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Paper 10
Entered: July 12, 2019

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

CYWEE GROUP LTD.,
Patent Owner.

Case IPR2019-00534
Patent 8,552,978 B2

Before PATRICK M. BOUCHER, KAMRAN JIVANI, and CHRISTOPHER L. OGDEN, *Administrative Patent Judges*.

BOUCHER, *Administrative Patent Judge.*

DECISION
Petition for *Inter Partes* Review and Motion for Joinder
35 U.S.C. §§ 314(a), 315(c)

Samsung Electronics Co., Ltd. ("Petitioner") filed (1) a Petition (Paper 1, "Pet.") to institute an *inter partes* review of claims 10 and 12 of U.S. Patent No. 8,552,978 B2 (Ex. 1001, "the '978 patent"); and (2) a Motion for Joinder (Paper 3, "Mot.") with IPR2018-01257 ("the related IPR"), which was instituted on December 11, 2018. CyWee Group Ltd.

("Patent Owner") filed a Preliminary Response (Paper 9, "Prelim. Resp.") to the Petition, as well as an Opposition (Paper 6, "Opp.") to Petitioner's Motion for Joinder. Petitioner filed a Reply (Paper 7, "Reply") to Patent Owner's Opposition in support of its Motion.

We grant the Motion for Joinder, joining Petitioner as a party to the related IPR, and terminate this proceeding.

I. BACKGROUND

A. The '978 Patent

The '978 patent "generally relates to a 3D pointing device," which is described as having the function of "detecting motions of the device and translating the detected motions to a cursor display such as a cursor pointing on the screen . . . of a 2D display device." Ex. 1001, 1:22–23, 1:29–33. For example, the pointing device "may be a mouse of a computer or a pad of a video game console" and the display device "may be a part of the computer or the video game console." *Id.* at 1:36–39. A user may then perform control actions and movements with the pointing device for some purpose, such as playing a video game. *Id.* at 1:52–55. For example, when the user moves the pointing device, a pointer on the display device may "move along with the orientation, direction and distance travelled by the pointing device." *Id.* at 1:56–61.

Figure 3 of the '978 patent is reproduced below.

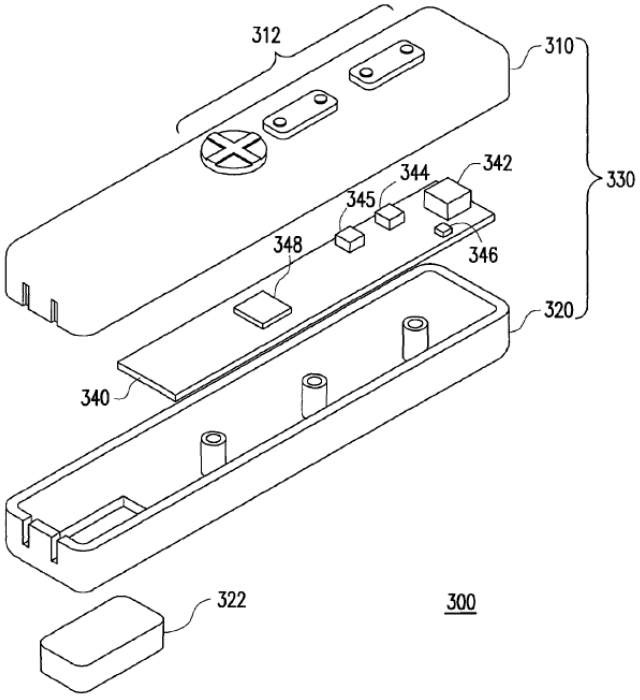

FIG. 3

Figure 3 is an exploded diagram showing electronic device 300, which may correspond to a pointing device. *Id.* at 9:14–16. Within housing 330, formed of top cover 310 and bottom cover 320, are rotation sensor 342, accelerometer 344, and magnetometer 345, each attached to printed circuit board 340, as well as other components that allow data transmission and processing. *Id.* at 9:26–33.

The ’978 patent refers to rotation sensor 342, accelerometer 344, and magnetometer 345 as “a nine-axis motion sensor module.” *Id.* at 9:57–62. The term “nine-axis” refers to and includes three angular velocities ω_x, ω_y, ω_z detected by rotation sensor 342, three axial accelerations Ax, Ay, Az detected by accelerometer 344, and three “magnetisms” Mx, My, Mz detected by magnetometer 345. *Id.* at 9:65–10:23. The *x*, *y*, and *z* components are illustrated in the patent for a Cartesian spatial reference

frame relative to electronic device 300, but, more generally, "may not need to be orthogonal in a specific orientation and they may be rotated in different orientations." *Id.* at 10:23–29.

Various dynamic environments may present external influences that impact the ability to calculate orientation accurately. *See id.* at 15:53–16:4. For example, nongravitational forces may cause undesirable axial accelerations and/or extraneous electromagnetic fields may cause undesirable magnetism. *Id.* at 15:55–60. Such complications are addressed with a method illustrated by the flow diagram shown in Figure 7 of the '978 patent, reproduced below.

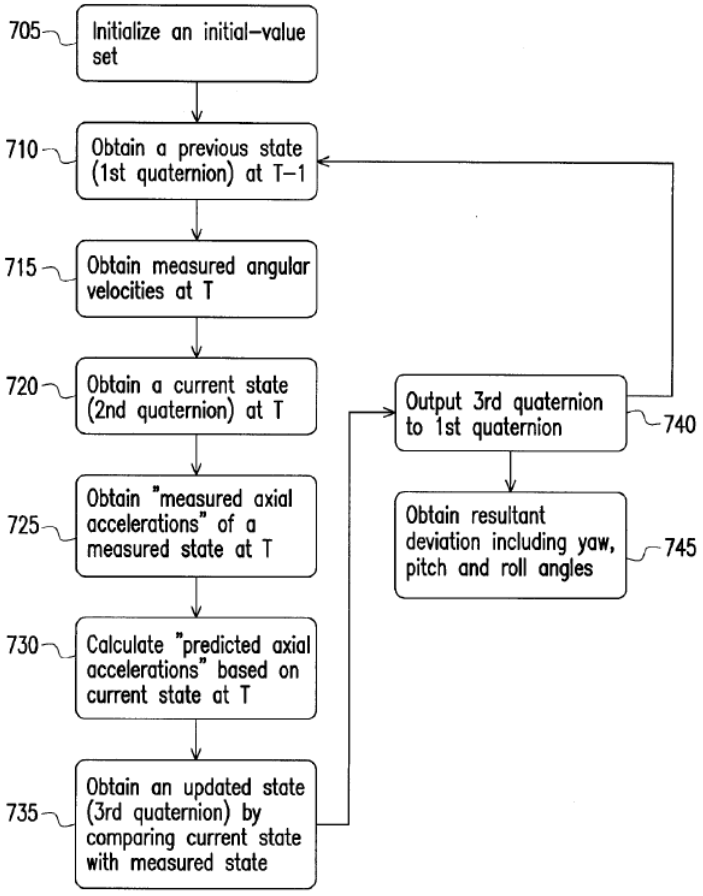

FIG. 7

Figure 7 shows a method "for obtaining and/or outputting a resultant deviation including deviation angles in a spatial reference frame of an electronic device." *Id.* at 13:60–63. The method of Figure 7 uses quaternions, which Petitioner's declarant, Majid Sarrafzadeh, Ph.D., explains are four-valued vector generalizations of complex numbers with "special mathematical properties that allow them to describe rotations efficiently." Ex. 1002 ¶¶ 30–31.

After obtaining a previous state of the nine-axis sensor module at steps 705 and 710, the method obtains measured angular velocities ω_x, ω_y, ω_z

from the motion sensor signals of the nine-axis motion sensor module at a current time, at steps 715 and 720. Ex. 1001, 14:23–43. A current-time measured state of the nine-axis motion sensor module is then obtained by obtaining measured axial accelerations Ax, Ay, Az at step 725; and predicted axial accelerations Ax′, Ay′, Az′ based on measured angular velocities ω_x, ω_y, ω_z are calculated at step 730. *Id.* at 14:43–51. This allows obtaining an updated state of the nine-axis motion sensor module at step 735 by comparing the current state with the measured state. *Id.* at 14:51–54. "[T]o provide a continuous loop," the updated state of the nine-axis motion sensor module is output to the previous state at step 740, i.e. by outputting the third quaternion obtained at step 735 to the first quaternion identified at step 710 for the previous state. *Id.* at 14:62–15:3. Ultimately, the resultant deviation is obtained at step 745, "whereby the resultant deviation compris[es] deviation angles associated with the updated state of the nine-axis motion module[,] excluding said undesirable external interferences in the dynamic environments." *Id.* at 14:54–62.

B. Challenged Claims

Challenged claims 10 and 12 are reproduced below.

> 10. A method for compensating rotations of a 3D pointing device, comprising:
>
> generating an orientation output associated with an orientation of the 3D pointing device associated with three coordinate axes of a global reference frame associated with Earth;

> generatin[g] a first signal set comprising axial accelerations associated with movements and rotations of the 3D pointing device in the spatial reference frame;
>
> generating a second signal set associated with Earth's magnetism; generating the orientation output based on the first signal set, the second signal set and the rotation output or based on the first signal set and the second signal set;
>
> generating a rotation output associated with a rotation of the 3D pointing device associated with three coordinate axes of a spatial reference frame associated with the 3D pointing device; and
>
> using the orientation output and the rotation output to generate a transformed output associated with a fixed reference frame associated with a display device, wherein the orientation output and the rotation output is generated by a nine-axis motion sensor module; obtaining one or more resultant deviation including a plurality of deviation angles using a plurality of measured magnetisms Mx, My, Mz and a plurality of predicted magnetism Mx′, My′, Mz′ for the second signal set.

Ex. 1001, 36:62–37:21.

> 12. The method of claim 10, wherein the orientation output is a rotation matrix, a quaternion, a rotation vector, or comprises three orientation angles.

Id. at 36:36–38.

C. Evidence

Petitioner relies on the following references:

Bachmann	US 7,089,148 B1	Aug. 8, 2006	Ex. 1004
Zhang	US 2004/0095317 A1	May 20, 2004	Ex. 1005
Liberty	US 7,158,118 B2	Jan. 2, 2007	Ex. 1006

In addition, Petitioner relies on a Declaration by Majid Sarrafzadeh, Ph.D. Ex. 1002. Patent Owner relies on a Declaration by Joseph LaViola, Ph.D. Ex. 2004.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 10 and 12 under 35 U.S.C. § 103(a) over the combination of Zhang and Bachmann and over the combination of Liberty and Bachmann. Pet. 3.

E. Real Parties in Interest

Petitioner identifies Samsung Electronics Co., Ltd. and Samsung Electronics America, Inc. as real parties in interest. Pet. 1. Patent Owner identifies only itself as a real party in interest. Paper 5, 2.

F. Related Matters

The parties identify the following matters as involving the '978 patent: (1) *CyWee Group Ltd. v. Google, Inc.*, No. 1:18-cv-00571 (D. Del.); (2) *CyWee Group Ltd. v. ZTE Corporation*, No. 3:17-cv-02130 (S.D. Cal.); (3) *CyWee Group Ltd. v. HTC Corporation*, No. 2:17-cv-00932 (W.D. Wash.); (4) *CyWee Group Ltd. v. Motorola Mobility LLC*, No. 1:17-cv-00780; (5) *CyWee Group Ltd. v. Huawei Technologies Co., Inc.*, No. 2:17-cv-00495 (E.D. Tex.); (6) *CyWee Group Ltd. v. LG Electronics, Inc.*, No. 3:17-cv-01102 (S.D. Cal.); (7) *CyWee Group Ltd. v. Samsung Electronics Co. Ltd.*, No. 2:17-cv-00140 (E.D. Tex.); and (8) *CyWee Group Ltd. v. Apple Inc.*, No. 4-14-cv-01853 (N.D. Cal.). Pet. 1–2; Paper 5, 2–3.

In addition to the instant proceeding, other parties have filed petitions and moved to join the related proceeding in the following matters: IPR2019-00525 (ZTE (USA), Inc.), IPR2019-00560 (LG Electronics Inc.), and IPR2019-00563 (Huawei Device USA, Inc. *et al.*). *See* Paper 5, 3. Related U.S. Patent No. 8,441,438 B2 ("the '438 patent") is the subject of IPR2018-01258. Petitioner notes that it has filed a petition challenging claims of the '438 patent, as well as filed a motion to join IPR2018-01258 in IPR2019-00535. Pet. 2. In addition, other parties have filed petitions and moved to join IPR2018-01258 in the following matters: IPR2019-00526 (ZTE (USA), Inc.), IPR2019-00559 (LG Electronics Inc.), and IPR2019-00562 (Huawei Device USA, Inc. *et al.*).

II. ANALYSIS

A. Introduction

In the related IPR, we instituted an *inter partes* review of claims 10 and 12 on the bases set forth above. *Google LLC v. CyWee Group Ltd.*, Case IPR2018-01257, slip op. at 7, 26 (PTAB Dec. 11, 2018) (Paper 8).

Petitioner challenges the same claims challenged in the related IPR on the same grounds of unpatentability. Pet. 3. The Petition is also "substantially identical" to the petition upon which review was instituted in the related IPR. *See* Mot. 1; Ex. 1012 (redlined version of Petition provided by Petitioner to highlight deviations from the petition in the related IPR). Patent Owner's Preliminary Response differs in certain respects from the preliminary response filed by Patent Owner in the related IPR. And Patent Owner relies on testimony by a different witness than it relied on during the

preliminary phase of the related IPR. *See* Ex. 2004. Accordingly, we initially address whether the Petition "warrants the institution of an inter partes review under section 314" in light of the arguments and evidence provided by Patent Owner specific to this proceeding. 35 U.S.C. § 315(c).

B. Legal Principles

Petitioner advances only obviousness challenges. A claim is unpatentable for obviousness under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are "such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective indicia of non-obviousness, i.e., secondary considerations.[1] *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

Additionally, the obviousness inquiry typically requires an analysis of "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *KSR*, 550 U.S. at 418 (citing *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) (requiring "articulated

[1] The parties do not address secondary considerations, which, accordingly, do not form part of our analysis.

reasoning with some rational underpinning to support the legal conclusion of obviousness")); *see In re Warsaw Orthopedic, Inc.*, 832 F.3d 1327, 1333 (Fed. Cir. 2016) (citing *DyStar Textilfarben GmbH & Co. Deutschland KG v. C.H. Patrick Co.*, 464 F.3d 1356, 1360 (Fed. Cir. 2006)).

C. Level of Ordinary Skill in the Art

Both Petitioner's declarant, Dr. Sarrafzadeh, and Patent Owner's declarant, Dr. LaViola, opine that a person of ordinary skill in the art would have "at least a Bachelor's Degree in Computer Science, Electrical Engineering, Mechanical Engineering, or Physics, or equivalent work experience, along with knowledge of sensors (such as accelerometers, gyroscopes and magnetometers), and mobile computing technologies." Ex. 1002 ¶ 24; Ex. 2004 ¶ 27. This statement is generally consistent with our determination in the related IPR that a person of ordinary skill in the art would have "an undergraduate degree in computer science, electrical engineering, mechanical engineering, or other related technical field, and knowledge of sensor systems and quaternion mathematics." *See Google*, slip op. at 15.

Dr. LaViola adds that such a person would also "be familiar with Kalman filters and EKFs [i.e., extended Kalman filters], and with equations typically used with such filters." Ex. 2004 ¶ 27. For purposes of this Decision, we do not adopt Dr. LaViola's statement regarding this additional specialized knowledge. Our conclusion would be the same even under Dr. LaViola's articulation of the standard because, if anything, such additional

specialized knowledge would strengthen the reason for effecting the combination of references that Petitioner proposes.

Accordingly, for purposes of this Decision, we consider a person of ordinary skill in the art to have an undergraduate degree in computer science, electrical engineering, mechanical engineering, or other related technical field, and knowledge of sensor systems and quaternion mathematics.

D. Claim Construction

Between the time the petition in the related IPR was filed and when the instant Petition was filed, the Board changed the claim-construction standard it uses in trial proceedings. *See* Changes to the Claim Construction Standard for Interpreting Claims in Trial Proceedings Before the Patent Trial and Appeal Board, 83 Fed. Reg. 51,340, 51,340 (Oct. 11, 2018) (stating "[t]his rule is effective on November 13, 2018 and applies to all IPR, PGR and CBM petitions filed on or after the effective date"). Specifically, the claims were construed in the related IPR using the broadest reasonable interpretation in light of the patent specification. *Google*, slip op. at 8 (citing 37 C.F.R. § 42.100(b) (2016)). For petitions filed after November 13, 2018, the Board uses "the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." 37 C.F.R. § 42.100(b); *see Phillips v. AWH Corp.*, 415 F.3d 1303, 1312–13 (Fed. Cir. 2005) (en banc).

Petitioner contends that we nonetheless "should apply the [broadest reasonable interpretation] standard to the instant petition because Samsung is simply seeking joinder as a co-petitioner to the Google proceeding." Pet. 11 n. 2. Patent Owner conversely contends that, because the Petition was filed after November 13, 2018, it "should be subject to claim construction under the *Phillips* standard." Opp. 8. For the reasons explained below, we need not resolve which claim-construction standard to apply under the specific circumstances presented to us.

1. "spatial reference frame"

Independent claim 10 recites "the spatial reference frame" and "a spatial reference frame associated with the 3D pointing device." Ex. 1001, 37:3, 37:11–12. Petitioner proposes that both phrases should be construed as "a reference frame associated with the 3D pointing device, which always has its origin at the same point in the device and in which the axes are always fixed with respect to the device." Pet. 11. Petitioner further asserts that Patent Owner "agreed to these constructions during a co-pending litigation." *Id.* at 14 (citing Ex. 1010, 2).

We adopted this construction in the related IPR as the broadest reasonable interpretation of the phrase. *Google*, slip op. at 9. That construction is also consistent with the Specification's use of the term, and clarifies that "the spatial reference frame" is with respect to the 3D pointing device, even though the phrase is recited without apparent antecedent basis. *See* Ex. 1001, 37:3. Furthermore, Patent Owner agrees that this "construction is consistent with the understanding of a [person having

ordinary skill in the art] and with the claim construction of the district courts." Prelim. Resp. 35 (citing Ex. 2003, 6; Ex. 2004 ¶ 54).

The construction thus comports with both the broadest reasonable interpretation and with the civil-action standard. In light of the parties' apparent agreement, we adopt Petitioner's proposed construction for purposes of this Decision.

2. "rotation output"

Independent claim 10 recites the phrase "rotation output" in multiple places. Ex. 1001, 37:6–7, 37:9, 37:13, 37:16. Petitioner proposes that the phrase be construed as "output of a rotation sensor," and we adopted this construction as the broadest reasonable interpretation of the phrase in the related IPR. Pet. 14 (citing Ex. 1002 ¶¶ 48–52); *Google*, slip op. at 10. According to Petitioner, this construction is consistent with how the term is used in the patent disclosure. Pet. 14 (citing Ex. 1001, 7:61–64). We agree with this assessment. *See* Ex. 1001, Abstract ("The rotation sensor generates a rotation output . . . ."), 7:61 ("The rotation sensor generates a rotation output . . . ."), 30:58–59 ("[T]he rotation sensor 342 generates a rotation output (ω_x, ω_y, ω_z) . . . ."), 31:51–52 ("[T]he rotation sensor 342 generates a rotation output . . . ."), 32:62–63 ("[ω_x, ω_y, ω_z]$_P$ is the rotation output generated by the rotation sensor 342."), 33:38–39 ([T]he rotation sensor 342 generates a rotation output (ω_x, ω_y, ω_z)."), 35:46 ("a rotation sensor, generating a rotation output").

Patent Owner does not dispute this construction and agrees that it "is consistent with the understanding of a [person having ordinary skill in the

art]." Prelim. Resp. 35 (citing Ex. 2004 ¶ 55). The construction thus comports with both the broadest reasonable interpretation and with the civil-action standard. In light of the parties' apparent agreement, we adopt Petitioner's proposed construction for purposes of this Decision.

3. "3D pointing device"

Independent claim 10 recites a "3D pointing device." Ex. 1001, 36:62, 36:65, 37:2–3, 37:9–11. Petitioner does not expressly address a construction for the phrase.

For purposes of the institution decision in the related proceeding, we preliminarily adopted the construction advanced by Patent Owner in that proceeding, namely "a device capable of sensing movement and orientation in three dimensions to point to or control actions on a display." *Google*, slip op. at 10–11. In the instant proceeding, Patent Owner shifts position and advocates for a construction specifically requiring that the "3D pointing device" be "handheld": "a handheld device that detects the motion of said device in three-dimensions and is capable of translating the detected motions to control an output on a display." Prelim. Resp. 32–34. In doing so, Patent Owner draws our attention to consideration of the phrase by two district courts and Dr. LaViola's testimony. *See* Ex. 2003, 7–8; Ex. 2004 ¶ 33, 52–53; Ex. 2006, 2; Ex. 2007, 6–7.

The evidence that Patent Owner presents in this proceeding may justify reaching a different construction under the civil-action standard than under the broadest reasonable interpretation. But because the prior art discloses handheld devices, as we discuss below, we would reach the same

ultimate conclusion as to institution regardless whether "3D pointing device" were construed as in the related IPR or under the more narrow construction Patent Owner advocates in this proceeding. Because we need not construe claim terms unless they are material to resolving the disputed issues, we do not expressly adopt a construction of "3D pointing device" for purposes of this Decision. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999)).

E. Scope and Content of the Prior Art

1. Overview of Zhang

Zhang describes a "universal pointing device to control home entertainment systems and computer systems using spatial orientation sensor technologies." Ex. 1005 ¶ 7. When a user points the device to an arbitrary position of a screen, a set of orientation sensors inside the device detects the orientation and generates a pointing direction signal. *Id.* ¶ 21. Via encoding and transmission of the signal to a display control unit, and subsequent decoding and processing of the transmitted signal, a pointer image is superimposed onto a video input signal and displayed on a screen. *Id.* "The user perceives that the pointer is moved following the aiming line of sight." *Id.*

Figure 3 of Zhang is reproduced below:

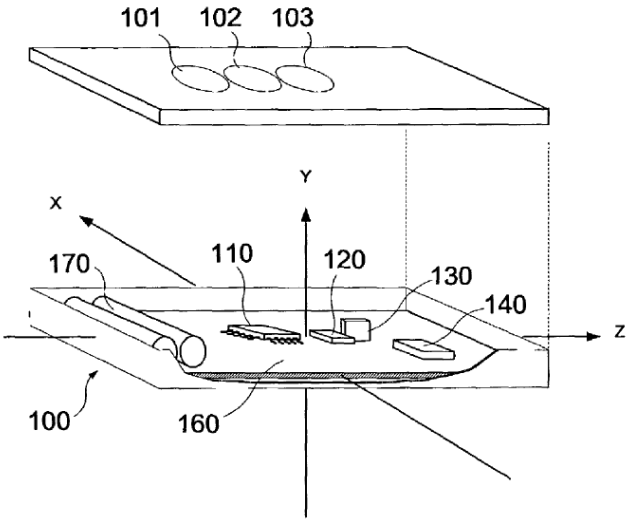

FIG. 3

Figure 3 illustrates internal components of the pointing device, as well as external buttons 101, 102, 103 for collecting "user selection activities." *Id.* ¶ 25. Orientation sensors 120 and 130 are mounted on printed circuit board 160, and respectively sense the device's yaw angle and pitch angle. *Id.* According to Zhang, "[a]dditional sensors (not show[n] in the picture) could be used to detect [the] device's roll angle which may provide an additional dimension of control." *Id.* Microcontroller 110 provides computation power as well as logic control for transmitted 140 and other electronic components. *Id.* Although Zhang expressly illustrates orientation detection with magnetic-field sensors and with accelerometor sensors, it teaches that "the orientation detection may not be limited to these types of sensors," and that other sensors such as a "gyro sensor" can be used. *Id.* ¶ 26.

2. Overview of Liberty

Liberty "relates generally to handheld, pointing devices and, more specifically to three-dimensional (hereinafter '3D') pointing devices and techniques for tilt compensation and improved usability associated therewith." Ex. 1006, 1:31–34. "Such devices enable the translation of movement, e.g., gestures, into commands to a user interface," with Liberty describing both angular movements of roll, pitch, and yaw, as well as linear movement along "x, y, and z axes." *Id.* at 7:17–27. To track user movements, Liberty uses sensors within the pointing device, with one embodiment including two rotational sensors and one accelerometer. *Id.* at 7:57–60.

Liberty explains that "various measurements and calculations" are performed in determining appropriate output for a user interface based on outputs of such sensors. *Id.* at 8:36–42. In particular, such measurements and calculations are used to compensate for (1) intrinsic factors, such as errors associated with the particular sensors used, and (2) non-intrinsic factors associated with the manner in which a user uses the pointing device, such as linear acceleration, tilt, and tremor. *Id.* at 8:42:53. Liberty provides examples of mathematical techniques for handling each of these effects. *See id.* at 8:54–12:53. Such techniques include converting data from the frame of reference of the pointing device's body into another frame of reference, such as a user's frame of reference that corresponds to a coordinate system associated with a screen on which a user interface is displayed. *Id.* at 16:21–29.

Liberty addresses various modifications that may be made to its disclosure, including the use of different sensors that measure motion with respect to the body of the device, such as "accelerometers, rotational sensors, gyroscopes, magnetometers and cameras." *Id.* at 18:30–33. In addition, Liberty notes that "[t]he user frame does not need to be stationary," such as when the user's frame of reference is selected to be the user's forearm, with the device responding only to wrist and finger movement. *Id.* at 18:34–37.

3. Overview of Bachmann

Bachmann describes "a method and apparatus for tracking the posture of a body without the need for a generated field (or source) of a plurality of fixed stations." Ex. 1004, 4:59–62. In particular, Bachmann describes "full body posture tracking of multiple users over an area that is only limited by the range of a wireless LAN." *Id.* at 5:3–6. As Bachmann explains, "a system having a plurality of sensors, each mounted to a limb of an articulated rigid body can be used to track the orientation of each limb." *Id.* at 5:25–28. Accordingly, "body posture can be tracked and introduced into a synthetic environment, thereby allowing a user to interface with the synthetic environment." *Id.* at 5:28–30.

Bachmann describes the use of a filter, in conjunction with data supplied by sensors, to produce a sensor orientation estimate. *Id.* at 7:32–34. In one embodiment of Bachmann, "the sensors include a three-axis magnetometer and a three-axis accelerometer." *Id.* at 7:34–35. In another embodiment, "the magnetometers and accelerometers are supplemented with

angular rate detectors configured to detect the angular velocity of the sensor." *Id.* at 7:35–40.

Figure 3 of Bachmann is reproduced below:

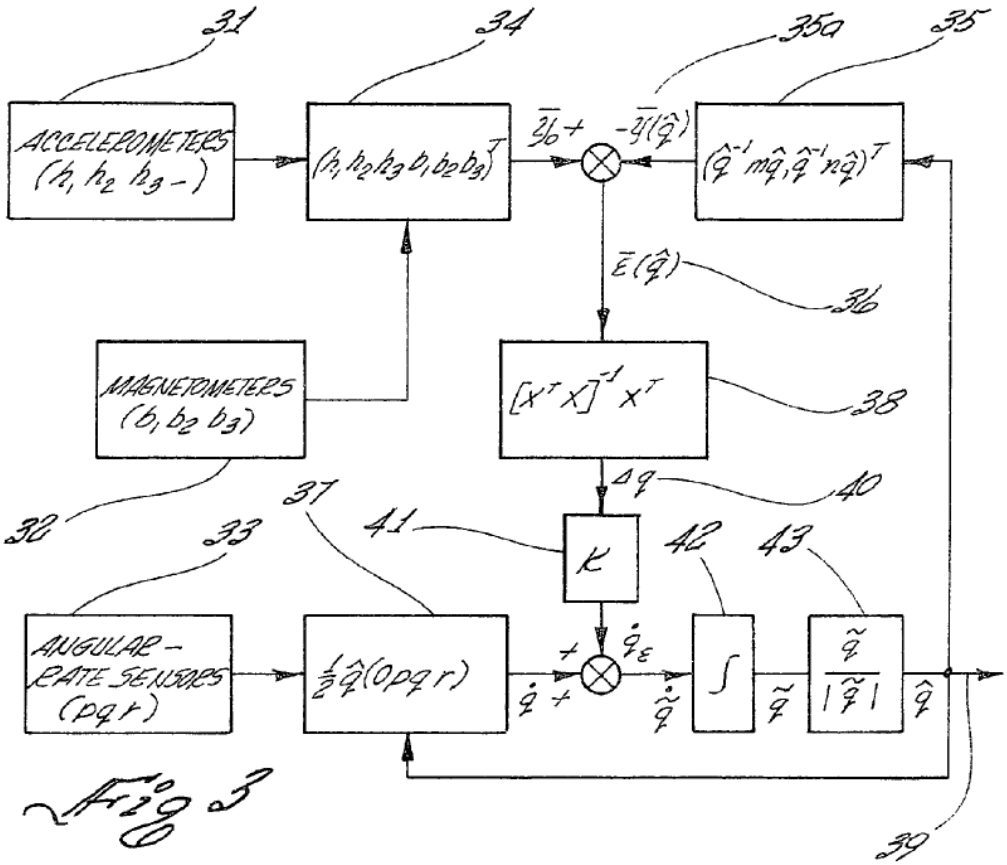

Fig. 3

Figure 3 is a block diagram that illustrates a filtering method disclosed by Bachmann. *Id.* at 4:46–48. Using outputs from accelerometers 31, magnetometers 32, and angular rate sensors 33, Bachmann calculates an output $\hat{q}$ (identified by number 39 in the lower right of the drawing), which is a quaternion representing the orientation of the tracked object in space. *Id.* at 10:10–14. In calculating such output $\hat{q}$, sensor measurements from accelerometers 31 and magnetometers 32 are used to calculate rate correction factor $\dot{q}_\varepsilon$, which is used to compensate rate $\dot{q}$ determined from

angular rate sensors 33 by minimizing the difference between actual and predicted measurements. *Id.* at 9:9–35, 10:10–65.

F. Combination of Zhang and Bachmann

Petitioner challenges claims 10 and 12 as unpatentable under 35 U.S.C. § 103(a) over Zhang and Bachmann. Pet. 14–56. "The combination of Zhang and Bachmann, broadly speaking, uses *Zhang's 3D pointing device* together with *Bachmann's extra sensors and method for compensating rotations*." *Id.* at 15.

Pointing to Zhang's express disclosure that orientation detection may not be limited to magnetic-field and accelerometer sensors, and that "a gyro sensor[] can also be used in the pointing control system," Petitioner reasons that it would have been obvious to add the angular-rate sensors of Bachmann. *Id.* at 27; Ex. 1005 ¶ 26. In doing so, Petitioner cites to testimony by Dr. Sarrafzadeh that one of skill in the art would have understood that such additional sensors provide at least two benefits: (1) allowing the device to detect different modes of movement, such as a roll angle; and (2) increasing the overdetermination to enable better error and noise control. Pet. 27 (citing Ex. 1002 ¶ 94).

In articulating a motivation to combine the references, Petitioner also points to Bachmann's disclosure that nine-axis sensors were known in the art and commercially available, and, in particular, to Bachmann's disclosure of using its sensors in "hand-held devices." *Id.* at 27–30; Ex. 1004, 13:42–48. As Petitioner summarizes, "Zhang's device has a housing, sensors and a software for using sensor output to calculate the orientation of the device,"

and "Bachmann has the same, but uses additional sensors and a modified calculation." Pet. 30 (citing Ex. 1002, ¶101). Petitioner reasons that "[t]hese functional blocks (sensors and calculations) could have been substituted for the same functional blocks in Zhang requiring only ordinary skill to implement," and that "[t]here would have been no unexpected results—only the *expected* improvement promised by Bachmann." *Id.* at 30–31 (citing Ex. 1002 ¶ 101).

We have reviewed Petitioner's detailed claim mapping for claims 10 and 12 at pages 35–56 of the Petition, and find that Petitioner adequately identifies the recited elements in its proposed combination of Zhang and Bachmann. Patent Owner makes several arguments, which we address below.

First, Patent Owner contends that Bachmann is not analogous art. Prelim. Resp. 35–40. We rejected a similar presentation of this argument in the related IPR based on the evidence and arguments on the preliminary record of that case, *Google*, slip op. at 21–22, but Patent Owner contends that construing "3D pointing device" as limited to a *handheld* device compels a different conclusion. *See* Prelim. Resp. 36 ("Proper interpretation of this term is necessary because it is important for determining whether the asserted references are analogous prior art."). We disagree.

As Patent Owner acknowledges, two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed; and (2) if the reference is not within the field of the inventor's endeavor, whether the reference is still "reasonably pertinent to the particular problem with which the inventor is involved." *In*

re Bigio, 381 F.3d 1320 (Fed. Cir. 2004); *see* Prelim. Resp. 37 (citing *In re Clay*, 966 F.2d 658–59 (Fed. Cir. 1992) for the same statement of the tests). According to Patent Owner, "[t]he '978 Patent is involved with the problem of compensating for accumulated errors of signals of a 3D pointing device using a nine-axis sensor system for the purposes of being able to better map the dynamic movements of that pointing device onto a display and to more precisely control actions on that display." Prelim. Resp. 39. Focusing on this characterization of the "problem" addressed by the '978 patent, Patent Owner argues that "*Bachmann* does not address ***the*** problem of mapping the movement and rotation of a 3D pointing device to more precisely control actions on a display." *Id.* (citing Ex. 1004 ¶ 85).

But as in the related proceeding, "we disagree with Patent Owner's characterization of the problem addressed by the '978 patent as focused on the control of a display." *Google*, slip op. at 21. Rather, as the '978 patent itself makes clear in its statement of the field of the invention, the problem addressed more generally involves "compensating signals of [an] orientation sensor subject to movements and rotations of [a] 3D pointing device." Ex. 1001, 1:22–27. Although Bachmann's emphasis is on tracking the posture of articulated rigid bodies, such as a human body, Bachmann presents its teachings more generally as "relate[d] to methods and apparatus for tracking the orientation . . . of an object," and specifically includes "hand-held devices" as examples of such objects. Ex. 1004, 1:18–20, 13:47–48. In light of this specific teaching, Bachmann "logically would have commended itself to [the] inventor's attention in considering [the] problem" of compensating signals of an orientation sensor. *See Clay*, 966 F.2d at 659.

We thus find Bachmann both to be in the same field of endeavor as the '978 patent and reasonably pertinent to the problem addressed.

This finding is not meaningfully mitigated by Patent Owner's observation that Bachmann has been cited by the Office "as a reference in twenty publications during various examination proceedings," of which "not a single one of them relates to a pointing device, let alone a 3D pointing device." *See* Prelim. Resp. 39. Patent Owner contends that this fact "corroborates Dr. LaViola's opinion that a [person having ordinary skill in the art] would not have considered *Bachmann* to have logically commended itself to the problems of using a handheld 3D pointing device to control actions on a display and compensating for accumulated sensor errors of such a device." *Id.* at 39–40 (citing Ex. 2004 ¶ 86). But Dr. LaViola's opinion rests on the same overly narrow characterization of the problem addressed by the '978 patent that we do not find persuasive on this record.

Second, Patent Owner contends that the combination of Zhang and Bachmann fails to disclose the "3D pointing device" recited in independent claim 10: "Because *Zhang* utilizes a four-axis sensor module, it cannot detect the roll of the pointing device." Prelim. Resp. 42 (citing Ex. 2004 ¶ 91). Although Zhang focuses on embodiments in which orientation sensors sense its device's yaw and pitch angles (*see* orientation sensors 120, 130 of Zhang Figure 3, reproduced above), Zhang explicitly teaches that additional sensors "could be used to detect [the] device's roll angle which may provide an additional dimension of control." Ex. 1005 ¶ 25. This teaching is consistent with "a 3D pointing device," under both a broadest reasonable interpretation of the term or under the civil-action standard.

In light of this teaching, we thus disagree with Patent Owner's further assertion that "*Zhang* teaches away from using the additional sensors of *Bachmann* to transform it from a 2D pointing device into a 3D pointing device." Prelim. Resp. 44 (citing Ex. 2004 ¶ 94). To support this assertion, Patent Owner highlights Zhang's discussion of accumulated acceleration errors that could result from adding additional accelerometers to the pointing device. *Id.* (citing Ex. 1005 ¶ 4). But Patent Owner generalizes this discussion too strongly to "additional sensors," contrary to Zhang's own specific teaching that "the orientation detection may not be limited to" magnetic field sensors and accelerometer sensors, and that "a gyro sensor[] can also be used." Ex. 1005 ¶ 26. Accordingly, we are not persuaded on the present record that Zhang teaches away from the combination proposed by Petitioner.

We also disagree with Patent Owner's argument that Bachmann, individually, fails to disclose a 3D pointing device, because "the signals measured by the sensors in *Bachmann* are not mapped onto a display screen as a movement pattern for the purpose of pointing to or controlling actions on the display screen." Prelim. Resp. 44–45. This argument is not persuasive, however, because it attacks Bachmann individually, without considering it in combination with Zhang. *See In re Keller*, 642 F.2d 413, 425 (CCPA 1981) ("The test for obviousness is not . . . that the claimed invention must be expressly suggested in any one or all of the references.")

Third, Patent Owner contends that the combination of Zhang and Bachmann does not disclose the "nine-axis motion sensor module" recited in independent claim 10. Prelim. Resp. 45. In advancing this contention,

Patent Owner acknowledges that Zhang "discloses that its sensors are attached to the circuit board," but asserts that Zhang "only discloses a four-axis sensor module." *Id.* at 45–46. But as addressed above, although Zhang focuses on embodiments in which yaw and pitch are sensed, Zhang also explicitly teaches that additional sensors "could be used to detect [the] device's roll angle which may provide an additional dimension of control." Ex. 1005 ¶ 25. Use of a nine-axis motion sensor module in lieu of the four-axis module expressly taught by Zhang is commensurate with the additional sensing of roll.

Patent Owner also contends that Zhang "teaches away from simply adding additional accelerometers to its sensor module" because "additional accelerometers introduce compounded noise and errors for which the device must compensate." Prelim. Resp. 46. But Patent Owner does not adequately explain why this specific disadvantage of integrating such acceleration-based sensors teaches away from the invention in light of Zhang's teachings, including the additional sensing of roll. *See In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004) (a prior-art reference does not teach away from the claimed subject matter unless the prior-art reference also criticizes, discredits, or otherwise discourages the solution claimed). Zhang's teaching is broad as to the type of sensors that may be used. *See* Ex. 1005 ¶ 26 ("[T]he orientation detection may not be limited to [a magnetic field sensor or accelerometer]. Other sensors, for example, a gyro sensor, can also be used in the pointing control system."). Indeed, in discussing the prior art, Zhang specifically notes that some commercial magnetic sensors "are packaged to detect two-axis, *even three-axis*,

magnetic field changes and provide a linear output to the direction of the magnetic field flux." *Id.* ¶ 4 (emphasis added).

Patent Owner further argues that Bachmann "likewise also teaches away from this limitation" because Bachmann "specifically states that the individual components of the disclosed MARG (Magnetic, Angular Rate, Gravite) sensor should 'be integrated using a single integrated circuit board *with the accelerometers mounted separately*.'" Prelim. Resp. 46 (quoting Ex. 1004, 14:49–51) (emphasis by Patent Owner). But the quotation in Bachmann only states that, in the MARG embodiment, "[t]he individual components *can be* integrated using a single integrated circuit board with the accelerometers mounted separately." Ex. 1004, 14:49–51 (emphasis added). This permissive statement of a possible embodiment does not appear to criticize, discredit, or otherwise discourage the solution claimed in the '978 patent. *See Fulton*, 391 F.3d at 1201.

Patent Owner further argues that, "[c]ontrary to what Petitioner and its expert would have the Board believe, mounting *Bachmann*'s additional sensors to *Zhang*'s PCB would require a level of skill greater than that possessed by a [person having ordinary skill in the art] at the time of invention." Prelim. Resp. 41 (citing Ex. 2004 ¶ 88). For the purpose of deciding whether to institute an *inter partes* review, any genuine issue of material fact created by differing testimonial evidence is "viewed in the light most favorable to the petitioner." *See* 37 C.F.R. § 42.108. Therefore, for the purpose of this decision, we resolve this issue in favor of Petitioner's declarant. *See* Ex. 1002 ¶ 87 ("[A] person of ordinary skill would have been able to integrate these sensors into Zhang's 3D pointing device using

standard amplifiers, filters, samplers, and analog-to-digital converters, adjusting as necessary."), ¶ 94 ("Including Bachmann's nine-axis sensor into Zhang's 3D pointer is therefore nothing more than following Zhang's suggestions.").

For these reasons, we conclude that Petitioner demonstrates a reasonable likelihood of prevailing on its challenge of claims 10 and 12 as unpatentable under 35 U.S.C. § 103(a) over Zhang and Bachmann.

G. Combination of Liberty and Bachmann

Petitioner challenges claims 10 and 12 as unpatentable under 35 U.S.C. § 103(a) over Liberty and Bachmann. Pet. 56–79. In doing so, Petitioner points to Liberty's broad disclosure that its "handheld system senses motion using or more sensors 901, e.g., rotational sensor(s), gyroscopes(s), accelerometer(s), magnetometer(s), optical sensor(s), camera(s) or any combination thereof." *Id.* at 64; Ex. 1006, 16:38–44; *see also* Ex. 1006, 18:29–33, 19:62–20:12. Petitioner uses this disclosure to construct an argument that largely parallels its arguments for the combination of Zhang and Bachmann.

That is, Petitioner reasons from Liberty's disclosure of various sensors that "it would have been obvious to add sensors to Liberty, including the additional sensors of Bachmann." Pet. 64. Petitioner further identifies the same benefits to such additional sensors as in its Zhang-Bachmann combination, namely detection of different movement modes, such as roll angle, and increased overdetermination for error and noise control, and supports such identification with testimony by Dr. Sarrafzadeh. Pet. 64–65

(citing Ex. 1002 ¶ 160). We have reviewed Petitioner's detailed claim mapping for claims 10 and 12 at pages 73–79 of the Petition, and find that Petitioner adequately identifies the recited elements in its proposed combination of Liberty and Bachmann.

In articulating a motivation to combine the references, Petitioner also points to Bachmann's disclosure that nine-axis sensors were known in the art and commercially available, and, in particular, to Bachmann's disclosure of using its sensors in "hand-held devices." *Id.* at 65–70; Ex. 1004, 13:42–48. As Petitioner summarizes, "Liberty's device has a housing, sensors and a software for using sensor output to calculate the orientation of the device," and "Bachmann has the same, but uses different sensors and a modified calculation." Pet. 67 (citing Ex. 1002 ¶ 164). Petitioner reasons that "[t]hese functional blocks (sensors and calculations) could have been substituted for the equivalent functional blocks in Liberty requiring only ordinary skill to implement," and that "[t]here would have been no unexpected results—only the *expected* improvement promised by Bachmann." *Id.* (citing Ex. 1002 ¶ 164).

Patent Owner disputes this motivation, contending that "[m]ounting *Bachmann*'s additional sensors to *Liberty*'s [printed circuit board] would require a level of skill greater than that possessed by a [person having ordinary skill in the art] at the time of invention." Prelim. Resp. 48 (citing Ex. 2004 ¶ 105). Patent Owner supports its position that "significant design work" and potentially "extensive redesign" would be required to implement the combination with testimony by Dr. LaViola. *Id.* at 48–49 (citing Ex. 2004 ¶ 105). Dr. LaViola also directly challenges the contrary testimony of

Dr. Sarrafzadeh: "Mounting *Bachmann*'s additional sensors to *Liberty*'s [printed circuit board] is not as clear-cut as Sarrafzadeh would have the Board believe and would require a level of skill greater than that possessed by a [person having ordinary skill in the art] at the time of invention." Ex. 2004 ¶ 105. The competing testimony creates a genuine issue of material fact, which we view in the light most favorable to Petitioner in determining whether the Petition warrants institution of an *inter partes* review. 37 C.F.R. § 42.108(c).

This disagreement between the parties' witnesses is also relevant to Patent Owner's contention that the combination of Liberty and Bachmann does not disclose the "nine-axis motion sensor module" recited in independent claim 10. *See* Prelim. Resp. 49–50. In particular, in addition to observing that Liberty alone "does not disclose a nine-axis motion sensor module," Patent Owner contends that Bachmann "teaches away from this limitation." *Id.* at 50 (citing Ex. 2004 ¶ 110). Alternatively, Patent Owner contends that "[e]ven if *Bachmann* does not actively teach away from mounting its accelerometers on the same [printed circuit board] as the other sensors to form a 'nine-axis motion sensor module' as required by the '978 Patent, it would nonetheless not have been obvious to mount *Bachmann*'s sensors on *Liberty*'s [printed circuit board]." *Id.* (citing Ex. 2004 ¶¶ 104–105, 109–110). The supporting testimony of Dr. LaViola bases these conclusions on the technical issues of mounting accelerometers to the circuit board. *See* Ex. 2004 ¶ 110. Because we are required to view the conflicting testimony in the light most favorable to Petitioner, we conclude that Petitioner makes a sufficient showing.

We conclude that Petitioner demonstrates a reasonable likelihood of prevailing on its challenge of claims 10 and 12 as unpatentable under 35 U.S.C. § 103(a) over Liberty and Bachmann.

H. Joinder

In light of the foregoing, and after consideration of Patent Owner's Preliminary Response, we conclude that the Petition warrants the institution of an inter partes review. Under such circumstances, discretion is provided to join Petitioner as a party to the related IPR. 35 U.S.C. § 315(c).

A joinder motion should: (1) set forth reasons why joinder is appropriate; (2) identify any new grounds of unpatentability asserted in the petition; (3) explain what impact, if any, joinder would have on the trial schedule for the existing review; and (4) address specifically how briefing and discovery may be simplified. *Kyocera Corp. v. Softview LLC*, Case IPR2013-00004, slip op. at 4 (PTAB Apr. 24, 2013) (Paper 15). Petitioner addresses each of these considerations in its motion. Mot. 3–8.

With respect to these factors, Petitioner contends that "[b]ecause these proceedings are substantively identical, good cause exists for joining this proceeding with the Google IPR so that Board, consistent with 37 C.F.R. § 42.1(b), can efficiently 'secure the just, speedy, and inexpensive resolution' of the Samsung and Google Petitions in a single proceeding." *Id.* at 4. In addition, Petitioner asserts that joinder will not negatively impact the trial schedule: "because the Samsung Petition relies on the same expert and the same declaration, only a single deposition is needed for the proposed joined proceeding." *Id.* at 6. Further, Petitioner "agrees to take an

'understudy' role which will simplify briefing and discovery." *Id.* Specifically, Petitioner concedes to several limitations on its participation in the joined proceeding: (1) to consolidate all filings with the current petitioner, unless a filing concerns issues solely involving Petitioner; (2) to be prohibited from raising any new grounds or introducing any arguments or discovery not introduced by the current petitioner; (3) to be bound by any agreement between Patent Owner and the current petitioner concerning discovery and/or depositions; and (4) not to receive any direct, cross-examination, or redirect time beyond that permitted under either 37 C.F.R. § 42.53 or any agreement between Patent Owner and the current petitioner. *Id.* at 6–7.

Patent Owner raises concerns that the instant Motion is one of four motions that have been filed by different parties: "A flood of joinder petitions of this kind prejudices Patent Owner, as it must now face the combined resources and efforts of all of the petitioners." Opp. 4. In particular, Patent Owner contends that it is "unfathomable" that the four parties who have filed joinder motions "will truly take an 'understudy' role." *Id.* at 5. Instead, Patent Owner hypothesizes that the petitioner parties will engage in "coordinated efforts to overwhelm" it as a small patent owner. *Id.* Although we are not unsympathetic to these concerns, they are not persuasive in the context of the significant constraints Petitioner agrees to accept for its joinder to the related IPR—constraints that can be managed and enforced by the Board. As Petitioner states, "CyWee cannot credibly complain of having to face multiple Petitioners when it is CyWee's own litigation activity that has prompted multiple Petitioners to challenge its

patent." Reply 3 (citing *Samsung Electronics America, Inc. v. Uniloc 2017 LLC*, Case IPR2017-01797, slip op. at 33 (PTAB Feb. 6, 2018) (Paper 8)).

Patent Owner also contends that joining Petitioner to the related IPR "raises new questions regarding [real parties in interest]." Opp. 10. But Patent Owner's bases, on the present record, for advancing this contention are speculative, grounded in its suspicion that "the petitioners seeking joinder to the Google IPR are working together." *Id.* Patent Owner elaborates that all of those petitioner parties "utilize the Google Android operating system on their devices that are at issue at district court," and speculates "whether other undisclosed third parties are [real parties in interest] having a stake in the outcome of the Google IPR." *Id.* It is not apparent from these limited speculations that Patent Owner would be entitled to additional discovery regarding real parties in interest under the standards that apply for such discovery. Moreover, we have already denied Patent Owner's motion for additional discovery in the related IPR. *See Google LLC v. CyWee Group Ltd.*, Case IPR2018-01257 (PTAB June 20, 2019) (Paper 30).

In addition, Patent Owner argues that joining Petitioner to the related IPR "would be a waste of time, effort, and resources for the Board, the parties, and the district court." Opp. 11. This argument is based on Patent Owner's characterization of the progression of the district court action as well-advanced. *Id.* ("[T]he District Court Action has progressed substantially to the point that fact discovery has concluded, as has expert discovery as to the issues of validity and infringement. The deadline for case dispositive motions has recentnly passed and both CyWee and Samsung

have moved for summary judgment and filed motions to strike expert opinions.") But Petitioner represents that "that case has been stayed pending the Google IPR." Reply 5 (citing *CyWee Grp. Ltd. v. Samsung Elecs. Co. Ltd.*, Case No. 2:17-cv-00140, D.I. 332 (E.D. Tex. Feb. 14, 2019). We agree with Petitioner that this development renders Patent Owner's argument moot.

Further, Patent Owner contends that "[b]ecause the claim construction standard applied to IPRs shifted between the time that the Google IPR was filed and the time that Samsung's petition and Motion were filed, the Board will need to address the new issue of which claim construction standard would apply if Samsung were to join." Opp. 8. This contention is also unpersuasive. Because the petition upon which the related IPR is based was filed prior to the date the Board changed the claim-construction standard it uses in trial proceedings, the related IPR will continue to use the broadest reasonable interpretation, regardless of the joinder of any parties to that proceeding. *See* 83 Fed. Reg. 51,340, 51,344 (Oct. 11, 2018) ("The Office will continue to apply the BRI standard for construing unexpired patent claims and proposed substitute claims in AIA proceedings where a petition was filed before the effective date of the final rule.").

In light of these considerations, we grant Petitioner's motion and terminate this proceeding so that all further filings are made in the related proceeding to which Petitioner is joined.

III. ORDER

It is

ORDERED that Petitioner's Motion for Joinder is *granted* and that Petitioner is hereby joined as a party to IPR2018-01257;

FURTHER ORDERED that the grounds of unpatentability on which trial was instituted in IPR2018-01257 are unchanged and remain the only grounds on which trial has been instituted;

FURTHER ORDERED that the Scheduling Order and any modifications thereto entered in IPR2018-01257 shall govern the schedule of the joined proceeding;

FURTHER ORDERED that the joined parties in IPR2018-01257 shall file all papers jointly in the joined proceeding as consolidated filings, and will identify each such paper as "Consolidated," except for papers that involve fewer than all of the parties;

FURTHER ORDERED that this proceeding is *terminated*;

FURTHER ORDERED that a copy of this Decision shall be entered into the record of IPR2018-01257; and

FURTHER ORDERED that the case caption in IPR2018-01257 shall be modified in accordance with the attached example to reflect joinder of Petitioner, as well as joinder of other petitions in accordance with decisions issued concurrently herewith.

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Paper XX
Entered: XX

Example Case Caption for Joined Proceeding

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE LLC, ZTE (USA), INC.,
SAMSUNG ELECTRONICS CO., LTD.,
LG ELECTRONICS INC., HUAWEI DEVICE USA, INC.,
HUAWEI DEVICE CO. LTD., HUAWEI TECHNOLOGIES CO. LTD.,
HUAWEI DEVICE (DONGGUAN) CO. LTD.,
HUAWEI INVESTMENT & HOLDING CO. LTD.,
HUAWEI TECH. INVESTMENT CO. LTD., and
HUAWEI DEVICE (HONG KONG) CO. LTD.,
Petitioner,
v.

CYWEE GROUP LTD,
Patent Owner.

Case IPR2018-01257
Patent 8,552,978 B2
