UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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GOOGLE INC.
Petitioner

v.

VISUAL REAL ESTATE, INC.
Patent Owner

_____

CASE IPR2014-01341
Patent 8,078,396

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PATENT OWNER'S PRELIMINARY RESPONSE TO PETITION

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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?page=all)
2002	Declaration of Dr. John R. Grindon in Support of Google's Opening Claim Construction Brief (submitted by Petitioner in *Vederi, LLC v. Google, Inc.*, No. 2:10-cv-07747 (C.D. Cal.), D.I. 50-1)
2003	Microsoft Corporation, Microsoft Computer Dictionary, 144 (Alex Blanton et al. eds., 5th ed. 2002)

Pursuant to 37 C.F.R. § 42.107, Patent Owner Visual Real Estate, Inc. ("Patent Owner" or "VRE") submits the following preliminary response to the Petition for *Inter Partes* Review[1] filed by Google Inc. ("Petitioner"). The Board should deny institution of *inter partes* review because the Petition fails to show that there is a reasonable likelihood of prevailing with respect to any of the challenged claims, as explained below. 35 U.S.C. § 314.

I.   INTRODUCTION

The Petition asserts challenges to Claims 1, 2, 5, 8-13, and 16 of U.S. Patent No. 8,078,396 (the "'396 Patent," Ex. 1002), entitled "Methods and Apparatus for Generating a Continuum of Three Dimensional Image Data." Because each challenge is without merit, the Petition should be denied.

The inventors, William D. Meadow, Randall A. Gordie, Jr. and Matthew Pavelle, had previously developed 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., geographic locations of interest). *See, e.g.,* Ex. 2001. The present invention of the '396 Patent

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[1] In this Preliminary Response, all citations to the "Petition" refer to the Corrected Petition filed on September 5, 2014 (Paper No. 4).

improved upon this commercial system by using camera images from Drive-By Video to generate point cloud arrays for three-dimensional ("3D") mapping applications.

In particular, the '396 Patent describes a system where a Drive-By Video is taken of a street level view, and various overlapping images are taken from disparate points along a "continuum" (e.g., the street path). An important aspect of the invention is the use of overlapping "features" in the multiple camera images to allow "portions" of the images to be "aligned" in forming a "composite image." 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 portions of 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".

The Petition requests *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) ("Fruh," Ex. 1004) and "Towards Urban 3D Reconstruction From Video" by Akbarzadeh et al. (June 14, 2006) ("Akbarzadeh," Ex. 1006) as the primary references. Neither Fruh nor Akbarzadeh teach the same type of process disclosed and claimed in the '396 Patent.

Grounds 1-3 of the Petition rely upon Fruh as the primary reference. In Grounds 1 and 2, Petitioner alleges that Claims 1, 2, 5, and 8-13 are either anticipated (Ground 1) or

rendered obvious (Ground 2) by Fruh alone. However, Grounds 1 and 2 fail because Fruh uses a scanner that does not include any overlapping "subjects," as required by the claims. Fruh is directed to a totally different problem, offering a totally different solution involving scans instead of images, which does not meet the limitations of Claim 1. This short-coming cannot be rectified with the conclusory and incomplete obviousness argument advanced in Ground 2, which does not even address the Supreme Court's *Graham* factors, ignoring the scope and content of the prior art, differences between the prior art and the claims at issue, the level of ordinary skill in the pertinent art, and secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17 (1966). This failure is a sufficient ground to deny the petition. *See AOL Inc. v. Coho Licensing LLC*, IPR2014-00966, Paper 6 at 13 (PTAB Nov. 20, 2014).

Ground 3 of the Petition recognizes that the scanner of Fruh is insufficient, and therefore seeks to combine Fruh with U.S. Patent No. 6,895,126 to Di Bernardo ("Di Bernardo," Ex. 1005). In Ground 3, the Petition recognizes that Fruh does not generate a "composite" video image as required by Claim 1, Step (b), and therefore alleges that Di Bernardo fills this gap. However, applying Di Bernardo's vision-based processing to Fruh's scanning system makes no sense and is actually directly contrary to Fruh's teaching to use scanner-based technology instead of video technology to generate a cloud array. And, Di Bernardo's actually teaches not to perform 3D reconstruction of scenes as being costly and inefficient. At the time of the invention, a person of ordinary skill in the art would not have

combined Fruh's scanning system with Di Bernardo's vision-based processing. For at least these reasons, Grounds 1-3 should be denied.

The Petition's remaining cumulative arguments (Grounds 4-6) are also to no avail. In particular, Grounds 4-6 rely upon Akbarzadeh as the primary reference. In Grounds 4-5, the Petition alleges that Claims 1, 2, 5, and 8-10 are either anticipated (Ground 4) or rendered obvious (Ground 5) based on Akbarzadeh or Akbarzadeh in view of Di Bernardo (Ground 6). The Petition fails to meet is burden of explaining how Akbarzadeh has the same critical elements that are missing from Fruh, or offer any unique analysis as to why it would be obvious to combine with Di Bernardo. Grounds 4-6 should be denied because the Petition completely fails to meet its burden of proving invalidity of any of the claims by a preponderance of the evidence.

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 Petition should be dismissed in its entirety.

In sum, the present Petition fails to demonstrate a reasonable likelihood that at least one of the claims challenged in the Petition is unpatentable. Accordingly, the Board should not institute *inter partes* review based on any of the Grounds set forth in the Petition. 37 C.F.R. § 42.108(c).

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.

A significant innovative aspect of the present invention is the use of the image data captured by cameras to generate point cloud arrays by taking portions of overlapping captured images, aligning overlapping features, and generating composite images.

Thus, the '396 Patent discloses the process where "image data is captured from disparate points along a continuum," such as "the path of a vehicle carrying a digital camera. . . ." Ex. 1002, 3:14-118. FIG. 1 of the '396 Patent illustrates an example of such a "continuum" used to "capture" the images. The "image data sets" captured are referred to as "Video DriveBy™" in the '396 Patent, which is defined as "street level video data captured in multiple angles encompassing a 360° view." Ex. 1002, 3:2-4. 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, '396 Patent, 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. 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 arrays 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.   CLAIM CONSTRUCTION

When considering whether to institute a patent trial, the Board has indicated that it will interpret the claims of a challenged patent using a "broadest reasonable construction" approach. Office Patent Trial Practice Guide, 77 Fed. Reg. 48756, 48766 (Aug. 14, 2012). In applying such a standard, it is important to recognize that the broadest reasonable construction of claim language is not one that permits any reading thereof. Instead, it is one that must be made "in light of the specification as it would be interpreted by one of ordinary skill in the art." *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). Of

course, patent claims must "conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description." 37 C.F.R. § 1.75(d)(1). That is, "[c]laim terms are also given their ordinary and customary meaning as would be understood by one of ordinary skill in the art in the context of the entire disclosure." *Garmin Int'l, Inc. v. Cuozzo Speed Techs. LLC*, IPR2012-00001, Paper 59 at 8 (PTAB Nov. 13, 2013) (citing *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007)).

Here, the claims should be construed from the perspective of a person having a bachelor of science in computer science or 4 years of technical experience and professional experience in image processing relating to real property maps.

For the purpose of this proceeding, Patent Owner disputes Petitioner's proposed constructions (to the extent one is provided) and offers claims constructions for at least the following claims terms: (1) "image data sets"; (2) "composite image" and (3) "point cloud array." Should this Board institute a trial based on such a construction, Patent Owner reserves the right to further challenge other constructions proposed by the Petition.

Taking into account the teachings of the '396 Patent and the entire disclosure, Patent Owner herein sets forth the following preliminary term construction proposals for the notable exceptions outlined above.

A.   "image data set"

The Petition does not include a proposed claim construction for the term "image data set" present in independent Claim 1.

The ordinary meaning of a "data set" in the context of "computing" and the '396 Patent specification is "a collection of related information made up of separate elements that can be treated as a unit in data handling." Ex. 2003, Microsoft Corporation, <u>Microsoft Computer Dictionary</u>, 144 (Alex Blanton et al. eds., 5th ed. 2002).

In the context of the '396 Patent, Patent Owner proposes an "image data set" to mean a "data set associated with images captured by a camera." This construction is consistent with its use in the '396 Patent. For example, the '396 Patent explains,

> [A] plurality of cameras can be fixedly attached to a vehicle
> capturing Video DriveBy™ data. Each camera therefore
> maintains a constant direction of image capture in relation to
> the heading of the vehicle. Mechanics of the camera, such as,
> for example, lens parameters and shutter speed, can indicate a
> depth of field during camera *image data capture*.

Ex. 1002, '396 Patent, 4:49-55 (emphasis added). The term "Video DriveBy" is specifically described in the specification as "video data" indicating again that image data describes one or more pictures produced by a camera. The '396 Specification states that image data may

be stored in JPEG and TIFF format.[2] *Id.* at 5:9-10.

The '396 Specification additionally states that an "image data set" may be captured by a camera (*Id.* at 4:54-55) and illustrates an "image data set" in FIG. 2. Each image data set "capture[s] images of a subject . . . from different points along a continuum." *Id.* at 5:24-25.

Patent Owner therefore respectfully submits that "image data set" should be construed to mean a "data set associated with an image captured by a camera" to be consistent with Claim 1 and the specification of the '396 Patent.

B.   "composite image"

The Petition offers no construction of the term "composite image."

The '396 Patent describes a "composite image" as "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." Ex. 1002 , 7:3-7. An example of a "composite image" is shown in FIG. 7, as composite image 700. "Using image data processing, the images 701-703 are aligned to form a composite image 700." *Id.* at 7:8-9.

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[2] JPEG and TIFF are computer file formats that are widely recognized in the computer programming and image processing fields. One skilled in the art would have been able to recognize, at the time of the invention, the file formats for representing pictorial images.

Accordingly, Patent Owner respectfully submits that "composite image" should be construed as "an image formed by aligning portions of at least two or more image data sets."

C.   "point cloud array"

The Petition offers an incomplete and under-inclusive construction of the term "point cloud array" to mean "a set of points corresponding to locations of features." Pet., 10. Patent Owner respectfully submits that "point cloud array" should be construed to mean "a set of points generated utilizing the location of feature points present in multiple image data sets in combination with the position and orientation of a camera capturing the image data set."

As the Petition recognizes, the term "point clouds" are discussed at Col. 2, lines 41-44 of the '396 Patent (Pet., 10) which reads as follows: "In general, point clouds are generated utilizing the location of feature points present **in multiple image sets in combination with the position and orientation of a camera capturing the image data set.**" Ex. 1002, 2:41-44 (emphasis added). However, the Petition's proposed construction fails to consider the full scope of the definition set forth in the specification. By focusing on only the first part of the cited sentence, the Petition's proposed construction is incomplete and omits important aspects of the claimed invention.

Patent Owner respectfully submits that a proper claim construction of "point cloud array" should include the full definition set forth in the specification, not a cropped and

incomplete version as the Petition proposes. Accordingly, the term "point cloud array" should be construed to mean "a set of points generated utilizing the location of feature points present in multiple image data sets in combination with the position and orientation of a camera capturing the image data set."

IV. ARGUMENT

A. Summary of Petitioned Grounds

The Petition requests *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) ("Fruh," Ex. 1004) and "Towards Urban 3D Reconstruction From Video" by Akbarzadeh et al. (June 14, 2006) ("Akbarzadeh," Ex. 1006) as the primary references.

Grounds 1-3 rely upon Fruh 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 (Ground 1) or rendered obvious (Ground 2) by Fruh. The Petition relies upon a passing reference in Fruh 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 Fruh's system uses to generate a 3D point cloud for a city block. Ex. 1001, ¶ 24 ("Fruh's system generates a 3D point cloud for a city block from vertical laser scans."). The cameras are not used for 3D imaging and instead are merely used to obtain texture information (the color of the 3D image), which is not relevant for Claim 1.

Moreover, the vertical laser scans of Fruh 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 Fruh cited by the Petition are properly analyzed, it is clear that Fruh does not anticipate nor render obvious the claimed invention.

Petitioner's attempt in Ground 3 to combine the laser scan system of Fruh 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 Fruh to double up the computational overhead therefore makes no sense. Likewise, Fruh rejects the use of "purely vision-based methods" (Ex. 1004, p. 2, col. 1, line 11) 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 Fruh is to develop "[t]hree-dimensional models of urban environments." Ex. 1004, Fruh, p. 1, col. 1, line 1. The combination thus fails.

Grounds 4-6 rely upon Akbarzadeh as the primary reference. In Grounds 4 and 5, the Petition alleges that Claims 1, 2, 5, and 8-10 of the '396 Patent are either anticipated

(Ground 4) or rendered obvious (Ground 5) by Akbarzadeh. However, once again, these Grounds fail because the Petition has failed to demonstrate that the cited prior art, Akbarzadeh, discloses elements (a) and (b) of Claim 1. Finally, the Petition's proposed combination of Akbarzadeh with Di Bernardo has no unique support or logic and fails to meet its burden, particularly as Di Bernardo directly teaches away from the reconstruction of 3D scene geometry. Ex. 1005, 2:3-5.

B.   The Declaration of Dr. Fuchs Should Be Given Little, If Any, Weight

As an initial matter, the declaration of Petitioner's expert, Dr. Henry Fuchs, (Ex. 1001) should be given little, if any, weight by the Board in evaluating the Petition. With respect to the analysis of the cited references, Dr. Fuchs' declaration does nothing more than parrot the arguments set forth in the Petition, without providing any additional underlying facts or data, any detailed technical analysis, or additional support. *Compare* Pet. at 22, *with* Ex. 1001, ¶¶ 48-49 (repeating identical language from the Petition). Petitioner cannot convert its attorney arguments into "evidence" by having its expert parrot the language. *See, e.g., Corning Inc. v. DSM IP Assets B.V.*, IPR2013-00050, Paper 77 at 25 (PTAB May 1, 2014) ("[The expert's] statement is a word-for-word reproduction of DSM's argument in the Response . . . Dr. Bowman does not disclose underlying facts or data on which his opinion is based; we give it, therefore, little weight."). For at least this reason, Dr. Fuchs' declaration should be disregarded.

Further, as discussed below, with respect to the disclosure of Di Bernardo, Dr.

Fuchs' declaration contradicts the declaration of Petitioner's other expert, Dr. Grindon, that

was submitted in district court litigation over patents with the same specification as Di

Bernardo (Ex. 2002).[3] To the extent Dr. Fuchs' declaration is inconsistent with the prior

testimony of Petitioner's other expert, it should be given no weight and disregarded.

C.   [RE: GROUND 1] Claims 1, 2, 5, and 8-13 Are <u>Not</u> Anticipated by Fruh

1.   Analysis of Fruh

Fruh "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,

Fruh, abstract. Fruh 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 p. 1, col. 1, lines 4-9. Fruh emphasizes the "enormous challenges to purely vision-

based methods" (e.g., camera systems) (*Id.* at p. 2, col. 1, lines 10-11), and instead

proposes "'drive-by scanning' as a method that is capable of rapidly acquiring 3D

geometry and texture data . . . ." *Id.* at p. 2, col. 2, lines 4-6).

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[3] Petitioner previously engaged Dr. Grindon to submit an expert declaration in district court

litigation regarding patents with the same specification as Di Bernardo. (Ex. 2002).

Although Fruh'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. 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. In this regard, according to Dr. Fuchs:

- "Fruh's system generates a 3D point cloud for a city clock from vertical laser scans . . . ." Ex. 1001, ¶ 24;

- FIGS. 1 and 5 in Ex. 1001, ¶ 26 show scanners;

- "Fruh discloses acquiring successive ground-based horizontal scans . . . ." Ex. 1001, ¶ 28;

- "Fruh discloses generating a 3D point cloud for a city block from vertical laser scans." Ex. 1001, ¶ 30.

This point is made in the Petition's claim chart, which cites to the following passage of Fruh as meeting the "generating a point cloud array" element: "Using the accurate pose information, we transform t**he 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).

Unlike the '396 Patent, which uses portions of overlapping photographic images taken at disparate points in a video drive-by to align such portions to create a continuous

image, Fruh teaches using a "vertical 2D **scans [that] are parallel and do not overlap**."

Ex. 1004, p. 2, col. 2, lines 17-18 (emphasis added).

Because of Fruh's fundamentally different approach of relying upon continuous, non-overlapping 2D **scans** to build a point cloud, instead of aligning features in overlapping drive-by **image** data, it does not anticipate or otherwise render obvious the claimed invention.

2. Independent Claim 1 is <u>not</u> anticipated by Fruh

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 a reasonable likelihood that Claim 1 is

anticipated by Fruh, as Fruh is directed to a completely different type of system using laser

scan data, which does not generate "image data sets," as required by Claim 1, and thus

does not teach any of the limitations of Claim 1.

> **(a) Fruh 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 that "multiple two-dimensional image data sets of a subject" are

received.

The Petition relies upon "**drive-by scanning**" data, as disclosed in Fruh, as

purportedly meeting this element. Pet., 29 (emphasis in original). While Fruh's drive-by

scanning data includes, image data captured by a camera, the image data is not used to

generate the point cloud. Dr. Fuchs and the Petition therefore rely upon the scanning data

collected by the "inexpensive 2D laser scanners" as purportedly meeting this element (and

the other elements of the claim), since it is the scanner data that are disclosed as being

used to generate the "point cloud" in Fruh. Pet., 31 (citing Ex. 1004, 16, 19; Ex. 1001, ¶ 30).

However, the "laser scan" in Fruh does not generate an "image data set," as that

term is properly construed. Properly construed, an "image data set" is a "data set

associated with an image captured by a camera." A "laser scan" is not an image captured by a camera. In fact, Fruh teaches against using "purely vision-based methods" (Ex. 1004, p. 2, col. 1, line 11) like the "image data sets" required in Claim 1.

Further, even if image data sets could include scanned data, the "drive-by scans" used in Fruh cannot be the claimed "image data sets" since this limitation of Claim 1 requires "*multiple two-dimensional image data sets of a subject*." In other words, as the '396 Patent 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, Fruh 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). Clearly, Fruh does not teach "image data sets," let alone, "multiple two-dimensional image data sets of a subject," as required by Claim 1, element 1.1 (step (a)).

Thus, the Petition has failed to meet its burden regarding Claim 1, element 1.1, and institution should be denied.

(b) Fruh does not disclose "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 (step b)) (emphasis added)

In element 1.2 of the '396 Patent, a "composite image" of the "subject" is generated "from portions of two or more of the multiple two-dimensional image data sets," where the

"portions are aligned." As set forth in element (a), "the *multiple two-dimensional image data sets*" are "*of [the] subject*".

The Petition and Dr. Fuchs each assert, without offering any support, that the "composite image" comprises "a single vertical slice of each of the two or more images." Pet., 13; Ex. 1001, ¶ 27. In the claim chart of the Petition, the supporting citations refer to nothing more than the drive-by scans cited in element 1.1, and a description of "the processed point cloud," which is purportedly the "point cloud array" of element 1.5 (*see* Pet., 31), not the composite image of element 1.2. Since the Petition fails to cite to any teaching in Fruh of a "composite image" or "a single vertical slice of each of two or more images," the Petition fails to meet its burden regarding element 1.2 of Claim 1.

Further, since the drive-by scan data do not include overlapping subjects, as discussed with respect to element 1.1, Fruh further does not teach element 1.2, which requires "multiple two-dimensional image data sets" of the subject.

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, Fruh teaches away from the claimed invention of the '396 Patent by requiring that the drive-by scan data not overlap, as discussed in element 1.1.

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 Fruh under the Petition's Ground 1.

3. Dependent Claims 2, 5, and 8-13 are <u>not</u> anticipated by Fruh

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 Fruh, 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 . . . .").

D. [RE: Ground 2] Claims 1, 2, 5, and 8-13 Are <u>Not</u> Obvious Under 35 U.S.C. § 103 Over Fruh

1. The Petition fails to provide any meaningful obviousness analysis

Recognizing the weakness of Ground 1 based on anticipation by Fruh, Petitioner

also requests *inter partes* review of the same set of claims, i.e., Claims 1, 2, 5, and 8-13 of

the '396 Patent, as being obvious over Fruh (Ground 2), as an alternative to Ground 1. In

doing so, however, Petitioner provided nothing more than a broad conclusory assertion that

"to the extent that any limitations are considered not to be anticipated by Fruh alone, such

limitations are also rendered obvious by Fruh . . . ." Pet., 18.

In particular, the Petition (Pet., 18) and Petitioner's expert declaration (Ex. 1001, ¶

39) provide no obviousness analysis at all with respect to Ground 2, let alone "articulated

reasoning with some rational underpinning to support the legal conclusion of obviousness."

In re Kahn, 441 F.3d 977, 988 (Fed. Cir. 2006). As the Board recently explained:

A petition for *inter partes* review **must include "[a] full statement of the reasons for the relief requested, including a detailed explanation of the significance of the evidence" relied on**. *See* 37 C.F.R. § 42.22(a)(2). The Patent Trial and Appeal Board "may exclude or give no weight to the evidence where a party has failed to state its relevance or to identify specific portions of the evidence that support the challenge." 37 C.F.R. § 42.104(b)(5). Here, Petitioner has **hinged its case on a single conclusory sentence from a declaration** that, in turn, cites to a 95 page range in a reference **with no effort to identify specific portions within that range that support the challenge**. *This is an insufficient showing to warrant institution of a trial for inter partes review*.

Universal Remote Control, Inc. v. Universal Electronics, Inc., IPR2014-01112, Paper 9 at 13 (PTAB Nov. 24, 2014) (emphasis added).

The Petition further fails to explain how the obviousness ground cures the deficiencies of Fruh discussed above in connection with the anticipation Ground 1 (such as Fruh's lack of any teaching of receiving "image data sets," let alone "multiple image data sets of a subject" or generating a "composite image" of the "subject" "from portions of two or more of the multiple two-dimensional image data sets," where the "portions are aligned").

The Board has previously dismissed similar obviousness grounds that were offered as an alternative to anticipation grounds but without any meaningful analysis. *See, e.g.*, *Synopsys, Inc. v. Mentor Graphics Corp.*, IPR2012-00041, Paper 16 at 16, 18 (PTAB Feb. 22, 2013). Petitioner's Ground 2 should likewise be dismissed.

For at least the foregoing reasons, it is respectfully submitted that the Petition **fails**

to demonstrate a reasonable likelihood that claims 1, 2, 5, and 8-13 are unpatentable as obvious over Fruh under the Petition's Ground 2.

E.   [RE: GROUND 3] Claims 1, 2, 5, 8-13, and 16 Are <u>Not</u> Obvious Under 35 U.S.C. §103 Over Fruh 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., 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 Fruh, the Petition should be denied since it failed to meet its burden to show unpatentability.

While the Petition proposes to combine Fruh 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" which has nothing to do with Claim 1, 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., Fruh's system for generating 3D models from 2D scans and images) in the same way" —makes no sense. *Id.*

Both Fruh and Di Bernardo are directed to making low cost and lower computational overhead systems. Fruh 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, p. 1, col. 1, lines 4-9. In fact, 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 Fruh with the vision-based technology of Di Bernardo,

since such a combination would become more cumbersome and computationally intensive.

Thus, since both Fruh 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, Fruh emphasizes the "enormous challenges to purely

vision-based methods" (Ex. 1004, p. 2, col. 1, line 9) (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.* at p. 2, col. 2, lines 4-6.

Similarly, Di Bernardo teaches against any combination with Fruh. 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, Col. 2, lines 3-5 (emphasis added). In other words, Di Bernardo teaches against combining with a system that would require the 3D scene geometry taught in Fruh.

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

F.   [RE: GROUND 4] Claims 1, 2, 5, and 8-10 Are <u>Not</u> Anticipated by Akbarzadeh

1.   Analysis of Akbarzadeh

The remaining Grounds rely upon Akbarzadeh as the primary reference. Akbarzadeh discloses "a data collection system and a processing pipeline for automatic geo-registered 3D reconstruction of urban scenes from video." Ex. 1006, Abstract. While Akbarzadeh "aim[s] at real-time performance," its "processing pipeline is currently far from being real-time." *Id.*

"The system collects multiple video streams, as well as GPS and INS measurements in order to place the reconstructed models in geo-registered coordinates." *Id.* The system generates texture maps for an entirely different purpose in a totally different manner than the invention claimed in the '396 Patent. Akbarzadeh discloses "capturing large amounts of data while driving through the streets" including "several hours of video data captured by a multi-camera system." *Id.* at 1.

Akbarzadeh generates a "depth map" for each video frame using its process. *Id.* at 5.

2. The Petition fails to demonstrate that Akbarzadeh anticipates Claim 1

Petitioner has the burden to show by a preponderance of the evidence that each and every element of Claim 1 is taught by Akbarzadeh. Since the Petition has failed to meet this burden, Ground 1 should be denied.

(a) Akbarzadeh 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) (emphasis added)

Claim 1 requires that "multiple two-dimensional image data sets of a subject" are received and that "each image data set is captured from a disparate point on a continuum" and "each image data set comprises a plurality of features."

To assert this element is taught by Akbarzadeh, the Petition relies upon the following quotes from Akbarzadeh:

- "**The system collects multiple video streams, as well as GPS and INS measurements in order to place the reconstructed models in georegistered coordinates**." Pet., 43 (quoting Ex. 1006, Abstract) (emphasis in original).

- "A system that automatically generates texture mapped, ground-level 3D models should be capable of **capturing large amounts of data while driving through the streets** and of processing these data efficiently. In this paper, we introduce an approach for fully automatic 3D reconstruction of

urban scenes from **several hours of video data captured by a multi-camera system**." Pet., 43-44 (quoting Ex. 1006, p.1) (emphasis in original).

- "The emphasis in our project is on developing a fully automatic system that is able to operate in continuous mode without the luxury of capturing data from selected viewpoints since **capturing is performed from a moving vehicle constrained to the vantage points of urban streets**." Pet., 43 (quoting Ex. 1006, p. 3) (emphasis in original).

While these passages disclose that multiple video image sets are captured, these excerpts do not disclose that the image sets are "of a subject," or that at least two image sets of the same subject are from the disparate points on the same continuum, or that each data set comprises a plurality of features. *Cf.* Pet., 23-24, 42-43. The Petition has simply failed to show each element of step a) (element 1.1) is taught by Akbarzadeh. For at least this reason, the Petition has failed to meet its burden regarding Claim 1, element 1.1, and therefore institution should be denied. *Universal Remote Control, Inc.*, IPR2014-01112, Paper 9 at 10-11; *Universal Remote Control, Inc.* v. *UEI Cayman, Inc. et al.,* IPR2014-01111, Paper 9 at 9-10 (PTAB Nov. 24, 2014).

> **(b) Akbarzadeh does not disclose "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) (emphasis added)**

In element 1.2 a "composite image" of the "subject" is generated "from portions of the two or more the multiple two-dimensional image data sets," where the "portions are

aligned." As set forth in element 1.1, "the *multiple two-dimensional image data sets" are* *"of [the] subject*."

Here, again the Petition has failed to meet its burden of showing each element of element 1.2 is disclosed in Akbarzadeh. In particular, the total support cited by the Petition for element 1.2 of Claim 1 is the following excerpts:

- "A system that automatically generates **texture-mapped, ground-level 3D models** should be capable of capturing large amounts of data while driving through the streets and of processing these data efficiently. In this paper, we introduce an approach for **fully automatic 3D reconstruction of urban scenes from several hours of video data captured by a multi-camera system**." Pet., 44 (quoting Ex. 1006, p. 1) (emphasis in original).

- "Once the camera poses have been computed, we use them together with the video frames to perform **stereo matching on the input images**. This leads to a depth map for each frame. **These depth maps are later fused to enforce consistency between them**." Pet., 44 (quoting Ex. 1006, p. 3) (emphasis in original).

There is no explanation of what in Akbarzadeh constitutes the claimed "composite image." To the extent the Petition is implicitly asserting that the "texture-mapped, ground level 3D models" is the alleged "composite image," there is no teaching in these passages

that the "model" is an "image" or a "composite image." There is no teaching of how these images are "generated."

The Petition's reliance on the second passage is also insufficient, in that there is no indication that the input images are "from portions of two or more of the multiple two-dimensional image data sets" of the same subject "captured from [] disparate point[s] on a continuum" as required by Claim 1 of the '396 Patent.

Further, while the passage refers to "matching" "camera poses" with "video frames" to form "a depth map for each frame," there is no teaching of "align[ing]" "portions" of two or more "image data sets" of the same subject "captured from [] disparate point[s] on a continuum" as specified in Claim 1.

Accordingly, the Petition fails to meet its burden of establishing that Akbarzadeh teaches this limitation 1.2. *Universal Remote Control, Inc.*, IPR2014-01112, Paper 9 at 10-11; *Universal Remote Control, Inc.*, IPR2014-01111, Paper 9 at 9-10.

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 Akbarzadeh under the Petition's Ground 4.

3. Dependent Claims 2, 5, and 8-10 are <u>not</u> anticipated by Akbarzadeh

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 Akbarzadeh, it has necessarily failed to show that dependent claims **2, 5, and 8-10** 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 . . . .").

G.   [RE: GROUND 5] Claims 1, 2, 5, and 8-10 Are <u>Not</u> Rendered Obvious By Akbarzadeh

Recognizing the weakness of Ground 4 based on anticipation by Akbarzadeh, Petitioner also requests *inter partes* review of the same set of claims, i.e., Claims 1, 2, 5, and 8-10 of the '396 Patent, as being obvious over Akbarzadeh (Ground 5), as an alternative to Ground 4. In doing so, however, Petitioner provided nothing more than a broad conclusory assertion that "to the extent that any limitations are considered not to be anticipated by Akbarzadeh alone, such limitations are also rendered obvious by Akbarzadeh . . . ." Pet., 26-27. *Universal Remote Control, Inc.*, IPR2014-01112, Paper No. 9 at 13 ("Here, Petitioner has hinged its case on a single conclusory sentence from a declaration that, in turn, cites to a 95 page range in a reference with no effort to identify specific portions within that range that support the challenge. This is an insufficient showing to warrant institution of a trial for *inter partes* review.").

In particular, the Petition (Pet., 26-27) and Petitioner's expert declaration (Ex. 1001, ¶ 62) provide no obviousness analysis at all with respect to Ground 5, let alone "articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

The Petition further fails to explain how the obviousness ground cures the deficiencies of Akbarzadeh discussed above in connection with the anticipation Ground 4 (such as the Petition's failure to show that Akbarzadeh teaches receiving "multiple image data sets of a subject," or that at least two image data sets of the same subject are from the disparate points on the same continuum, or that each data set comprises a plurality of features, or generating a "composite image" of the "subject" "from portions of two or more of the multiple two-dimensional image data sets," where the "portions are aligned."

The Board has previously dismissed similar obviousness grounds that were offered as an alternative to anticipation grounds but without any meaningful analysis. *See, e.g.,* *Synopsys, Inc.,* IPR2012-00041, Paper No. 16 at 16, 18. Petitioner's Ground 5 should likewise be dismissed.

For at least the foregoing reasons, it is respectfully submitted that the Petition fails to demonstrate a reasonable likelihood that claims 1, 2, 5, and 8-10 are unpatentable as obvious over Akbarzadeh under Petitioner's Ground 5.

H.   [RE: GROUND 6] Claims 1, 2, 5, 8-13, and 16 Are <u>Not</u> Obvious Over Akbarzadeh in View of Di Bernardo

In further recognition that Akbarzadeh does not disclose a "composite image" as set forth in element 1.2 of Claim 1, the Petition offers without any support or analysis to combine Akbarzadeh with Di Bernardo. Pet., 27. All that the Petition offers is a cross-reference to the same deficient reasoning provided with respect to Ground 3, seeking to combine Akbarzadeh with Di Bernardo. *Id.* Here again, the Petition is deficient, and Ground

6 should also be denied. *AOL Inc.*, IPR2014-00966, Paper 6 at p. 13 (citing *Liberty Mutual Ins. Co. v. Progressive Casualty Ins. Co.*, CBM2012-00003, 2012 WL 9494791, at *2 (PTAB Oct. 25, 2012)) ("A petitioner who does not state the differences between a challenged claim and the prior art, and relies instead on the Patent Owner and the Board to determine those differences risks having the corresponding ground of obviousness not included for trial for failing to adequately state a claim for relief."); *see also Synopsys, Inc.*, IPR2012-00041, Paper No. 16 at 16, 18.

V.   CONCLUSION

For at least the foregoing reasons, the Board should deny *inter partes* review based on any of the grounds argued by Petitioner challenging Claims 1, 2, 5, 8-13, and 16 and grant any and all other relief to Patent Owner 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 2nd day

of December, 2014, a copy of the foregoing PATENT OWNER'S PRELIMINARY

RESPONSE TO PETITION, together with Patent Owner's Exhibit List and Exhibit

Nos. 2001-2003, was served via e-mail, based upon the agreement between the parties, on

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