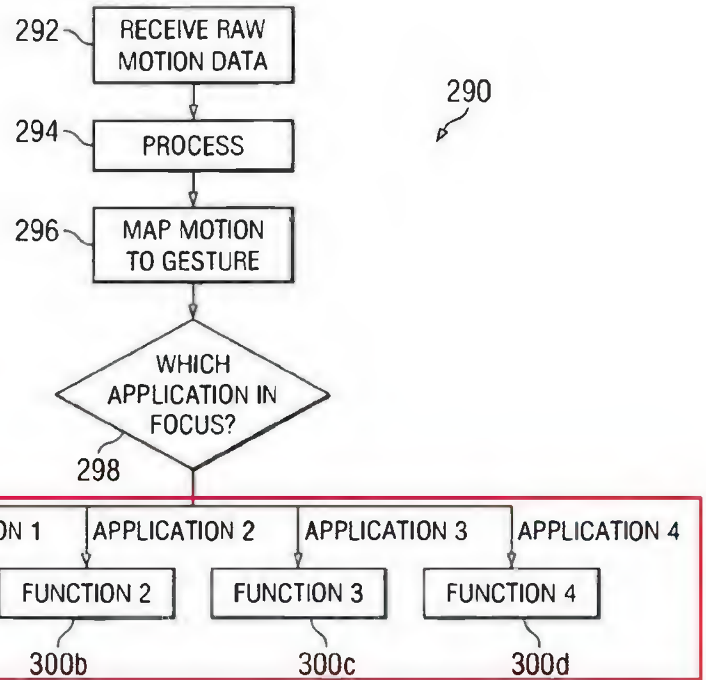
a) "The system of claim 1, wherein the detectors and the manager are configured to receive data from at least one client application and use this data to interpret the profile, wherein the profile descriptions are bound with external data from the at least one client application."

Linjama in combination with *Lehrman* and *Marvit* discloses or suggests this limitation. (Ex. 1002, ¶¶125-130.) *Linjama* and *Lehrman* do not explicitly disclose that "the detectors and the manager are configured to receive data from at least one client application and use this data to interpret the profile, wherein the profile descriptions are bound with external data from the at least one client application." However, it would have been obvious in view of *Marvit* to modify the combined *Linjama-Lehrman* system discussed above for claim 1 to implement such features. (Ex. 1002, ¶125.)

Marvit is directed to gesture-based control of handheld devices, and thus is in the same technical field as *Linjama*. (Ex. 1008, 1:19-20 ("[A] handheld device with [ ] a motion interface is provided."), Title, Abstract; Ex. 1002, ¶126.) Therefore, a POSITA would have had reason to consider the teachings of *Marvit* when implementing the combined *Linjama-Lehrman* system. (Ex. 1002, ¶126.)

Marvit discloses that a handheld device 10 performs a function based on a detected gesture. (Ex. 1008, 28:41-42 ("a user moves handheld device 10 in the form of the letter 'O'"); Ex. 1002, ¶127.) *Marvit*'s "handheld device 10 maps the gesture 'O' to a particular function by accessing a function database . . . which may include a plurality of functions that may be performed by one or more applications running on the device." (Ex. 1008, 28:53-57.) *Marvit* explains that "[t]he particular function mapped to the gesture 'O' may depend on a particular application in focus or being used by the user at the time," and that "[f]or example, in some applications 'O' [may] comprise a command to open a file, while in other applications it may comprise a command to call a certain number." (*Id.*, 28:59-64.) *Marvit* discloses with respect to Figure 19 (annotated below) an approach for mapping a detected gesture to a function based on the application in focus. (*Id.*, 29:49-51 ("In the illustrated embodiment [of Figure 19], a gesture has different functions assigned based on the application in focus."), FIG. 19; Ex. 1002, ¶127.)

FIG. 19



(Ex. 1008, FIG. 19 (annotated to show application-specific mapping of detected gesture to function); Ex. 1002, ¶127.)

Marvit recognizes that "[i]f each gesture were mapped to its own function, no matter what application was in focus[,] then the overall capability of the device would be reduced, and some gestures would likely not be used in some applications." (Ex. 1008, 29:25-28.) Indeed, *Marvit* explicitly states an advantage to taking into account the application (a POSITA would have understood this to be a *client application*) that is in focus, when implementing gesture-based control of mobile device functionality. "The ability for particular gestures to be mapped to different commands depending on the context, such as the application in use, increases the functionality of the device." (Ex. 1008, 29:11-14 (emphasis added); *see also id.*, 29:1-11 (disclosing application-specific meanings for gestures), 30:5-22 ("receiving the gesture input 'S' may be a command for saving a file. If the e-mail application is in focus, then receiving the gesture input 'S' may be a command for sending an e-mail."); Ex. 1002, ¶128.)

In light of *Marvit*'s disclosures, a POSITA would have been motivated to modify the *Linjama-Lehrman* system to receive data from at least one client application on mobile terminal 10 and use this data to interpret the detected the profile description (e.g., the combination of orientation and motion condition in ¶[0052] in *Linjama*), wherein the profile description is bound with external data from the at least one client application. (Ex. 1002, ¶129.) For example, as discussed above, a POSITA would have recognized that receiving data from a client application (such as data regarding the application in focus, in *Marvit*'s above example) and using such data to interpret the combination of orientation and motion conditions (the claimed "profile") would have increased the functionality and capability of *Linjama*'s mobile terminal 10. (*Id.*; Ex. 1008, 29:1-14.) A POSITA would have had the knowledge and skill to configure *Linjama*'s gesture detector 16 and controller 18 to receive and use such data, because those are the components involved in gesture-based control of mobile device functionality, as discussed above for claim 1. (*Supra* Sections IX.A.1(e)-(g) (explaining that the software executing the functions of controller 18 is a "manager" and the software implementing the functions of gesture detector 16 includes software corresponding to the motion and orientation detector); Ex. 1002, ¶129.) The combined *Linjama-Lehrman-Marvit* system would have therefore disclosed that "the detectors and the manager are configured to receive data from at least one client application and use this data to interpret the profile."

A POSITA would further have recognized that binding the profile description in gesture detector 16 in *Linjama* with external data from the client application(s) (e.g., external data representing an application-specific status, such as whether an application is in focus, like in *Marvit*, or application-specific data for mapping a gesture, also like in *Marvit*) would have been a predictable way to implement application-dependent gesture-based control of the mobile terminal. (Ex. 1002, ¶130.) For example, *binding* the profile descriptions with external data from the client application(s) would have been predictable, given *Marvit*'s explicit disclosure of *mapping* detected gestures to functions based on the context, such as the application in use. (Ex. 1008, 29:11-14; Ex. 1002, ¶130.) Such a configuration would have resulted in a more user-friendly system and would have been a straightforward to implement. (Ex. 1002, ¶130.) *KSR*, 550 U.S. at 416.

2. Claim 5

a) "The system of claim 1 wherein the fast motion phase detected by the motion detector is classified as one selected from the group consisting of: motion up against gravity, motion down with gravity, and motion orthogonal to gravity, said classified fast motion phase added to the profile."

Linjama in combination with *Lehrman* and *Marvit* discloses or suggests this limitation. (Ex. 1002, ¶¶131-137.) *Linjama* discloses that gesture detector 16 determines whether the mobile terminal is moving, i.e., in a "fast motion phase." (*Supra* Section IX.A.1(f).) *Linjama* also receives "signals" that include "information related to the *direction* and magnitude of movement of the mobile terminal." (Ex. 1005, ¶[0052] (emphasis added).) Therefore, *Linjama* discloses the "direction" associated with "fast motion phase." (Ex. 1002, ¶131.) But *Linjama* and *Lehrman* do not disclose that the fast motion phase detected by the motion detector "is classified as one selected from the group consisting of: motion up against gravity, motion down with gravity, and motion orthogonal to gravity, said classified fast motion phase added to the profile." Such a feature, however, would have been obvious in view of *Marvit*. (Ex. 1002, ¶131.)

A POSITA would have had reason to consider the teachings of *Marvit* when implementing the combined *Linjama*-*Lehrman* system. (*Supra* Section IX.B.1; Ex. 1002, ¶132.) *Marvit* discloses detecting acceleration of a handheld device along x-, y-, and z-axes, and further discloses with respect to Figure 6 using such acceleration data to determine a "dominant axis of motion." (*Id.*, 8:55-9:6, FIG. 6; Ex. 1002, ¶132.) Therefore, *Marvit* discloses classifying the motion as one of "motion up against gravity, motion down with gravity, and motion orthogonal to gravity," as recited in claim 5. (Ex. 1002, ¶133.)

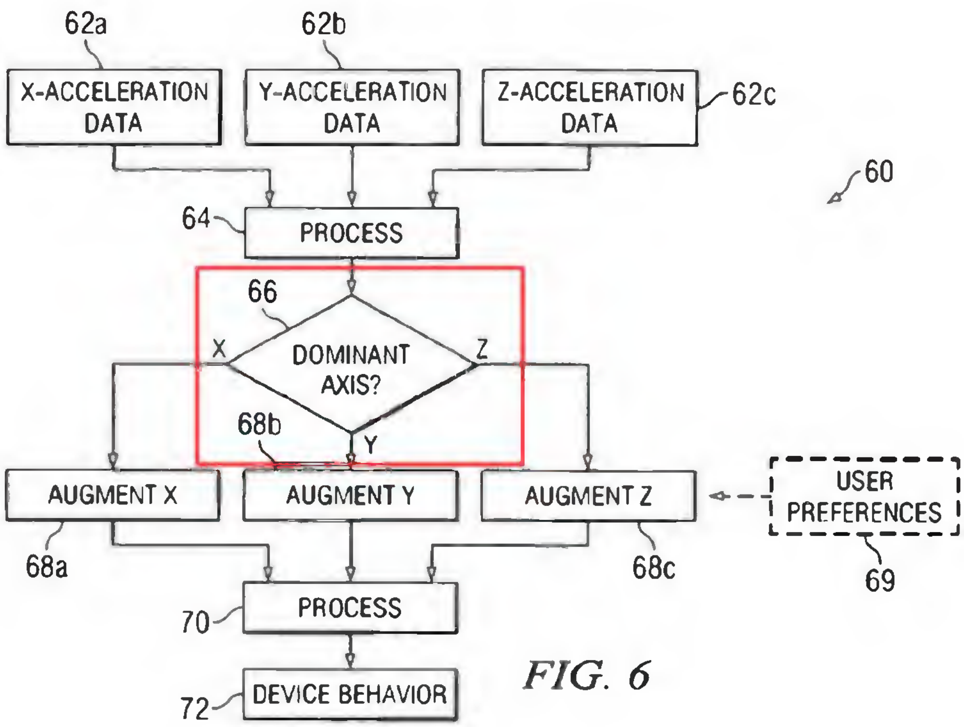
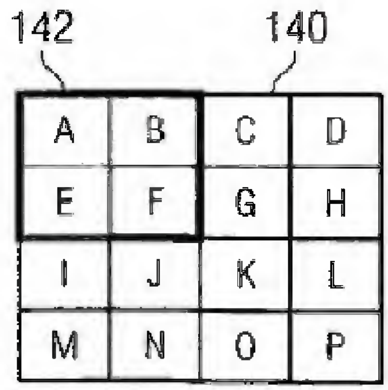


FIG. 6

(Ex. 1008, FIG. 6 (annotated); Ex. 1002, ¶132.)

Marvit also discloses that motion input may be used to navigate a virtual desktop. *Marvit* discloses with reference to Figure 11 that a box 142 "represents information currently displayed at handheld device 10" and "includes portions A, B, E and F of virtual desktop 140." (Ex. 1008, 14:61-63; Ex. 1002, ¶134.)



(Ex. 1008, FIG. 11 (excerpted).)

Marvit explains that "if a user desires to change the information of desktop 140 displayed at the device to, for example, information of boxes C, D, G and H, then the user can use motion input to move box 142 representing the display of the device to the right the necessary amount (two portions to the right in the illustrated example)." (*Id.*, 14:64-15:2.) *Marvit* discloses "moving handheld device 10 to the right an applicable amount to change the information displayed" (*id.*, 15:3-4) and a POSITA would have understood that that such "movement to the right" constitutes "motion orthogonal to gravity." (Ex. 1002, ¶135.) Therefore, for this additional reason, *Marvit* discloses classifying the motion as one of "motion up against gravity, motion down with gravity, and motion orthogonal to gravity," as recited in claim 5.

In light of such disclosures in *Marvit*, a POSITA would have been motivated to configure the combined *Linjama-Lehrman* system so that the fast motion phase detected by gesture detector 16 is classified as one selected from the group consisting of: motion up against gravity, motion down with gravity, and motion orthogonal to gravity, and so that the classified fast motion phase is added to the profile. (*Id.*, ¶136.) Such motion corresponds to "the fast motion phase," as discussed above for limitation 1(f). (*Supra* Section IX.A.1(f); Ex. 1002, ¶136.) A POSITA would have recognized that determining the direction of the motion in *Linjama*, i.e., determining the direction of the "fast motion phase" based on *Marvit* and adding the detected direction (i.e., up against gravity, down against gravity, or orthogonal to gravity) to the profile would have enhanced the gesture detection capabilities of the combined system, e.g., by enabling information about whether motion is up against gravity, down with gravity, or orthogonal to gravity to be used for gesture recognition. (Ex. 1002, ¶136.) *KSR*, 550 U.S. at 416.

3. Claim 8

a) "The system of claim 1, wherein the motion condition detection by the detector includes instructions selected from the group consisting of: detecting start and stop motion, and detecting back-and-forth motion."

While *Linjama* and *Lehrman* do not explicitly disclose this feature, it would have been obvious in view of *Marvit* to configure the combined *Linjama-Lehrman* system (discussed above for claim 1) to implement such features. (Ex. 1002, ¶¶138-139.) A POSITA would have had reason to consider the teachings of *Marvit* when implementing the combined *Linjama-Lehrman* system. (*Supra*

Section IX.B.1; Ex. 1002, ¶138.) *Marvit* discloses determining whether a handheld device is at rest or in motion based on detected changes in acceleration. (Ex. 1008, 10:9 ("handheld device"), 13-17 ("If detected acceleration change along each of the three axes is not greater than a set threshold, then the device may be considered at rest . . . ."; Ex. 1002, ¶138.) *Marvit* discloses that a "process for recognizing a spatial signature may involve pattern recognition and learning algorithms." (Ex. 1008, 21:63-65.) *Marvit* explains that the "[t]he process may analyze relative timings of key accelerations associated with the signature," and that "[t]hese may correspond to *starts and stops of motions*, curves in motions and other motion characteristics." (*Id.*, 21:65-22:1 (emphasis added).)

In light of *Marvit*'s disclosures, a POSITA would have been motivated to configure the combined *Linjama-Lehrman* system so that the motion condition detection by the gesture detector 16 includes instructions for detecting start and stop motion. (Ex. 1002, ¶139.) For example, based on *Marvit*'s explicit statement that starts and stops of motion may be key accelerations for a spatial signature that is to be recognized, a POSITA would have found it beneficial to configure the combined system to be able to detect start and stop motion. (*Id.*) This configuration would have expanded the feature set of the combined *Linjama-Lehrman* system. (*Id.*) Because *Linjama* discloses determining whether mobile terminal is substantially stationary or moving, a POSITA would have known how to implement the above configuration. (*Id.*)

4. Claim 9

a) "The system of claim 1, further comprising the detector and the manager to poll data from non-motion sensors, to fuse the polled data with motion data, and add the data to the profile."

While *Linjama* and *Lehrman* may not explicitly disclose this limitation, it would have been obvious in view of *Marvit* to configure the combined *Linjama-Lehrman* system to implement such features. (Ex. 1002, ¶¶140-141.)

A POSITA would have had reason to consider the teachings of *Marvit* when implementing the combined *Linjama-Lehrman* system. (*Supra* Section IX.B.1; Ex. 1002, ¶140.) *Marvit* discloses receiving data from multiple types of detectors, including cameras ("non-motion sensors") and fusing data from multiple detectors. (Ex. 1002, ¶140.) For example, *Marvit* discloses that a motion detector 22 (red below) within a handheld device 10 "includes accelerometers 24a, 24b and 24c [and] cameras 26a, 26b and 26c." (Ex. 1008, 4:48-49; *see also id.*, 4:40 ("handheld device"), 5:29-31 ("motion detector 22 also includes cameras 26a, 26b and 26c, which may comprise charge coupled device (CCD) cameras or other optical sensors"); Ex. 1002, ¶140.) A POSITA would have understood that *Marvit*'s disclosure of "cameras" discloses or at least suggests "non-motion sensors" as recited in claim 9. (Ex. 1002, ¶140.) *Marvit* further discloses that processing at step 174 of Figure 13 (below) includes "*fusion of data* from multiple detection components." (Ex. 1008, 20:29-30 (emphasis added); *see also id.*, FIG. 13.)

In light of *Marvit*'s disclosures, a POSITA would have been motivated to configure the combined *Linjama-Lehrman* system to enable the detector and the manager to poll data from non-motion sensors, to fuse the polled data with motion data, and add the data to the profile. (Ex. 1002, ¶141.) For example, in light of *Marvit*'s disclosure regarding cameras a POSITA would have recognized the benefit of polling data from non-motion sensors (e.g., cameras) and fusing such polled data with motion data, e.g., to provide a richer data set that could enable additional inferences to be drawn regarding the gestures made by the user. (*Id.*) Fusing data from various sensors was well known long before the alleged invention of the '106 patent and would have been predictable to implement in order to improve performance and/or accuracy of motion detection and/or orientation detection. (*Id.*) A POSITA would also have been motivated to add the data to the profile, in order to provide greater functionality for the combined system (e.g., to enable inferences to be drawn based on still image data captured by a camera and fused with motion data). (*Id.*) *KSR*, 550 U.S. at 416.

5. Claim 13

a) "The article of claim 12, further comprising instructions to receive data from at least one client application and use this data to interpret the profile, wherein the profile descriptions are bound with external data from the at least one client application."

Linjama in combination with *Lehrman* and *Marvit* discloses or suggests the features of claim 13, for at least reasons similar to those presented above regarding claim 2. (*Supra* Sections IX.A.6, IX.B.1; Ex. 1002, ¶142.)

6. Claim 16

a) "The article of claim 12 wherein the instructions to detect motion include a motion condition classification selected from the group consisting of: motion up against gravity, motion down with gravity, and motion orthogonal to gravity."

Linjama in combination with *Lehrman* and *Marvit* discloses or suggests this limitation at least for similar reasons as those presented above for claim 5. (*Supra* Sections IX.A.6, IX.B.2; Ex. 1002, ¶143.)

7. Claim 19

a) "The article of claim 12, wherein the instructions to detect motion condition include instructions selected from the group consisting of: detecting start and stop motion, and detecting back-and-forth motion."

Linjama in combination with *Lehrman* and *Marvit* discloses or suggests this limitation, for at least reasons similar to those presented above regarding claim 8. (*Supra* Sections IX.A.6, IX.B.3; Ex. 1002, ¶144.)

8. Claim 20

a) "The article of claim 12, further comprising instructions to poll data from non-motion sensors and to fuse the polled data with motion data."

Linjama in combination with *Lehrman* and *Marvit* discloses or suggests this limitation, for at least reasons similar to those presented above regarding claim 9. (*Supra* Sections IX.A.6, IX.B.4; Ex. 1002, ¶145.)

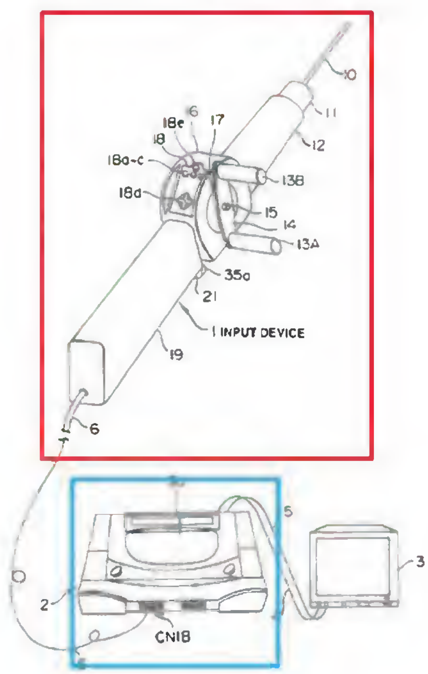
C. Ground 3: *Linjama* in View of *Lehrman* and *Tosaki* Renders Obvious Claims 1, 3, 4, 6, 7, 10-12, 14, 15, 17, and 18

1. Claim 1

As discussed above in Ground 1, *Linjama* in combination with *Lehrman* discloses all the limitations of claim 1. (*Supra* Sections IX.A.1(a)-(k); Ex. 1002, ¶¶66-105, 147.) Petitioner anticipates that Patent Owner may argue that claim 1 requires that the motion based input system *only* detects orientation towards gravity during a slow motion phase. Patent Owner may argue that such a feature is implied by one or more limitations of claim 1 (e.g., "each orientation in the sequence being limited to a slow motion phase") and is not disclosed by the *Linjama-Lehrman* combination. While *Linjama* discloses such a feature (*supra* Section IX.A.1(i)), such a feature would nevertheless have been rendered obvious by the *Linjama-Lehrman* combination in view of *Tosaki*. (Ex. 1002, ¶¶147-155.)

Tosaki "relates to an input device used in a game which simulates fishing" and discloses detecting the motion and orientation of the input device. (Ex. 1009, 1:7-8, 7:11-32; Ex. 1002, ¶148.) Therefore, a POSITA would have had reason to consider the teachings of *Tosaki* when implementing *Linjama*'s system because, as discussed above, *Linjama* also discloses detecting motion and orientation of an input device (mobile terminal 10). (Ex. 1002, ¶148; Ex. 1005, ¶[0052].) Having looked to *Tosaki*, a POSITA would have seen that *Tosaki* discloses an input device 1 (red below) coupled to a game processing device 2 (blue below):

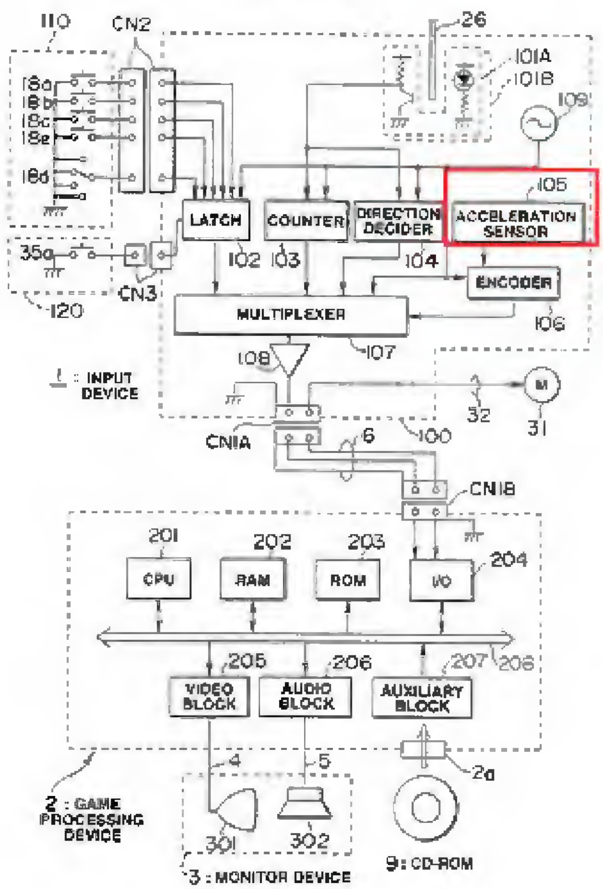
FIG.1



(Ex. 1009, FIG. 1 (annotated to show input device 1 in red, and game processing device 2 in blue); Ex. 1002, ¶148.)

As shown in Figure 4 (annotated below), *Tosaki* discloses that input device 1 includes an acceleration sensor 105 that detects acceleration. (Ex. 1009, 6:44-49, 7:4-7, FIGS. 4; Ex. 1002, ¶149.)

FIG.4



(Ex. 1009, FIG. 4 (annotated); Ex. 1002, ¶149.)

Tosaki discloses using acceleration sensor 105 to detect one of two attributes of input device 1—its "strength of movement," or alternatively its "orientation." (Ex. 1009, 7:11-20; Ex. 1002, ¶150.) *Tosaki* explicitly states that "strength of movement" and "orientation" (also referred to in *Tosaki* as "inclination") are detected in different modes of operation, called "acceleration detection mode" and "inclination detection mode," respectively. (Ex. 1009, 7:20-22, 7:33-34, 7:44-57; Ex. 1002, ¶150.) *Tosaki* explains that "[t]his clear distinction between an acceleration detection mode and an inclination detection mode is made *in order to eliminate the instability arising when the system detects inclination at all times*, whereby even the smallest movements made by the player holding the rod are detected and these are reflected in the game processing, *leading to processing is that is not intended by the player*." (Ex. 1009, 7:33-39 (emphasis added).) Thus, *Tosaki* discloses that orientation (i.e., "inclination" in *Tosaki*) is only detected in inclination detection mode, and explains why doing so only in inclination detection mode is beneficial. (Ex. 1002, ¶150.)

Tosaki discloses that "the inclination is detected when the size of the data is smaller than the acceleration due to gravity" and the strength of the movement is detected if the strength of the movement is greater than the acceleration due to gravity. (Ex. 1009, 9:5-11.) That is, *Tosaki* discloses detecting orientation or inclination of the input device only when the detected acceleration is less than the acceleration due to gravity (i.e., only when the input device is in "a slow motion phase"). (Ex. 1002, ¶151.)

In light of *Tosaki*'s disclosures, a POSITA would have been motivated to modify *Linjama*'s system so that gesture detector 16 only detects orientation during a slow motion phase (e.g., when the mobile terminal 10 is "substantially stationary"). (*Id.*, ¶152.) As discussed above for claim 1, *Linjama* discloses a first phase in which mobile terminal 10 is substantially stationary and a second phase in which mobile terminal is moving, and further discloses that a "downward orientation" is sensed during the substantially stationary phase. (Ex. 1005, ¶[0052].) In light of *Tosaki*, a POSITA would have recognized that maintaining a sequence of detected orientations where each orientation in the sequence is limited to a slow motion phase (e.g., limited to a substantially stationary phase) would have helped ensure that unintended movements (e.g., when the mobile terminal is not substantially stationary) do not result in identification of gestures that the user did not intend. (Ex. 1002, ¶152.) The above modification would have made the combined system more user-friendly. (*Id.*)

A POSITA would have also recognized that detecting orientation in only a slow motion phase would have allowed the mobile terminal 10 to save power because the orientation detection would not be conducted all the time. (*Id.*, ¶153.) The power savings motivation is consistent with *Linjama*'s discussion in ¶[0046] where *Linjama* explains reducing signaling to reduce power consumption. (Ex. 1002, ¶153; Ex. 1005, ¶[0046].)

Such a modification of the combined *Linjama-Lehrman* system based on *Tosaki* would have been straightforward for a POSITA to implement. (Ex. 1002, ¶154.) *KSR*, 550 U.S. at 416. For instance, simple modifications would have been made to the software code for gesture detector 16 such that the orientation of mobile terminal 10 is only detected when the mobile terminal 10 is substantially stationary. (Ex. 1002, ¶154.)

Linjama in combination with *Lehrman* and *Tosaki* discloses or suggests the remaining limitations of claim 1 for the reasons discussed above for claim 1 in Ground 1 with the only modification to the analysis for claim 1 being that discussed above. (*Supra* Sections IX.A.1(a)-(k); Ex. 1002, ¶155.)

2. Claims 3, 6, 10-12, 14, and 17

Linjama in combination with *Lehrman* and *Tosaki* discloses or suggests the limitations of these claims for reasons similar to those discussed in Sections IX.A.2-8; Ex. 1002, ¶156.) The same analysis presented above for these claims in Ground 1 is also applicable for the *Linjama-Lehrman-Tosaki* combination discussed above in Section IX.C.1. (Ex. 1002, ¶156.) But for claims 3 and 6, the following additional analysis applies.

With respect to claim 3, *Linjama* discloses detecting a downward-facing orientation of mobile terminal 10, followed by detecting an upward-facing orientation of the mobile terminal. (Ex. 1005, ¶[0048] (disclosing that the "predefined gesture" "may include turning mobile terminal 10 to face downwards for a certain period of time, i.e. one or two seconds, and then turning the mobile terminal 10 to face upwards").) Because orientation is detected only when the mobile terminal is "substantially stationary" (i.e., in the "slow motion phase") in the *Linjama-Lehrman-Tosaki* combination (*supra* Section IX.C.1), the motion phase for each of these orientations (i.e., upward-facing and downward-facing) is an "adjacent motion phase" "selected from the group consisting of: a rest and a defined slow motion phase." (Ex. 1002, ¶157.)

With respect to claim 12, the *Linjama-Lehrman-Tosaki* combination discloses that the gesture detector 16 only detects orientation towards gravity for a slow motion phase. (*Supra* Section IX.C.1.) Therefore, the *Linjama-Lehrman-Tosaki* combination discloses "instructions to detect orientation towards gravity for each slow motion phase and *absent detecting orientation towards gravity during fast motion phases*" as recited in claim element 12(g). (Ex. 1002, ¶158.)

3. Claims 4 and 15

a) "4. The system of claim 1, further comprising instructions to avoid detecting orientation during a fast motion condition."

b) "15. The article of claim 12, further comprising instructions to avoid detecting orientation during a fast motion condition."

Linjama in combination with *Lehrman* and *Tosaki* discloses or suggests the feature of dependent claims 4 and 15 because in the *Linjama-Lehrman-Tosaki* combination discussed above, gesture detector 16 *only* detects orientation during a slow motion phase. (*Supra* Section IX.C.1; Ex. 1002, ¶159.) Therefore, the combination discloses "instructions to avoid detecting orientation during a fast motion condition." (Ex. 1002, ¶159; *supra* Section IX.A.1(f) (explaining that software implements the functions of gesture detector 16).)

4. Claims 7 and 18

While *Linjama* and *Lehrman* do not explicitly disclose the limitations of claim 7, it would have been obvious in view of *Tosaki* to modify the combined *Linjama-Lehrman* system to implement such features. (Ex. 1002, ¶¶160-164.)

Tosaki, which is discussed above for claim 1 in Section IX.C, discloses that input device 1 may be "modelled on a bat used when actually playing baseball." (Ex. 1009, 16:17-18.) *Tosaki* discloses that when such an input device 1 is used in the context of a computer-implemented baseball simulation game, "the path of the swing should be determined *by detecting the angle of the bat before the start of the swing and after the end of the swing*, and then finding the general path of the bat by referring to a table or the like which converts these angles to a path of travel." (*Id.*, 16:43-47 (emphasis added).)

In light of *Tosaki*'s disclosure, a POSITA would have been motivated to configure the combined *Linjama-Lehrman-Tosaki* system discussed above for claim 1 (*supra* Section IX.C.1) so that the fast motion detection by the motion detector includes instructions to compute and add to the profile a rotation angle required to transfer from a first motion phase to a second motion phase based on orientation at the first and second motion phases, the first and second motion phases selected from the group consisting of: slow motion and rest. (Ex. 1002, ¶162.) For example, such a skilled person would have recognized that at the start and end of a swing of input device 1 simulating a baseball bat, the input device would have been substantially stationary. (*Id.*)

Therefore, and in light of *Linjama*'s disclosure that orientation is determined when mobile terminal 10 is substantially stationary (Ex. 1005, ¶[0052]), a POSITA would have been motivated to configure the combined *Linjama-Lehrman-Tosaki* system as discussed above. (Ex. 1002, ¶163.) In particular, adding such a rotation angle to the profile would have enabled a swing as described above to be identified by *Linjama*'s gesture detector 16, thereby adding functionality to the combined system. (*Id.*) In other words, implementing the above configuration would have enabled *Linjama*'s mobile terminal 10 to be used as a like baseball bat, e.g., so that motion and orientation could be detected in order to support a baseball game simulation. (*Id.*) This configuration would have made the combined system more user-friendly by enabling a broader variety of movements/orientations to be recognized. (*Id.*)

While *Linjama* and *Lehrman* do not explicitly disclose the limitations of claim 18, it would have been obvious in view of *Tosaki* to modify the combined *Linjama-Lehrman* article (discussed above for claim 12) to implement such features, for at least reasons similar to those discussed above regarding claim 7. (Ex. 1002, ¶164.)

D. Ground 4: *Linjama* in View of *Lehrman*, *Tosaki*, and *Marvit* Renders Obvious Claims 2, 5, 8, 9, 13, 16, 19, and 20

Linjama in combination with *Lehrman* and *Tosaki*, and *Marvit* discloses or suggests the features of dependent claims 2, 5, 8, 9, 13, 16, 19, and 20 for at least similar reasons as those presented above for these dependent claims in Ground 2. (Ex. 1002, ¶165-166.) The addition of *Tosaki* does not affect the analysis for these dependent claims in Ground 2. (Ex. 1002, ¶166.)

X. THE BOARD SHOULD INSTITUTE ALL GROUNDS

For Ground 1 Petitioner relies on *Linjama* in view of *Lehrman* for the independent claims (claims 1 and 12), and for Ground 3 Petitioner instead relies on

Linjama in view of *Lehrman* and *Tosaki* to address a possible argument and/or interpretations by Patent Owner and/or the Board (*supra* Section IX.C.1). Therefore, Grounds 1 and 3 are different. Moreover, the addition of Ground 3 also allows Petitioner to challenge claims 4, 7, 15, and 18, which are not challenged under the combination presented in Ground 1. In Grounds 2 and 4, Petitioner addresses claims 2, 5, 8, 9, 13, 16, 19, and 20 based on the additional disclosures in *Marvit*, following the respective approaches taken in Grounds 1 and 3 regarding the independent claims. All grounds should be instituted in order to enable fuller development of the record.

XI. CONCLUSION

For the reasons given above, Petitioner requests institution of IPR for claims 1-20 of the '106 patent based on each of the grounds specified in this petition.

Respectfully submitted,

Dated: April 27, 2018 By: /Naveen Modi/
Naveen Modi (Reg. No. 46,224)

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(d), the undersigned certifies that the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 8,370,106 contains, as measured by the word-processing system used to prepare this paper, 13,918 words. This word count does not include the items excluded by 37 C.F.R. § 42.24 as not counting towards the word limit.

Respectfully submitted,

Dated: April 27, 2018

By: /Naveen Modi/
Naveen Modi (Reg. No. 46,224)

CERTIFICATE OF SERVICE

I hereby certify that on April 27, 2018, I caused a true and correct copy of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 8,370,106 and supporting exhibits to be served via express mail on the Patent Owner at the following correspondence address of record as listed on PAIR:

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A courtesy copy was also sent electronically to Patent Owner's litigation counsel listed below:

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Paper No. 7
Entered: November 7, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

KEYNETIK, INC.,
Patent Owner.

Case IPR2018-00986
Patent 8,370,106 B2

Before LYNNE E. PETTIGREW, IRVIN E. BRANCH, and STACEY G. WHITE, *Administrative Patent Judges*.

BRANCH, *Administrative Patent Judge*.

DECISION
Institution of *Inter Partes* Review
35 U.S.C. § 314(a)

I. INTRODUCTION

Samsung Electronics Co., Ltd. ("Petitioner") filed a Petition (Paper 1, "Pet.") to institute an *inter partes* review of claims 1–20 of U.S. Patent No. 8,370,106 B2 (Ex. 1001, "the '106 patent"). KEYnetik, Inc. ("Patent

C. Real Parties-in-Interest

Petitioner identifies Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. as the real parties-in-interest. Pet. 1. Patent Owner identifies only itself as a real party-in-interest. Paper 4, 1.

D. Related Proceedings

The parties state that the '106 patent is asserted in *KEYnetik, Inc. v. Samsung Electronics Co., Ltd.*, Case No. 2-17-cv-02794 (D.N.J.). Pet. 1; Paper 4, 2.

III. ANALYSIS

A. The Level of Ordinary Skill

In determining the level of ordinary skill in the art, various factors may be considered, including the "type of problems encountered in the art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *In re GPAC Inc.*, 57 F.3d 1573, 1579 (Fed. Cir. 1995) (quotation and citation omitted). We also are mindful that the level of ordinary skill in the art may be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001); *In re Oelrich*, 579 F.2d 86, 91 (CCPA 1978).

Petitioner proposes that "[a] person of ordinary skill in the art at the time of the alleged invention of the '106 patent ('POSITA') would have had at least a bachelor's degree in electrical engineering or a similar field, and at least two to three years of experience in motion sensing techniques and devices." Pet. 3–4 (citing Ex. 1002 ¶¶16–17). Petitioner contends that "[m]ore education can substitute for practical experience and vice versa."

Id. at 4. Patent Owner advances essentially the same understanding.[5] *See* Prelim. Resp. 18.

For purposes of this decision, we adopt Patent Owner's proffered level of skill in the art.

B. Claim Construction

The Board interprets claims of an unexpired patent using the broadest reasonable construction in light of the specification of the patent in which they appear. *See* 37 C.F.R. § 42.100(b) (2017); *Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 2131, 2144–46 (2016) (upholding the use of the broadest reasonable interpretation standard); Office Patent Trial Practice Guide, 77 Fed. Reg. 48,756, 48,766 (Aug. 14, 2012). Under the broadest reasonable construction standard, claim terms are generally given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art at the time of the invention and in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Petitioner proposes constructions for the claim 1 terms "motion detector," "orientation detector," and "inference state machine." Pet. 11–14.

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[5] Patent Owner contends:

> A PHOSITA relevant to the '106 Patent, in the 2007–2009 time frame, would have been someone familiar with the various motion-sensing technologies by way of experience and/or schooling. That person would likely have earned a bachelor's degree in electrical engineering, computer science or another related field, and have at least two years of experience with motion-sensing technologies. More education can substitute for practical experience and vice versa.

Prelim. Resp. 18.