UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

MEDIT CORPORATION,
Petitioner,

v.

3SHAPE A/S,
Patent Owner.

Case IPR2023-01313
U.S. Patent No. 9,629,551 B2

PETITIONER'S REQUEST FOR DIRECTOR REVIEW

Petitioner Medit Corporation ("Petitioner" or "Medit") hereby requests rehearing of the Decision Denying Institution of *Inter Partes* Review (Paper 6, "Decision" or "Dec.") and remand to the panel for further consideration. Review of the Decision by the Director, or in the alternative, delegation of the case to the Delegated Rehearing Panel for reconsideration, is necessary because the Board's refusal to institute trial rested entirely on two clearly erroneous interpretations of the two primary references relied on in the Petition—Newcombe and Herbst. Correcting either one of these errors should result in a reversal of the denial of institution and remand to the panel for further consideration, because either reference, standing alone, provides independently sufficient bases for finding a reasonable likelihood of success on the merits.

First, in assessing Newcombe, the Board *sua sponte* created its own "hypothetical example" that appears nowhere in the reference, the file history, any brief from either party, or any testimony from the experts, and relies on an alteration of a key Figure. The Board then applied this hypothetical example in a manner that misinterpreted the testimony of Petitioner's expert, to determine that Newcombe did not teach "determining" an "excluded volume" as required by the claims.

Second, in reviewing Herbst, the Board relied on a truncated quotation from the specification to incorrectly interpret certain Figures in the reference. Neither

party relied on this truncated quotation and the full context establishes the Board's error with respect to the Figure relied upon in the Decision.

Accordingly, the Decision constitutes a clear abuse of discretion that led to the Board improperly declining to institute an *inter partes* review of claims 1–12 and 15–25 of U.S. Patent No. 9,629,551 ("the '551 patent"). In light of the Board's abuse of its discretion, Petitioner respectfully requests review of the Decision by the Director, or delegation to the Delegated Rehearing Panel for reconsideration.

I. BACKGROUND

The '551 patent is directed to "a method for detecting a movable object in a location, when scanning a rigid object in the location by means of a 3D scanner for generating a virtual 3D model of the rigid object." Ex. 1001 at 1:6–9. The '551 patent states that obtaining one or more 3D representations of an object can generally be accomplished by using a 3D scanner to collect information about surfaces within the scanner's field of view and then developing a mathematical representation of the three-dimensional surface of the object via specialized software. *Id*. at 15:21–35. In addition to scanning a surface, one or more "excluded volumes," which "is the volume in space where no surface can be present," are determined. *Id*. at 4:32–35; 22:65–66. Notably, while the '551 patent gives an example of how the excluded volume may be determined using a 3D volume grid (*see id*. at 27:49–60), it does not limit determining the excluded volume to any given method or set of methods.

The Decision focuses on independent claim 1, and states that the Board's analysis of that claim applies to the two remaining independent claims 23 and 25. Dec. 15. Claim 1 is directed to a method of detecting a "movable object in a location" when scanning a rigid object using a 3D scanner, that comprises providing a first and second 3D representation of at least part of the surface of the object. Ex. 1001, 29:45–52. The Board's Decision specifically analyzed the "determining" elements of claim 1, which read as follows:

> determining for the first 3D representation a first excluded volume in space where no surface can be present in both the first 3D representation and the second 3D representation; [and]
>
> determining for the second 3D representation a second excluded volume in space where no surface can be present in both the first 3D representation and the second 3D representation[.]

Id. at 29:53–60.

A. Newcombe

The Petition set forth the teachings of Newcombe, which is directed to a moving-object segmentation system that "receives the depth images captured by the mobile depth camera 102, and performs a segmentation operation to identify objects in the depth images that are moving or being manipulated and which are independent of the relatively unchanging background." Paper 2 ("Pet.") at 11 (*citing* Ex. 1005, 3:1–6). Newcombe discloses capturing multiple depth images and aligning the points in the images using an iterative closest point (ICP) algorithm. *Id*. at 11–12

(*citing* Ex. 1005, 6:54–7:26). This comparison also detects points that are "outliers" because they have moved a distance that is beyond a threshold amount in between the two captures; these "indicate points in the depth image where something has changed since the previous depth image," such as a moving object. *Id*. at 12 (*citing* Ex. 1005, 7:27–30; 8:27–9:16, 9:24–29).

With respect to the "determining" elements, the Petition devoted seven pages to analyzing how Newcombe teaches determining an excluded volume for a 3D representation. Pet. 24–30. This analysis was supported with citation to the Declaration of Petitioner's expert Dr. Foroosh, who testified that a person of ordinary skill in the art ("POSITA") would have understood Newcombe to disclose scanning the surface of an object using multiple depth images, which would correspond to the claimed first and second 3D representations. Ex. 1003 ¶¶ 112–117. Furthermore, Dr. Foroosh testified that "a POSITA would understand that all spaces within the obtained 3D depth images for the location that *do not* correspond to a surface within the background of the location would collectively constitute an excluded volume, as recited by the claims." *Id*. Thus, by determining the surface of a rigid object, Newcombe ***necessarily*** also determines the space between the scanner and the surface where no surface is present—the "excluded volume" of claim 1.

In its Decision, the Board overlooked this entire discussion and instead focused on the "threshold distance" disclosure of Newcombe. Dec. 15–20.

Moreover, in analyzing the threshold distance, the Board manufactured an "annotated version" of Figure 1 and relied on that novel figure to analyze its own "hypothetical example" that has no basis in the record. *Id*. at 18–19. As a result, the Board did not consider the actual teachings of Newcombe and erroneously dismissed the evidence and analysis set forth in the Petition.

B. Herbst

The Petition also set forth the disclosures of Herbst, which is directed to a method of detecting moving objects within a scene by comparing color and depth information for surfaces scanned in two separate images or maps of a scene. Pet. 13 (*citing* Ex. 1006, 1). Herbst's camera takes 3D scans of a location that it converts to a "surfel," which is a representation of a surface. *Id*. at 13–14 (*citing* Ex. 1006, 1–4). Multiple scans of a surface result in multiple 3D maps that can be used to detect differences between the maps, and Herbst discloses calculating a probability that any object in a scene moved from one map to the next. *Id*. at 14 (*citing* Ex. 1006, 4–5). The two scans can then be merged into a single 3D model that removes any moveable objects. *Id*. at 14–15 (*citing* Ex. 1006, 5–7, Figs. 6(a), 6(d), 7(b)).

The Petition, supported by Dr. Foroosh, analyzed how Herbst teaches the "determining" elements of claim 1. Pet. 51–53 (*citing* Ex. 1003 ¶¶ 262–267). Dr. Foroosh testified that Herbst applies probabilistic models to its 3D scans to

"calculate the probability that a surface within a scene is at a particular depth measurement." Ex. 1003 ¶ 263. By capturing multiple 3D scans, and

> aligning and comparing two different 3D representations of a location and applying these probabilistic models to the surfaces observed in the scene in each 3D representation, Herbst's method can determine a probability that any of the surfaces observed in either 3D representation moved relative to its location in or absence from the other 3D representation.

Id. Dr. Foroosh provided his opinion that a POSITA would have understood that Herbst, "by assigning surfels to 3D points detected in frames of that scanning visit, is teaching that the empty space determined accordingly between the scanner and the surface, where no 3D point on any surface is detected, is excluded from the 3D surfel representation of the corresponding scan visit." *Id*. ¶ 264. The fact that Herbst determines surfels that represent the surface of a scanned object means that Herbst ***necessarily*** also determines the space between the scanner and the surface where no surface is present, and thus discloses determining an excluded volume.

The Board overlooked this discussion and, as a result, incorrectly stated that "Petitioner merely asserts that 'Herbst teaches the determination of an excluded volume using the probabilistic model disclosed'" and "says nothing else about *determining* a first excluded volume." Dec. 29. The Decision also criticizes Dr. Foroosh's testimony for "not sufficiently explain[ing] any relationship between assigning surfels to 3D points and determining a volume in space," (*id*. at 30) despite

the testimony outlined above. Finally, the Decision misreads the Figures of Herbst to provide an incorrect example that allegedly contradicts Dr. Foroosh's reading of the reference. Dec. 30. Accordingly, the Board abused its discretion by overlooking arguments made by the Petitioner and then criticizing the Petition for lacking these very arguments, while at the same time misapprehending Herbst's disclosure.

II. LEGAL STANDARD

"Requests for Director Review of the Board's decision whether to institute an AIA trial . . . shall be limited to decisions presenting (a) an abuse of discretion or (b) important issues of law or policy." *See* USPTO, *Revised Interim Director Review Process* at 2.B, Availability of Director Review: AIA Trial Proceedings (last modified Apr. 16, 2024). An abuse of discretion exists if a decision: "(1) is clearly unreasonable, arbitrary, or fanciful; (2) is based on an erroneous conclusion of law; (3) rests on clearly erroneous fact finding; or (4) involves a record that contains no evidence on which the Board could rationally base its decision." *Intelligent Bio-Sys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016).

Delegation of a decision to the Delegated Rehearing Panel may be appropriate where "a decision does not present an issue that rises to a level requiring review by the Director but, nonetheless, warrants further consideration within the Board by an independent panel." *See* USPTO, *Delegated Rehearing Panel* at 2.B, Delegation of Review to the DRP: Criteria for Delegation to the DRP (last modified Feb. 21, 2024).

"[T]he Director may designate a DRP to consider whether a material issue of fact or law was misapprehended or overlooked by the original Board decision." *Id*.

III. THE BOARD ABUSED ITS DISCRETION IN DENYING INSTITUTION

For both primary references, the Board based its decision on a flawed or incomplete reading of Petitioner's arguments and/or Dr. Foroosh's testimony that led it to disregard or discredit the arguments Petitioner actually made and misconstrue the disclosure of the references. Accordingly, this is not a situation in which Petitioner is merely disagreeing with the Board's weighing of the evidence or rearguing its Petition. *See, e.g.*, *EMC Corp. v. PersonalWeb Techs., LLC,* IPR2013-00085, Paper 29 at 4 (PTAB June 5, 2013) ("[M]ere disagreement with the Board's analysis or conclusion is not a proper basis for rehearing."). Rather, the situation presented herein is akin to those in which the USPTO reconsidered Board decisions misapprehending a Petitioner's arguments or overlooking the arguments that were made. *See, e.g.*, *DK Crown Holdings Inc. v. Diogenes Ltd*., IPR2023-00268, Paper 14 at 21–24 (PTAB Feb. 21, 2024) (DRP decision granting rehearing of denial of institution where Board misapprehended the Petition's argument regarding prior art).

A. The Board Abused Its Discretion in Relying on Clearly Erroneous Fact Finding Regarding Newcombe, Including a Board-Created "Example" Figure That Does Not Appear in the Reference

Newcombe teaches a method that detects "outlier" (*i.e.*, moving) points between two captured depth images. Ex. 1005, 7:27–30, 8:27–9:16, 9:24–29. It

does so by defining a "threshold distance" and if, in between the two scans, a point has moved more than this threshold distance, then it is flagged as an outlier. *Id*. at 8:39–48. This is shown in Figure 6 of Newcombe, where the distance between source point 502 and destination point 602 (distance 604) is beyond a threshold distance, resulting in the destination point being labeled an outlier. *Id*.

The Decision evinces a fundamental misunderstanding of this straightforward disclosure in Newcombe based on its use of an "annotated version" of Newcombe's Figure 1 that the Board itself created. As depicted below, the Board modified Figure 1 to add a "destination point," shown as a red dot, located in space between camera 102 and window 106. Dec. 19. This destination point, according to the Board, "belongs to a moving object." *Id*. at 19–20.

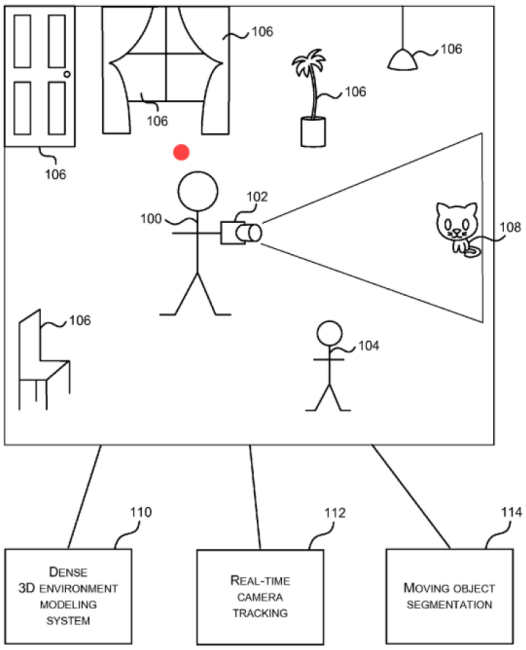

FIG. 1

The Board then used its annotated figure to create "a hypothetical example" to illustrate why Petitioner's assertions were "inconsistent with Newcombe's teachings." *Id*. at 18–19. According to the Board, in this example, "Newcombe's ICP algorithm determines that a destination point (shown in red) in space between camera 102 and the window belongs to a moving object." *Id*. at 19–20. Based on that hypothetical, the Board incorrectly concluded that Petitioner's position would be that "'any point' in space beyond the destination point (shown in red) would also be labeled as a moving object." *Id*. at 20. Because this would lead to the nonsensical result that window 106 is labeled a moving object, the Board concluded that Petitioner's interpretation of Newcombe must be wrong. *Id*.

This is, indeed, a nonsensical argument. ***But it is not the argument that Petitioner made.*** Instead, the Petition argued that Newcombe's "first compatibility test relies on defining a threshold distance for a measurement between points in two 3D depth images," and if the points are further apart than the threshold distance, they are labeled "outliers." Pet. 26 (*citing* Ex. 1005, 8:3–33, 9:26–29). Dr. Foroosh similarly testified that Newcombe determines an excluded volume by detecting moving "outlier" objects, "defining a distance threshold . . . beyond which any point will be deemed an outlier." Ex. 1003 ¶ 116. As set forth in the Petition, "a POSITA would understand that by defining a distance threshold for the two three-dimensional

depth images beyond which any point will be deemed an outlier, Newcombe teaches the determination of an excluded volume. Pet. 28.

The Board's hypothetical example confused the concept of a distance "beyond" *a threshold distance* (which is what Newcombe teaches and what Petitioner argued) with the concept of points "beyond" *a defined point in space* (which is what the Board's hypothetical example demonstrates). In other words, the Board misunderstood the use of the word "beyond" (*i.e.*, greater than) a threshold distance, and instead interpreted it to mean "beyond" (*i.e.*, behind) a point in space. This is the only way the Board could have reached its mistaken conclusion that Petitioner believed all points in Newcombe *behind* the red-dot "moving object" (such as the window) are also labeled a moving object. *See* Dec. 20.

The fact that the "greater than" meaning of "beyond" is the only correct understanding is evident from the text accompanying Newcombe's Figure 6:

> differences between the previous depth image 500 and the current depth image 600 (e.g. due to new or moving objects) result in the distance 604 between the source and destination points being ***greater than*** the pre-defined distance threshold, and hence the destination point is labeled as an outlier.

Ex. 1005, 8:43–48 (emphasis added).

By unjustifiably discrediting the correct interpretation of Newcombe based on its own flawed use of a "hypothetical example," the Board abused its discretion and failed to consider the Petitioner's actual argument. Petitioner in fact argued that

Newcombe discloses using depth images to determine a surface and exclude moving objects using its ICP algorithm. Pet. 26–28. Dr. Foroosh testified that a POSITA would understand that determining a surface (and excluding outlier points) would also necessarily result in determining an excluded volume, *i.e.* the empty space between the scanner and the surface. The Board therefore committed a clear abuse of discretion in determining that the Petition failed to sufficiently set forth how Newcombe meets the "determining" steps of the method of claim 1, and by extension, the remaining independent claims.

B. The Board Abused Its Discretion in Relying on Clearly Erroneous Fact Finding Regarding Herbst, Including Overlooking Testimony from Dr. Foroosh and Misapprehending Herbst's Figures

Herbst uses 3D scans to create a "surfel" representation of a surface. Ex. 1006, 1–4. Herbst uses multiple scans to calculate a probability that any object in a scene moved from one map to the next. *Id*. at 4–5. The two scans can then be merged into a single 3D model that removes any moveable objects. *Id*. at 5–7, Figs. 6(a), 6(d), 7(b). Herbst teaches that converting the 3D scan points to surfels "reduce[s] map size and smooth[es] evidence from multiple frames." *Id*. at 2. Dr. Foroosh testified that a POSITA would have understood that this reduced map (*i.e.*, 3D representation) size is achieved in Herbst by assigning surfels to represent the surface and then excluding "the empty space determined accordingly between the scanner and the surface, where no 3D point on any surface is detected." Ex. 1003 ¶ 264.

The Decision quotes this testimony, but then immediately states: "It is unclear how reducing the size of a map (3D representation) satisfies determining a first excluded volume in space." Dec. 29. The Board gives no reason why Dr. Foroosh's testimony cited above does not "sufficiently explain any relationship between reducing the size of a map and determining a volume in space." *Id*.

Instead, the Decision immediately focuses on Figure 6(a) of Herbst, only to misapprehend that Figure. Dr. Foroosh testified that a POSITA would have understood that the empty space in the Figure – "i.e., the space in the scene that is not occupied by the table, the objects on the table, or any other surface – would constitute an excluded volume." Ex. 1003 ¶ 266. Yet, the Board committed clear error in stating that "[i]t appears that the empty space shown in Figure 6(a) . . . includes space where a surface belonging to a very small foreground object can be present" (Dec. 30), because it errantly conflated Figure 7(b) with Figure 6(a). While the Decision purports to rely on "Herbst's teaching that it 'do[es] not show foreground components that are very small, of which there are . . . three in Fig. 6,'" *id*., Figure 6(a) does ***not*** include small foreground objects in its empty space. The quote from Herbst that the Board relies on to dismiss the teaching in Figure 6(a) is ***actually associated with Figure 7(b)***:

> In Fig. 7(b) we show four extracted foreground connected components along with the merged backgrounds; again we have filled in some holes

> on the table. We **do not show foreground components that are very small, of which there are** one in Fig. 5 and **three in Fig. 6**.

Ex. 1006, 5. In the above quote, the bold text is the portion quoted by the Board. But the full context of the quote makes clear that the small, unshown objects are actually in Figure 7(b), a representation of moving objects that were extracted from the scans shown in Figures 5 and 6. *Id*. at 5, 7 ("Fig. 7: Objects extracted from the scene pairs of Fig. 1 and Fig. 6, and the merged background components of each pair of scenes."). The disclosure partially quoted by the Board simply describes how the authors of Herbst only chose the large moving objects of Figure 6 to extract into Figure 7(a) and chose not to show smaller objects. But these smaller objects are, in fact, shown in Figure 6, and the "empty space" of Figure 6 does not contain any objects. Indeed, it is difficult to understand how the empty space of a scan could.

This misinterpretation of Herbst infects the remainder of the Decision's analysis of the Herbst ground and leads the Board to discredit Dr. Foroosh's testimony. Dr. Foroosh and the Petition explained how Herbst's surfel method reduces map size by excluding empty space between the scanner and the surface, thus necessarily resulting in the determination of an excluded volume. Without the Board's misapprehension of Herbst's Figure 6(a), its disregard of Dr. Foroosh's testimony to this effect is unsupported. When the Petition and Dr. Foroosh's testimony are properly considered, the preliminary record clearly supports a finding

that Herbst sufficiently discloses the "determining" steps of claim 1. The Board therefore committed a clear abuse of discretion in concluding otherwise.

IV. CONCLUSION

In view of the foregoing, Petitioner respectfully requests Director Review and reversal of the Decision Denying Institution of *Inter Partes* Review or, in the alternative, delegation of review to the Delegated Rehearing Panel for reconsideration. The Board's denial of institution, based on a misapprehension of the disclosures of the prior art and Petitioner's arguments, should be reversed, and the Petition should be remanded for further proceedings.

Dated: April 22, 2024

Respectfully Submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on April 22, 2024, I caused a true and correct copy of the foregoing Request for Director Review to be served electronically via e-mail upon the following counsel.

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