

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

GOOGLE INC.
Petitioner

v.

VISUAL REAL ESTATE, INC.
Patent Owner

CASE IPR2014-01341
Patent 8,078,396

PATENT OWNER'S RESPONSE TO PETITION

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EXHIBIT LIST

<u>EXHIBIT NO.</u>	<u>DESCRIPTION</u>
2001	Tony Quesada, “New cameras capturing appraisal market,” Jacksonville Business Journal, June 2, 2008 (http://www.bizjournals.com/jacksonville/stories/2008/06/02/story4.html?pag e=all)
2002	Declaration of Dr. John R. Grindon in Support of Google’s Opening Claim Construction Brief (submitted by Petitioner in <i>Vederi, LLC v. Google, Inc.</i> , No. 2:10-cv-07747 (C.D. Cal.), D.I. 50-1)
2003	Microsoft Corporation, <u>Microsoft Computer Dictionary</u> , 144 (Alex Blanton et al. eds., 5th ed. 2002)
2004	Press Release, FNC, <i>FNC® Strategic Alliance to Help Clients Mitigate Risk, Cut Costs</i> (Apr. 8, 2008)
2005	Deposition Transcript of Henry Fuchs, Ph.D. (April 22 and 23, 2015)
2006	U.S. Provisional Application No. 60/238,490 filed on October 6, 2000

Pursuant to 37 C.F.R. § 42.120, Patent Owner Visual Real Estate, Inc. (“Patent Owner” or “VRE”) submits the following Patent Owner response to the Petition for *Inter Partes* Review filed by Google Inc. (“Petitioner”) on the grounds instituted by the Board in its Institution Decision dated February 27, 2015 (Inst. Dec., Paper No. 11).¹ At least for the reasons set forth herein, Judgment should be entered in favor of VRE on the remaining grounds of the Petition, namely that claims 1, 2, 5, 8 and-13 of U.S. Patent No. 8,078,396 (the “’396 Patent”) are not unpatentable

I. INTRODUCTION

The inventors, William D. Meadow, Randall A. Gordie, Jr. and Matthew Pavelle, had previously developed and deployed a commercial system for capturing Drive-By Street view video images of residential and commercial real estate. The system processed these video images to generate composite images of residential and commercial streets. Using this system, real estate appraisers were able to locate and view particular subjects (e.g., an address designated as a geographic location of interest). *See, e.g.*, Ex. 2001, Ex. 2004.

The present invention of the ’396 Patent improved upon this commercial system by using camera images from Video Drive-By Data to generate point

¹ In this Response, all citations to the “Petition” refer to the Corrected Petition filed on September 5, 2014 (Paper No. 4).

cloud arrays for three-dimensional (“3D”) mapping applications.

In particular, the ’396 Patent describes a system where Video Drive-By Data is taken of a street level view with various overlapping images captured at disparate points along a “continuum” (*e.g.*, the pathway of a vehicle with a camera driving down a street). Ex. 1002, 3:14-21.

An important aspect of the invention is the use of features in the multiple camera images to allow “portions” of the images to be “aligned” in a dimension consistent with a path of image capture to form a “composite image.” Ex. 1002, 7:1-7. For example, two different images may include only certain portions of a building, but both images include at least one common feature (*e.g.*, the same tree). The common feature is used as a reference point to align the different the portions of the two or more images of the building to create a composite image showing the entire building. The position of the “features” in the images are also “track[ed]” and used to “generat[e]” a point cloud array which is converted to a “polygon based model”. *See, e.g.* Ex. 1002. 5:43-49.

The Petition requested *inter partes* review for six overlapping and cumulative grounds relying on “An Automated Method for Large-Scale, Ground-Based City Model Acquisition” by Früh et al. (October 2004) (“Früh,” Ex. 1004) as the primary references. However, Früh does not teach the same type process disclosed and claimed in the ’396 Patent.

On August 20, 2014, Google, Inc. (“Petitioner”) filed a Petition for *Inter Partes* Review for claims 1 and 3-11 of the ‘800 Patent pursuant to 35 U.S.C. §§ 311-319. A Corrected Petition for *Inter Partes* Review (“Petition”) was filed on September 5, 2014. On February 27, 2015, the Patent Trial and Appeal Board (the “Board”) issued a Decision to Initiate Trial for *Inter Partes* Review (the “Order”) limiting review of claims in the ‘396 Patent as follows:

Instituted Ground 1: Claims 1, 2, 5, and 8-13 as allegedly anticipated under 35 U.S.C. §102(b) by Früh (corresponding to Petition Ground 1); and

Instituted Ground 2: Claims 1, 2, 5, 8, 9, and 11-13 as allegedly unpatentable under 35 U.S.C. § 103(a) over Früh and Di Bernardo (corresponding to Petition Ground 3).

The Board refused to institute on any other ground, and thus the remaining grounds in the Petition are not the subject of this trial.

Grounds 1 and 2 of the Petition rely upon Früh as the primary reference. However, Grounds 1 and 2 fail because Früh uses a scanner that does not, and cannot, include **multiple** image data sets (as that term is defined in the Board’s Institution at 12 (“a data set associated with an image”)), that cannot possibly contain a “subject” in more than one image data set, when each image data set is captured from a different point on a single continuum, as specified in Claim 1. Inst. Dec. 11-12. This is in keeping with the contribution of Früh, since Früh is

directed to a distinct (and different) problem and offers a completely different solution. Früh's solution involves scan data instead of images, and scan data from a single point on a single continuum cannot meet the limitations of Claim 1. Ex. 1004, Abstract.

Ground 2 of the Petition recognizes that the scanner of Früh is insufficient, and therefore seeks to combine Früh with U.S. Patent No. 6,895,126 to Di Bernardo ("Di Bernardo," Ex. 1005). The Petition also recognizes that Früh does not generate a "composite" video image as required by Claim 1, Step (b), and therefore alleges that Di Bernardo fills this gap. Pet. At 19. However, applying Di Bernardo's vision-based processing to Früh's scanning system makes no sense and is actually directly contrary to Früh's teaching of the use of scanner-based technology to generate a cloud array instead of video technology. Di Bernardo actually teaches not to perform 3D reconstruction of scenes as being costly and inefficient. Ex. 2002, pg. 6, lines 20-28. VRE respectfully submits, that at the time of the invention, a person of ordinary skill in the art would not have combined Früh's scanning system with the incompatible architecture of Di Bernardo's vision-based processing (expressly rejected in Früh). Thus, VRE should be awarded Judgment on Ground 2 also.

As shown herein, the Petition has failed to meet its burden regarding at least independent Claim 1. The remaining challenged claims are all dependent

claims. Since the Petition has failed to meet its burden at least regarding Claim 1, from which the remaining claims all depend, the '396 should be found not unpatentable.

II. OVERVIEW OF U.S. PATENT NO. 8,078,396

The '396 Patent discloses and claims a process to generate a continuum of image data with polygon based models, including three dimensional polygon models, as developed for the commercial embodiment of a system and brought to market by inventors William D. Meadow, Randall A. Gordie, and Matthew Pavelle. *See* Ex. 2001. This was a significant technological breakthrough in that it offered a unique method of generating three- dimensional models from the same image data used to generate Video Drive-By imagery and street level imagery. This is meaningful because it allows existing libraries of image data to generate 3D models.

A significant innovative aspect of the present invention was the use of **image data** captured **by cameras** to generate point cloud arrays by taking **portions** of **overlapping** captured images, aligning overlapping features, and generating composite images. *See, e.g.* Ex. 1002, 5:45-49.

Thus, the '396 Patent claims a process where “each image data set is captured from a disparate point on a continuum,” (Claim 1) such as a “path of a vehicle carrying a digital camera. . . .” Ex. 1002 (emphasis added), 3:14-118.

FIG. 1 of the '396 Patent illustrates an example of such a “continuum” used to “capture” the images.

As taught by the '396 Patent and claimed in Claim 1, multiple image data sets are captured at a single point of the same continuum of a vehicle travelling down a street by using multiple cameras in an array and capturing images simultaneously. Ex. 1002, 6:1-4. The use of the term “continuum” is consistently used as a singular continuum:

- 3:15-19 (illustrating a single continuum in Fig. 1A, where “in some embodiments the continuum 100 includes the path of a vehicle carrying a digital camera, or other image data capturing device. Image data sets are captured at disparate points 101-106 along the continuum.”);
- 5:23-25 (illustrating “exemplary image data sets 201-203 are illustrated which capture images of a subject 200 from different points along a continuum.”); and
- 5:38-40 (clearly illustrating a single continuum, wherein “a related two dimensional image data set 400B captured from a separate point along a continuum of travel 404.”).

In addition to capturing images, positional information is also captured. For example, positional data can identify a “geospatial designation,” such as latitude

and longitude coordinates for a parcel of land in the captured images. Such positional data may be determined from data collected by a GPS device, an inertial navigation system, and/or accelerometers, as well as data describing the direction of image capture (*e.g.*, from an electronic compass) and the depth of field of the camera. *See* Ex. 1002, 3:30-32, 46-48, 53-55, 4:37-42, 59-62.

In some embodiments, such as the claimed embodiment, “image data sets . . . overlap the subject matter captured. ***The overlap allows for features present in one image data set to be present in a second image data set***, and preferably in a tertiary image data set.” *Id.* at 5:25-29 emphasis added. Figs. 3 and 7 illustrate examples of this aspect of the claimed the invention.

As explained with respect to FIG. 4, “feature” refers to “various objects contained within the image data set,” such as “a tree in a front yard of a real estate parcel,” “a roof line of a house,” or “an edge of a driveway.” *Id.* at 5:30-37. “Feature points” are points located on such objects. Significantly, with respect to the claimed invention “[t]he image data set 400B includes many of the same features as image data set 400A,” and “the location of one or more features is registered and the relative position of one or more features is tracked.” *Id.* at 5:40-41, 43-45.

This information is combined and used “to generate point arrays based upon the feature point data.” *Id.* at 5:48-49; *see also*; *Id.* at 5:38-48. Figs. 5A and

5B illustrate examples of “point cloud arrays 501A-503A . . . which represent various aspects of the image data sets.” *Id.* at 5:50-52. The various point clouds illustrate a tree 501, the house 502, and the driveway 503. *Id.* at 5:52-55. “The position of each point cloud array is tracked.” *Id.* at 5:55-56.

As illustrated in Fig. 6, “point cloud arrays can be converted to three-dimensional polygon based models of artifacts present in the image data sets. The three-dimensional polygon based models are based upon physical attributes determined by processing the two-dimensional image data.” *Id.* at 6:50-54. Here again, the importance of two or more image data sets including the same overlapping feature was emphasized in the example of “a polygon model of a tree 601 . . . based upon point clouds derived from two or more two-dimensional data sets.” *Id.* at 6:55-57.

As reflected in dependent Claim 2, “image data derived from image data sets corresponding to the three-dimensional models can be sprayed over the three-dimensional polygon models.” *Id.* at 6:60-63.

III. ARGUMENT

A. Summary

The Institution Decision granted *inter partes* review for two grounds. Both grounds rely upon Früh as the primary reference. In Grounds 1 and 2, the Petition alleges that Claims 1, 2, 5, 8-13, and 16 of the '396 Patent are either anticipated by Früh (Ground 1) or rendered obvious by Früh in view of Di

Bernardo (Ground 2). The Petition relies upon a passing reference in Früh to a “camera” in addition to ground-based laser scans to continuously acquire texture and geometry data. But, as Petitioner’s expert recognizes, it is *only* the “vertical laser scans” that Früh’s system uses to generate a 3D point cloud for a city block. Ex. 1001, ¶ 24 (“Früh’s system generates a 3D point cloud for a city block from vertical laser scans.”). The camera in Früh is not used for 3D imaging and instead is only used to obtain texture information (the color of the 3D image), which is not relevant for Claim 1. 1004 at 2. Likewise, the Institution Decision also only relies upon scans in its analysis. Inst. Dec. at 14-15.

Moreover, the vertical laser scans of Früh are very different technology than the claimed drive-by video cameras used to capture “image data sets” in the ’396 Patent. As discussed below, these differences are so significant that when the excerpts of Früh cited by the Petition are properly analyzed, it is clear that Früh does not anticipate nor render obvious the claimed invention.

Petitioner’s attempt in Ground 2 to combine the laser scan system of Früh with the drive-by camera system of Di Bernardo to purportedly fill the gaps also fail because these two non-analogous systems have nothing to do with each other and each reference actually teaches away from combining these two competing technologies. Indeed, as Petitioner’s own expert on the Di Bernardo reference admits Di Bernardo teaches against adding computational overhead to its system,

and therefore Dr. Fuchs' proposed combination of adding the computation system of Di Bernardo to the computation system of Früh to double up the computational overhead therefore makes no sense. Ex. 2002, 6:20–7:7. Likewise, Früh rejects the use of “purely vision-based methods” (Ex. 1004, p. 2) to generate a point cloud as required by Claim 1. Finally, Di Bernardo rejects “the reconstruction of 3D scene geometry” and “the dense sampling of the locale in multiple dimensions” (Ex. 1005, 2:3-5), yet the very point of Früh is to develop “[t]hree-dimensional models of urban environments.” Ex. 1004, Früh, p. 1, col. 1, line 1. The combination thus fails.

1. [RE: GROUND 1] Claims 1, 2, 5, and 8-13 Are Not Anticipated by Früh

i. Analysis of Früh

Früh “describe[s] an automated method for fast, ground-based acquisition of large- scale 3D city models” using “a truck equipped with one camera and two, fast inexpensive 2D laser scanners, being driven on city streets under normal traffic conditions.” Ex. 1004, Früh, abstract.

Früh emphasizes the speed and low costs of its solution throughout its disclosure and contrasts its techniques with prior systems that were “difficult and time consuming,” “require significant manual intervention,” and are “prohibitively expensive.” *Id.* at 1. Früh emphasizes the “**enormous challenges to purely vision-based methods**” (e.g., camera systems) (*Id.* at 2 (emphasis added)), and

instead proposes “‘drive-by scanning’ as a method that is capable of rapidly acquiring 3D geometry and texture data” *Id.* at 2. Although Früh’s system has a “camera” mounted to the car, this camera is irrelevant to the process steps in Claim 1, and is merely used for the “spraying” step of Claim 2. *Id.* at 12.

As pertinent to the present Petition, it is only the “fast, inexpensive 2D laser scanners” that are relevant to Dr. Fuchs’ analysis of the step of generating a point cloud array required by the claim. Früh describes using two dimensional laser scans to capture only lines and single points of data. *Id.* at 8. In Früh, vertical laser scans capture data points of a façade being driven past and horizontal scans are used to locate the truck via correlation with another reference. *Id.* at Abstract. In this regard, according to Dr. Fuchs, “Früh’s system generates a 3D point cloud for a city block from vertical laser scans” Ex. 1001, ¶ 24. Fuchs further explains that Figs. 1 and 5 of Früh illustrate the use of laser scanners. Ex. 1001, ¶ 26. Indeed, the Institution Decision likewise focuses its discussion of Früh on its laser scans. Inst. Dec. at 15-16. Fuchs states that “Früh discloses generating a 3D point cloud for a city block from vertical laser scans.” Ex. 1001, ¶ 30. The X, Y, and Z coordinates of Fig. 1 of Früh correlate the X and Y dimensions with the location of the truck and the Z dimension with a vertical scan. Ex. 1004, at 4.

Petitioner’s claim chart, which cites to the following passage of Früh in regard to the “generating a point cloud array” element: “Using the accurate pose

information, we transform **the vertical laser scans** into global coordinates and obtain a structured point cloud for a city block as shown in Fig. 19, with a detailed view shown in Fig. 20.” Pet. 31 (emphasis added) (citing Ex. 1004, 19; Ex. 1001, ¶ 30).

Früh teaches using a “vertical 2D **scans [that] are parallel and do not overlap.**” Ex. 1004, at 2 (emphasis added). In fact, it is impossible to overlap since the laser scans of Früh are linear or point generating and the scans are performed while the truck is travelling at normal speed down a roadway. The “Results” of Früh provide for a distance of between 80cm and 150cm between vertical scans. *Id.* at 12.

Früh discusses an approach fundamentally different from the ‘396 Patent since at any given point on a continuum, Früh only generates a single two-dimensional image data set, the vertical scan, whereas the ‘396 Patent teaches the use of an array of multiple cameras simultaneously capturing image data sets at any given point on a continuum thereby generating multiple two-dimensional image data sets captured from a single point of a continuum. *Id.* at 3. Ex. 1002, at 6:1-3.

ii. Independent Claim 1 is not anticipated by Früh

Independent Claim 1 of the '396 Patent is directed to a method for creating a continuum of image data. The claim recites the following elements:

[1.P] 1. A method for creating a continuum of image data, the method comprising:

[1.1] a) receiving multiple two-dimensional image data sets of a subject, wherein each image data set is captured from a disparate point on a continuum and each image data set comprises a plurality of features;

[1.2] b) generating a composite image of the subject from portions of two or more of the multiple two-dimensional image data sets, wherein the portions are aligned in a dimension consistent with the continuum;

[1.3] c) receiving data descriptive of a location of the plurality of features;

[1.4] d) tracking the position of at least one of the plurality of features in two or more of the two-dimensional images;

[1.5] e) generating a point cloud array for the at least one of the plurality of features;

[1.6] f) converting the point cloud array to a polygon based model;
and

[1.7] g) associating a location for the polygon based model relative to the portions of the image data sets and based upon the location of the plurality of features.

Critically, Petitioner has failed to demonstrate that Claim 1 is anticipated by Früh, as Früh is directed to a completely different type of system that uses laser scan data to generate point clouds at geographic locations, but is not capable of generating multiple image data sets from a disparate point on a continuum and associating models with portions of those image data sets as required by Claim 1, and thus does not teach the limitations of Claim 1. Ex. 1004, Abstract.

(a) Früh does not disclose, inter alia, “receiving multiple two-dimensional image data sets of a subject, wherein each image data set is captured from a disparate point on a continuum and each image data set comprises a plurality of features;” (Claim 1, element 1.1)

Claim 1 requires “receiving multiple two-dimensional image data sets of a subject ... captured from a disparate point on a continuum”. The ‘396 teaches the use of an array of cameras that capture image data simultaneously. Ex. 1002, 6:1-4. Simultaneous capture by multiple cameras provides multiple two-dimensional image data sets from a single point on a continuum. As Petitioner’s Expert conceded in his deposition, Früh cannot and does not disclose this first critical element because the vertical scans of Früh do not overlap and therefore

cannot include multiple image data sets at a given point. Ex. 2004, 247:20-21.

Accordingly, Früh does not meet the limitations of element 1.1 of Claim 1 of the ‘396 Patent.

As discussed above, the horizontal scan is only utilized in Früh to determine an X,Y position of a truck carrying the scanners via correlation with another source, such as an aerial map. Ex. 1004, 3. However, even if it were to be argued that the horizontal scan in Früh is an image data set, the horizontal scan of Früh does not include a plurality of features.

Accordingly, Früh does not meet the limitations of element 1.1 of Claim 1 of the ‘396 Patent.

(b) Früh does not disclose, inter alia, “generating a composite image of the subject from portions of two or more of the multiple two-dimensional image data sets, wherein the portions are aligned in a dimension consistent with the continuum; ” (Claim 1, element 1.2)

As with other claim limitations, the elements of Früh cannot be forced to meet the claimed limitations of Claim 1 element 1.2, in this case, a series of vertical laser scans cannot be aligned in a dimension consistent with the continuum. As the Institution Decision found the claimed “composite image” is “an image formed by aligning portions of at least two or more image data sets.” (Inst. Dec. at 13). Vertical laser scans may include features, but they are by definition “vertical” and Früh specifically states that other scans may overlap and

accurately register with each other, but the teachings of Früh do not: “3D scans overlap and can hence be accurately registered with each other if an initial pose is known approximately, this is not possible in our approach, since vertical 2D scans are parallel and **do not overlap**.” Ex. 1004, at 2 (emphasis added).

In instituting this trial, the Board did not appreciate the claims requirements that “portions” of two or more image data sets for the same continuum must overlap. Inst. Dec. at 19. However, absent a requirement that the image data sets overlap, it is not possible to align “portions” of such datasets. This is clear in the context of the ‘396 Patent disclosure.

The claimed process is succinctly described and illustrated in the ‘396 Patent in relation to Figure 7, 7:1-13:

“image data sprayed over the three-dimensional polygon formats includes a composite image is formed by aligning two or more of the image data sets. Unlike stitching processes previously known, the present invention creates a composite through alignment of portions of data from more than one data set. Alignment can be accomplished in image data processing. Using image data processing, the images 701-703 are aligned to form a composite image 700. The composite image 700 is essentially two dimensional image data arranged as a second continuum, or ribbon.” (Ex. 1002, 7:1-13).

Element 1.2 of Claim 1 is particularly described in 7:48-52.

“select portions 704-707 of two or more sets of captured image data are

aligned to generate the composite image 708. As illustrated, some preferred embodiments include vertical slices of data 704-707 aligned in a horizontal plane to form the composite image 708.”

(*Id.* at 7:48-52).

In other words, in order to align “portions” of multiple two-dimensional image sets, features within the image sets need to be in common and overlap. Otherwise, there is nothing to “align”.

In relation to the Früh disclosure, the continuum is therefore the path of the truck, a horizontal dimension. The 2D laser scans of Früh are line based. Ex. 1004, 4. Parallel vertical lines **do not overlap** and therefore **cannot be aligned** in a horizontal dimension. *Id.* at 2. Parallel vertical 2D scans therefore cannot be aligned in a dimension consistent with the path of the truck, because they do not overlap, there are no points to align. Consequently, Früh does not disclose aligning the multiple two-dimensional image data sets of Früh in a dimension consistent with the continuum. The Petition also fails to cite any “alignment” or as a practical matter any of the aspects of element 1.2, and thus fails to meet its burden to prove anticipation. Again, Früh teaches does not teach the claimed invention, and if anything, teaches away from the claimed invention of the ’396 Patent by requiring that the drive-by scan data not overlap.

- (c) **Früh does not disclose, inter alia, “tracking the position of at least one of the plurality of features in two or more of the two-dimensional images; ” (Claim 1, element 1.4)**

Element 1.4 of the '396 Patent is taught and illustrated in relation to Figure

3. The specification explains, “[I]mage data sets . . . *overlap the subject matter captured*. The *overlap* allows for features present in one image data set to be present in a second image data set, and preferably in a tertiary image data set.” Ex. 1002, 5:26-29 (emphasis added). By stark contrast, and as discussed above, Früh makes clear its drive-by scans are “vertical 2D scans [that] are parallel and *do not overlap*.” Ex. 1004, p. 2, Col. 2, lines 17-18 (emphasis added). **With no overlap, none of the data present in a first scan of Früh can be present in a second scan of Früh**, consequently, a feature in a first scan of Früh cannot be present in a second scan of Früh and tracking the position of at least one of the plurality of features in two or more of the two-dimensional images is impossible.

For at least the foregoing reasons, it is respectfully submitted that the Petition fails to demonstrate a reasonable likelihood that independent Claim 1 is unpatentable as anticipated by Früh under the Petition’s Ground 1.

iii. Dependent Claims 2, 5, and 8-13 are not anticipated by Früh

The remaining claims of the '396 Patent all depend from Claim 1. As the Petition has failed to show a reasonable likelihood that Claim 1 is anticipated by Früh, it has necessarily failed to show that dependent claims 2, 5, and 8-13 are

anticipated. *See, e.g., CallCopy, Inc. v. Verint Americas, Inc.*, IPR2013-00492, Paper 14 at 7 (PTAB Feb. 5, 2014) (holding that “[b]ecause the grounds asserted against the dependent claims suffer from the defects of the grounds asserted against the independent claims, [the Board] need[ed] to address only the grounds asserted against independent claims . . .”).

2. [RE: GROUND 2] Claims 1, 2, 5, 8-13, and 16 Are Not Obvious Under 35 U.S.C. §103 Over Früh in View of Di Bernardo

With respect to Claim 1, the Petition cites Di Bernardo solely for the purpose of allegedly teaching element 1.2, “generating a composite image of the subject from portions of two or more of the multiple two-dimensional image data sets, wherein the portions are aligned in a dimension consistent with the continuum.” Pet., at 38.

Significantly, the Petition offers no obvious arguments with respect to element 1.2, and thus to the extent the Board agrees that element 1.2 is not taught by Früh, the Petition should be denied since it failed to meet its burden to show unpatentability.

While the Petition proposes to combine Früh with Di Bernardo to provide element 1.2, the alleged motivations offered in the petition are insufficient. The first proffered motivation relates to “overlaying metadata”. However, Claim 1 has nothing to do with metadata, let alone the missing elements. Pet., 22. The second

proffered motivation—using “known techniques (*e.g.*, generating composite images of a geographic area . . .) to improve similar devices (*e.g.*, Früh’s system for generating 3D models from 2D scans and images) in the same way” —is not logical since Früh deliberately offers an alternative to image-based systems in the first three columns of the Früh article. *Id.* See also Ex. 1004, 1-2.

Both Früh and Di Bernardo are directed to making low cost and lower computational overhead systems. Früh does this by using “drive-by scanning” techniques in contrast to prior systems that were “difficult and time consuming,” “require significant manual intervention,” and are “prohibitively expensive.” Ex. 1004, at 1.

Dr. Grindon, another expert of Petitioner who has submitted sworn testimony regarding Di Bernardo, explained in litigation involving patents with the same disclosure as Di Bernardo that “[t]he patents-in-suit [Di Bernardo], in seeking to improve upon the so-called ‘computationally intensive’ and ‘cumbersome’ methods of forming composite images in the prior art, teach a single way to form composite images that seeks to minimize this computational burden.” Ex. 2002, ¶ 39.

At the time of the invention, a person of ordinary skill in the art would not seek to combine the scanning process of Früh with the vision-based technology of Di Bernardo, since such a combination would become more cumbersome and

computationally intensive. Ex. 1004, at 2.

Further, as Dr. Grindon, Petitioner's other expert, explains, "the provisional patent application states that '[t]he present method is a compromise between quality of the synthetic image and algorithmic complexity.'" (Ex. 2002, Dr. Grindon, ¶ 28 (quoting Ex. 2006, p. 9)). In other words, Di Bernardo choose lower quality images in order to avoid the algorithmic complexity. As the Federal Circuit has warned, "[s]uch a change in a reference's 'principle of operation' is unlikely to motivate a person of ordinary skill to pursue a combination with that reference." *Plas-Pak Indus. v. Sulzer Mixpac AG*, No. 2014-1447, Slip op. at 7 (Fed. Cir. Jan. 27, 2015) (nonprecedential) (citing *In re Mouttet*, 686 F.3d 1322 (Fed. Cir. 2012); *In re Ratti*, 270 F.2d 810 (CCPA 1959)).

Thus, since both Früh and Di Bernardo teach against a combination, the Petition's argument fails as a matter of law. *See In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994) ("[A] reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant."). In particular, as discussed above, Früh emphasizes the "enormous challenges to purely vision-based methods" (Ex. 1004, 2) (such as that used in Di Bernardo) and instead proposes "'drive-by scanning' as a method that is capable of rapidly acquiring 3D geometry and texture data" *Id.*

Similarly, Di Bernardo teaches against any combination with Früh. Di Bernardo explains, “Such a system **should not require the reconstruction of 3D scene geometry** nor the dense sampling of the locale in multiple dimensions.” Ex. 1005, 2: 3-5 (emphasis added). In other words, Di Bernardo teaches against combining with a system that would require the 3D scene geometry taught in Früh.

However, even if Di Bernardo were to be combined with Früh, it would not invalidate Claim 1 of the ‘396 Patent. As discussed above in regard to Früh and Ground 1 of the Institution, Früh teaches vertical linear scans that **do not overlap**. Petitioner understood that vertical linear scans cannot be aligned in a dimension consistent with the continuum and consequently seeks to an image based reference (Di Bernardo) to make up for this deficiency. However, Di Bernardo fails to do so. Nothing in Di Bernardo describes or suggests how to make vertical linear scans align in a dimension that is not congruent with the vertical lines. The whole premise of Früh is that the X, Y dimensions provide data to locate a position of a scan and the Z dimension provides point cloud data. The 2D image scans of Früh are vertical linear data which because they do not overlap cannot be aligned in a dimension consistent with the continuum of data capture.

In still another aspect, Di Bernardo relies on GPS for positional data, Früh deliberately discards GPS and relies on airborne DSM. *See* Ex. 1004, 2 (“in our

approach, rather than GPS, we use an aerial image or an airborne DSM to precisely reconstruct the path of the acquisition vehicle.”). The two references rely on two very incompatible methodologies for positioning and therefore alignment of different image data sets. Due to the incompatibilities, the Früh and Di Bernardo may not be combined into a cohesive working system.

For at least the foregoing reasons, it is respectfully submitted that the Petition **fails to demonstrate** that independent Claim 1 and its dependent claims are unpatentable as obvious over Früh in view of Di Bernardo under Petitioner’s Ground 3.

3. [RE: GROUNDS 1 and 2] Claims 2, 5, 8-13, and 16 are dependent on Claim 1, therefore any arguments against the validity of these claims suffer at least the same defects as Claim 1

In support of the obviousness challenge as to Claims 2-4, 10, 11, 13-15, and 18, Petitioner relies on the disclosures of Früh discussed above with regard to independent Claim 1.

As discussed above, Früh fails to teach or suggest all of the claim elements of independent Claim 1, including, for example, “[1.1] receiving multiple two-dimensional image data sets of a subject, wherein each image data set is captured from a disparate point on a continuum and each image data set comprises a plurality of features;” “[1.2] generating a composite image of the subject from portions of two or more of the multiple two-dimensional image data sets, wherein

the portions are aligned in a dimension consistent with the continuum; “ and “ [1.4] tracking the position of at least one of the plurality of features in two or more of the two-dimensional images.”

Furthermore, the Petition does not rely on Di Bernardo to cure these deficiencies of Früh with respect to the limitations of Claim 1. When combining two or more references to establish a prima facie case of obviousness, the references together must teach or suggest all of the claim elements. *In re Royka*, 490 F.2d 981, 985 (C.C.P.A. 1974). Accordingly, the Petition failed to establish a prima facie case of obviousness for any of the challenged claims.

As discussed above, Petitioner fails to demonstrate a reasonable likelihood that independent Claim 1 is obvious over Früh. Dependent claims are nonobvious if the independent claim from which they depend are nonobvious. *In re Fine*, 837 F.2d 1071, 1076 (Fed. Cir. 1988); see also MPEP § 2143.03. Since Claim 1 is nonobvious, Claims 6, 8, 10 and 11, which are dependent thereon, are likewise nonobvious. For at least this reason, the Board should find claims 1, 6, 8, 10 and 11 valid. *See, e.g., CallCopy, Inc. v. Verint Americas, Inc.*, IPR2013-00492, Paper 14, p. 7 (PTAB Feb. 5, 2014) (holding that “[b]ecause the grounds asserted against the dependent claims suffer from the defects of the grounds asserted against the independent claims, [the Board] need[ed] to address only the grounds asserted against independent claims . . .”).

IV. CONCLUSION

For at least the foregoing reasons, Petitioner has failed to demonstrate a reasonable likelihood that it would prevail in showing that any claim of the '396 Patent is unpatentable based upon any of the asserted grounds. Accordingly, the Board should deny the Petition and grant any and all other relief to Patent Owner that the Board deems just.

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), the undersigned hereby certifies that on this 4th day of June, 2015, a copy of the foregoing PATENT OWNER'S RESPONSE TO PETITION, together with Patent Owner's Exhibit List and Exhibit Nos. 2004-2006, was served via e-mail, based upon the agreement between the parties, on the following counsel of record for Petitioner:

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