

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

AMAZON.COM INC.,
Petitioner,

v.

KAIFI LLC
Patent Owner.

IPR2025-00627
U.S. Patent No. 7,689,001

**PETITION FOR *INTER PARTES* REVIEW
UNDER 35 U.S.C. § 312 AND 37 C.F.R. § 42.104**

TABLE OF CONTENTS

PETITIONER’S EXHIBIT LIST	6
LISTING OF CHALLENGED CLAIMS.....	8
I. INTRODUCTION	12
II. GROUNDS FOR STANDING.....	12
III. NOTE.....	12
IV. SUMMARY OF THE ’001 PATENT	13
V. PROSECUTION HISTORY	16
VI. LEVEL OF ORDINARY SKILL IN THE ART.....	17
VII. CLAIM CONSTRUCTION	17
VIII. RELIEF REQUESTED AND THE REASONS FOR THE REQUESTED RELIEF	18
IX. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE....	18
A. Challenged Claims	18
B. Statutory Grounds for Challenges	19
C. Emanuel is prior art under §102(e) based on its provisional	20
D. Ground 1: Claims 1, 2, 5, 7, 8, 10 are obvious under §103 over Emanuel and Ihara.....	23
1. Emanuel	23
2. Ihara.....	24
3. Reasons to Combine Emanuel and Ihara	24
4. Claim 1	31

5.	Claim 2	55
6.	Claim 5	58
7.	Claim 7	61
8.	Claim 8	63
9.	Claim 10	67
E.	Ground 2: Claims 3, 4 and 9 are obvious under §103 over Emanuel, Ihara, and Tanaka.....	69
1.	Tanaka	69
2.	Reasons to Combine Emanuel, Ihara, and Tanaka	69
3.	Claim 3	72
4.	Claim 4	73
5.	Claim 9	74
F.	Ground 3: Claims 6 and 12 are obvious under §103 over Emanuel, Ihara, and deVos.....	74
1.	deVos.....	74
2.	Reasons to combine Emanuel with deVos.....	75
3.	Claim 6	77
4.	Claim 12	79
G.	Ground 4: Claim 11 is obvious under 35 U.S.C. §103 over Emanuel, Ihara, and Sheynblat.....	79
1.	Sheynblat.....	79
2.	Reasons to combine Emanuel with Sheynblat.....	80

3.	Claim 11	82
H.	Ground 5: Claims 8-10 are obvious under 35 U.S.C. §103 over Emanuel, Ihara, and Tanaka (to the extent claim 8 is interpreted as having means-plus-functions limitations).....	84
1.	Claim 8.....	84
2.	Claim 9.....	102
3.	Claim 10.....	102
I.	Ground 6: Claim 11 is obvious under 35 U.S.C. §103 over Emanuel, Ihara, and Sheynblat (to the extent claim 8 is interpreted as having means-plus-functions limitations).....	103
4.	Claim 11	103
J.	Ground 7: Claim 12 is obvious under 35 U.S.C. §103 over Emanuel, Ihara, and deVos (to the extent claim 8 is interpreted as having means-plus-functions limitations).....	103
5.	Claim 12.....	103
X.	DISCRETIONARY DENIAL WOULD BE INAPPROPRIATE.....	103
A.	No basis for <i>Fintiv</i> denial	103
B.	No basis for §325(d) denial	105
XI.	CONCLUSION.....	105
XII.	MANDATORY NOTICES	106
A.	Real Party-in-Interest	106
B.	Related Matters.....	106
C.	Lead and Back-up Counsel and Service Information	106
	CERTIFICATE OF WORD COUNT.....	108

CERTIFICATE OF SERVICE	109
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PETITIONER’S EXHIBIT LIST

Ex.1001	U.S. Patent No. 7,689,001
Ex.1002	Prosecution History of U.S. Patent No. 7,689,001
Ex.1003	Declaration of Nikos Papanikolopoulos, Ph.D. under 37 C.F.R. §1.68
Ex.1004	<i>Curriculum Vitae</i> of Nikos Papanikolopoulos, Ph.D.
Ex.1005	U.S. Patent 7,845,560 to Emanuel et al. (“Emanuel”)
Ex.1006	U.S. Provisional Application No. 60/635,813 (“Emanuel-Prov”)
Ex.1007	U.S. Patent 6,650,776 to Ihara et al. (“Ihara”)
Ex.1008	U.S. Patent Application Publication 2004/0189856 to Tanaka (“Tanaka”)
Ex.1009	Cognex In-Sight Product Guide (“Cognex-Guide”)
Ex.1010	Cognex In-Sight 5100 and 5400 Brochure (“Cognex-Brochure”)
Ex.1011	U.S. Patent 5,137,354 to deVos at al. (“deVos”)
Ex.1012	U.S. Patent 6,677,894 to Sheynblat et al. (“Sheynblat”)
Ex.1013	Erwin et al., “Modular Computer Architecture Strategy for Long Term Missions,” AFIPS '69 (Fall): Proceedings of the November 18-20, 1969, Fall Joint Computer Conference, 337-345 (1969) (“Erwin”)
Ex.1014	Markus Zahn, “Electromagnetic Field Theory: A Problem Solving Approach,” Wiley, 1-4 (1979) (“Zahn”)
Ex.1015	Sekimori et al., “High-Speed Obstacle Avoidance and Self-Localization for Mobile Robots Based on Omni-directional Imaging of Floor Region,” RoboCup 2001, 205-206 (2001) (“Sekimori”)

Ex.1016	U.S. Patent 3,887,273 to Griffiths et al. (“Griffiths”)
Ex.1017	Athanas et al., “Real-Time Image Processing on a Customer Computing Platform,” IEEE February 1995, 17-24 (“Athanas”)
Ex.1018	U.S. Patent 4,771,307 to Kuno et al. (“Kuno”)
Ex.1019	Preliminary Infringement Contentions, <i>KAIFI LLC v. Amazon.com, Inc. et al</i> , No. 2:24-cv-00542 (EDTX)
Ex.1020	EDTX Local Rules 2023
Ex.1021	Judge Gilstrap Docket for March 16, 2026
Ex.1022	Docket Control Order, <i>KAIFI LLC v. Amazon.com, Inc. et al</i> , No. 2:24-cv-00542 (EDTX)
Ex.1023	Interim Procedure for Discretionary Denials in AIA Parallel District Court Litigation, June 21, 2022
Ex.1024	Statistics on District Court Timing (Dec. 31, 2024)
Ex.1025	John J. Craig, “Introduction to Robotics,” Pearson Prentice Hall, 21-40 (2005) (“Craig”)
Ex.1026	Dan B. Marghitu, 2001 “Mechanical Engineer’s Handbook,” Academic Press, 70 (“Marghitu”)
Ex.1027	Yasuda et al., “Object Recognition and Self-Localization for Interactive Soccer Robots,” Proceedings of the 2004 IEEE International Conference on Robotics and Biomimetics (2004) (“Yasuda”)
Ex.1028	Hightower et al., “Location Systems for Ubiquitous Computing,” IEEE Computer (2001) (“Hightower”)
Ex.1029	Holtman et al., “Building a Large Location Table to Find Replicas of Physics Objects,” Computer Physics Communications Vol. 140 (2000) (“Holtman”)
Ex.1030	Emanuel-Prov Excerpt Chart corresponding to Emanuel

LISTING OF CHALLENGED CLAIMS

Claim 1	
[1.0]	A method for recognizing a location by a mobile terminal having a built-in camera, the method comprising:
[1.1]	a) photographing a location recognition tag storing location recognition information;
[1.2]	b) measuring a distance to the location recognition tag;
[1.3]	c) analyzing an image of the photographed location recognition tag, and obtaining location information corresponding to the location recognition tag;
[1.4]	d) obtaining direction information of the photographed location tag; and
[1.5]	e) calculating a mobile terminal location by using the distance information measured in b), the location information obtained in c), and the direction information obtained in d).
Claim 2	
[2.0]	The method of claim 1, wherein the direction information obtained in d) is offset information of an offset state of the location recognition tag based on the mobile terminal,
[2.1]	and the offset information is obtained by analyzing a photographing angle of the photographed location recognition tag.
Claim 3	
[3.0]	The method of claim 1, wherein the distance information in b) is measured by the camera when an auto focusing operation of the camera is performed.
Claim 4	
[4.0]	The method of claim 1, wherein the distance information in b) is

	measured by a distance measuring sensor using infrared rays or ultrasonic waves.
Claim 5	
[5.0]	The method of claim 1, wherein the location recognition tags are arranged so that a desired precision for using the location recognition tags at a predetermined physical area may be achieved, and
[5.1]	the location recognition tags are formed as one-dimensional or two-dimensional barcode types.
Claim 6	
[6.0]	The method of claim 1, wherein, in e), the mobile terminal location is calculated through a triangulation measuring algorithm by using the distance information, the location information, and the direction information corresponding to the three or more location recognition tags.
Claim 7	
[7.0]	The method of any one of claim 1 to claim 6, wherein the location recognition tag stores location information of one among an absolute location coordinate and a logic location coordinate.
Claim 8	
[8.0]	A location recognition device for recognizing a location by using a built-in camera, the location recognition device comprising:
[8.1]	an image photographing unit for photographing a plurality of location recognition tags that are arranged in a predetermined physical area and respectively store location recognition information, and for performing a digital image process;
[8.2]	a distance measuring unit for measuring a distance to the location recognition tag;

[8.3]	an image analyzing unit for analyzing an image of the location recognition tag processed by the image photographing unit, and obtaining corresponding location information and direction information of the location recognition tag; and
[8.4]	a location recognizing unit for recognizing a user location by using distance information measured by the distance measuring unit, and the location information and the direction information obtained by the image analyzing unit.
Claim 9	
[9.0]	The location recognition device of claim 8, further comprising a distance measuring sensor for measuring a distance to the location recognition tag by using infrared rays or ultrasonic waves.
Claim 10	
[10.0]	The location recognition device of claim 8, further comprising a tag location information storage unit for storing location coordinate information of a location of the location recognition tag, and logic location coordinate information corresponding to the location coordinate information.
Claim 11	
[11.0]	The location recognition device of claim 8 or claim 10, wherein the location recognizing unit transmits the information obtained by the image analyzing unit to an external location managing server, receives location information calculated by the external location managing server, and recognizes a user location.
Claim 12	
[12.0]	The location recognition device of claim 8 or claim 10, wherein, when the image photographing unit photographs three or more location recognition tags from one position, the location recognition unit recognizes the user location through a triangular measuring algorithm by using the distance information of the

	distances to the three or more location recognition tags measured by the distance measuring unit and the location and direction information of the three or more locations and directions obtained by the image analyzing unit.
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I. INTRODUCTION

U.S. Patent No. 7,689,001 (the “’001 patent,” Ex.1001) relates to calculating a position of an object using a camera and markers (e.g., barcodes) at known positions. Ex.1001, Abstract. At the time of the claimed invention, however, this type of location calculation was already well known—and every limitation recited in the claims of the ’001 patent was either disclosed or obvious prior to the earliest priority date. In particular, Emanuel (Ex.1005) teaches the exact marker-based, location calculation technique claimed by the ’001 patent. Ex.1005, Abstract (“Position markers...are viewed with a camera, images are captured and processed, and the position...of the object [is] calculated.”).

Accordingly, Amazon.com Inc. (“Petitioner”) respectfully requests that the Board review and cancel as unpatentable under (pre-AIA) 35 U.S.C. §103(a) claims 1-12 (hereinafter, the “Challenged Claims”) of the ’001 patent.

II. GROUNDS FOR STANDING

Petitioner certifies that the ’001 patent is eligible for IPR and that Petitioner is not barred or estopped from requesting IPR challenging the patent claims. 37 C.F.R. § 42.104(a).

III. NOTE

Petitioner cites to exhibits’ original page numbers. **Emphasis** in quoted material has been added. Claim terms are presented in *italics*.

IV. '001 PATENT

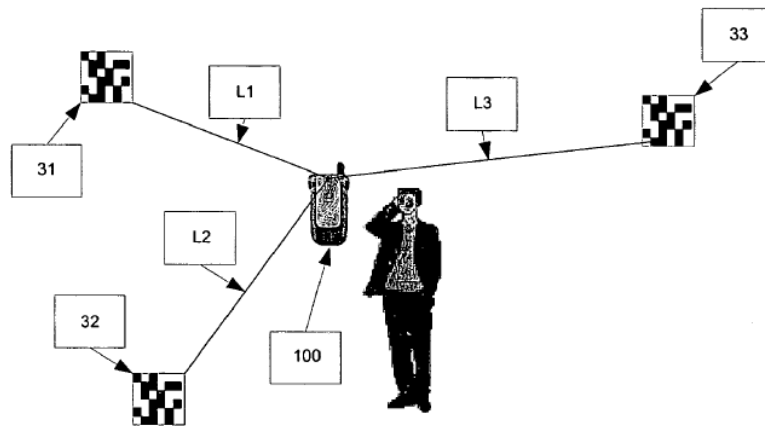
A. Technological Background

Dr. Papanikolopoulos's declaration describes the relevant background technology predating the '001 patent, which is cited as appropriate below.

Ex.1003, ¶¶35-48.

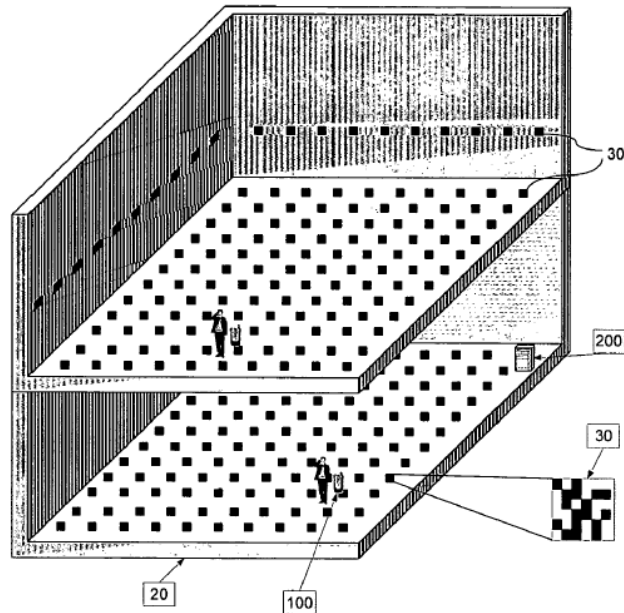
B. Overview

The '001 patent “relates to a location recognition device...and a method thereof.” Ex.1001, Abstract. The process begins by taking pictures of “location recognition tags” (such as 2D barcodes):



Ex.1001, Fig. 5

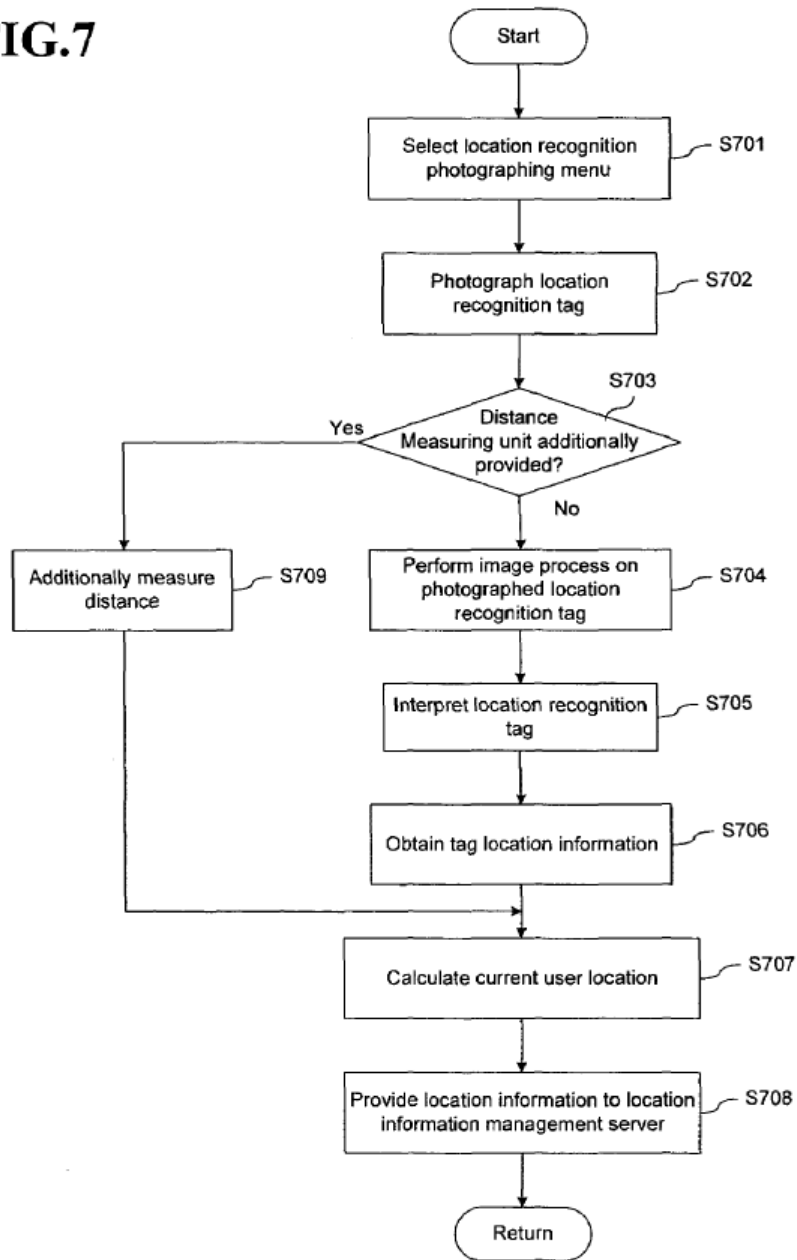
These barcodes are distributed throughout a geographic area, for example as illustrated below:



Ex.1001, Fig. 2

The '001 patent also describes an algorithm for using a camera and a tag to determine the users' position and is depicted in Figure 7, which shows the steps “for recognizing a...user location.” Ex.1001, 1:19-20.

FIG.7



Ex.1001, Fig. 7

In step S707, “[t]he location recognizing unit 150 receives the absolute location coordinate, the photographing angle, and the information on the distance to the location recognition tag 30, and calculates the current user location.”

Ex.1001, 7:54-57.

V. PROSECUTION HISTORY

The '001 patent issued from U.S. Application 11/516,876 filed September 7, 2006, which claims priority to Korean Patent Application 10-2005-0114022 filed November 28, 2005. It is unnecessary to determine whether the '001 patent is entitled to its earliest possible priority date because the prior art relied upon herein pre-dates the earliest possible priority date.¹

During prosecution, the claims were allowed without objections or rejections. Ex.1002, 105-106. In the Notice of Allowance, the Examiner found that none of the prior art considered “teaches or fairly suggests...measuring a distance to the location tag and obtaining direction information of the imaged location tag, where the distance and direction are used together with the location information to determine the location of the mobile terminal that captured the image.” Ex.1002, 106.

The Examiner erred in allowing the '001 patent because this subject matter was well-known.

¹ Petitioner does not concede that the '001 patent is entitled to claim the benefit of the November 2005 Korean application and reserves the right to challenge the priority date in this or another forum.

VI. LEVEL OF ORDINARY SKILL IN THE ART

A Person of Ordinary Skill in The Art (“POSITA”) in November 2005 (the earliest possible priority date) would have been someone knowledgeable and familiar with the location recognition arts that are pertinent to the ’001 patent. That person would have a bachelor’s degree in electrical engineering, computer engineering, computer science, mechanical engineering, or equivalent training, and approximately two years of experience working with location recognition or location tracking technologies. Lack of work experience can be remedied by additional education, and vice versa. Ex.1003, ¶¶29-30.

VII. CLAIM CONSTRUCTION

No claim terms require express construction to resolve the issues presented in this Petition.² *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). For the purposes of this Petition, Petitioner applies Patent Owner’s apparent position in its Infringement Contentions that no terms invoke §112, ¶6. *See* Ex.1019, 1-123 (no terms identified as invoking §112, ¶6³); *see also* 37 C.F.R. §42.104(b)(3) (requiring the petition to set forth only “how the challenged claim is to be construed”); *Hospira, Inc. et al. v. Amgen Inc.*,

² Petitioner does not concede that the challenged claims satisfy §112 or §101.

³ *See* Ex.1020 (EDTX Local Rules), 55.

IPR2021-00528, Paper 7 at 7 (Aug. 17, 2021) (“Petitioner’s willingness to adopt Patent Owner’s proposed constructions for purposes of this proceeding is sufficient to satisfy the requirements of §42.104(b)(3).”); *ZTE Corp. et al. v. WSOU Invests., LLC*, IPR2021-00698, Paper 10 at 8-10 (Oct. 18, 2021) (declining to apply §112 ¶6 where a claim term did not include the words “means” and Petitioner adopted Patent Owner’s plain and ordinary meaning construction for the purposes of the proceeding).

In the event the Board finds that any of the “*unit*” terms in claims 8-12 invoke §112, ¶6, Petitioner presents alternative grounds 5-8 that analyze the claims under §112, ¶6 (solely for the purposes of this Petition). *See General Electric Co. v. Vestas Wind Systems A/S*, IPR2018-00928, Paper 9 at 15-16 (Nov. 5, 2018) (“In other words, the rule [37 C.F.R. §42.104(b)(3)] does not prohibit a petitioner from submitting more than one construction.”).

VIII. RELIEF REQUESTED AND THE REASONS FOR THE REQUESTED RELIEF

Petitioner asks that the Board institute a trial for *inter partes* review and cancel the Challenged Claims in view of the analysis below.

IX. IDENTIFICATION OF HOW THE CLAIMS ARE UNPATENTABLE

A. Challenged Claims

Petitioner challenges claims 1-12.

B. Statutory Grounds for Challenges

Grounds	Claim(s)	Basis (pre-AIA)
#1	1, 2, 5, 7, 8, and 10	§103 Emanuel and Ihara
#2	3, 4, and 9	§103 Emanuel , Ihara , and Tanaka
#3	6 and 12	§103 Emanuel , Ihara , and deVos
#4	11	§103 Emanuel , Ihara , and Sheynblat
#5	8-10	§103 Emanuel , Ihara , and Tanaka
#6	11	§103 Emanuel , Ihara , and Sheynblat
#7	12	§103 Emanuel , Ihara , and deVos

U.S. Patent 7,845,560 to Emanuel et al. (“**Emanuel**,” Ex.1005) was filed December 3, 2005, and claims priority to U.S. Provisional Application No. 60/635,813 (“**Emanuel-Prov**,” Ex.1006), filed December 14, 2004. As discussed below, Emanuel is prior art under §102(e) as of the filing date of Emanuel-Prov.

U.S. Patent 6,650,776 to Ihara et al. (“**Ihara**,” Ex.1007) was filed June 28, 1999, and issued on November 18, 2003. Ihara is thus prior art under §102(b).

U.S. Patent Application Publication 2004/0189856 to Tanaka (“**Tanaka**,” Ex.1008) was filed December 24, 2003, and published on September 30, 2004. Thus, Tanaka is prior art under §102(a) and 102(b).

U.S. Patent 5,137,354 to deVos et al (“**deVos**,” Ex.1011) was filed August 1, 1991, and issued on August 11, 1992. Thus, deVos is prior art under §102(b).

U.S. Patent 6,677,894 to Sheynblat et al. (“**Sheynblat**,” Ex.1012) was filed November 30, 1998, and issued January 13, 2004. Thus, Sheynblat is prior art under §102(b).

C. Emanuel is prior art under §102(e) based on its provisional

Emanuel is entitled to the December 14, 2004 filing date of Emanuel-Prov “if the disclosure of the provisional application provides support for the claims in the reference patent in compliance with §112, ¶1.” *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1381 (Fed. Cir. 2015). The MPEP further clarifies that “at least one claim of the potential reference [Emanuel] must be supported by the written description of the relied upon provisional application [Emanuel-Prov],” MPEP §2136.I(B), which is satisfied here.

Emanuel-Prov provides support for claim 1 of Emanuel:

Claim 1 of Emanuel	Emanuel-Prov (Ex.1006)
A method of determining the position and the rotational orientation of an object within a predefined coordinate space, the method comprising:	“A method of determining a coordinate position and azimuth orientation (i.e., directional heading) of an object within a predefined coordinate space, the method comprising:” Ex.1006, 12. “The method of the present invention determines a coordinate position and rotational orientation (i.e., directional heading) of an object within a coordinate space. The method comprises the steps of:” Ex.1006, 3.
a) providing a plurality of unique position markers having identifying indicia and positional reference indicia thereupon, the markers being arranged at predetermined known positional locations within the coordinate space so that at least one position marker is within view of the object;	“a) providing a plurality of unique position markers having identifying indicia and positional reference indicia thereupon, the markers being arranged at predetermined positional locations within the coordinate space so that at least one position marker is within view of the object;” Ex.1006, 12; <i>see also</i> Ex.1006, 3, 5-6.
b) using an image acquisition system mounted on the object, acquiring an image of the at least one position marker	“b) Using an image acquisition system mounted on the object, acquiring an image of the at least one position marker within view;” Ex.1006, 3.

within view;	
c) processing the image to determine the identity, the position relative to the object, and the rotational orientation relative to the object of each position marker within view; and	“c) Processing the image to determine the identity of each position marker and the position of each position marker relative to the object, and to determine the orientation of each position marker relative to the object;” Ex.1006, 3.
d) calculating the position of the object and the rotational orientation of the object in the coordinate space and storing the position and rotational orientation information in a memory.	“d) Calculating the position of the object and the rotational orientation of the object in the coordinate space and storing the position and rotational orientation information in a memory.” Ex.1006, 3.

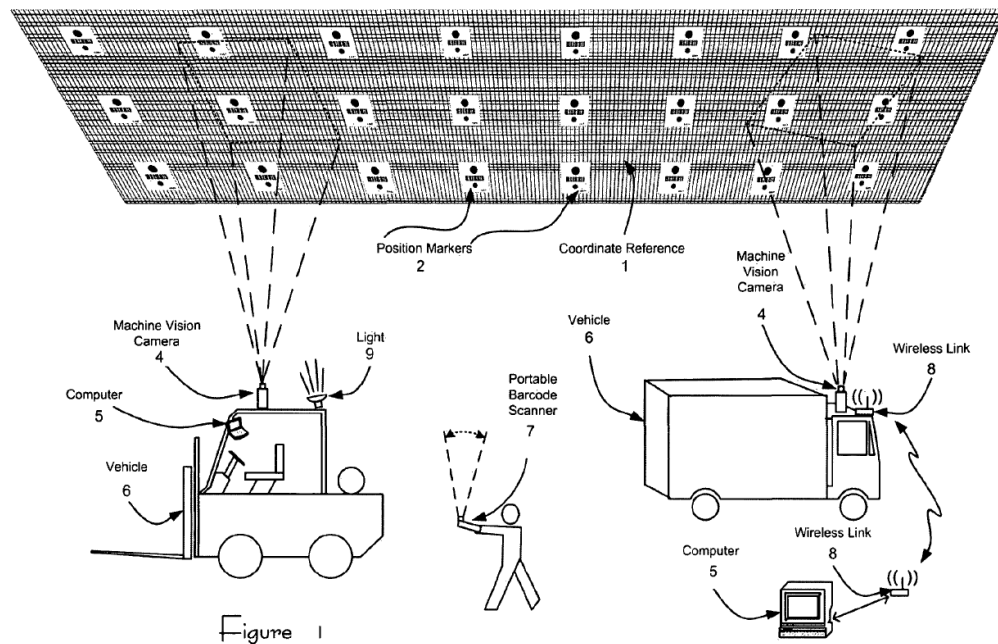
Further, all portions of Emanuel (Ex.1005) relied upon in this Petition have written description support in the Emanuel-Prov (Ex.1006). Such support is indicated by dual citations to Emanuel and Emanuel-Prov. For ease of reference, the cited portions of Emanuel-Prov are provided in Ex.1030. Emanuel is thus prior art under §102(e) as of December 14, 2004, the filing date of Emanuel-Prov.

D. Ground 1: Claims 1, 2, 5, 7, 8, 10 are obvious under §103 over Emanuel and Ihara.

1. Emanuel

Emanuel relates to a “method and apparatus for determining position...of an object within a predetermined area.” Ex.1005, Abstract; Ex.1006, 1. In Emanuel, “[p]osition markers, encoded with their identity, are viewed with a camera, images are captured and processed, and the position...of the object [is] calculated.” Ex.1005, Abstract; Ex.1006, 1.

The object’s position is “determined by acquiring images of position markers which are placed to known locations in or near the coordinate space, i.e., the region of interest.” Ex.1005, 5:13-16; Ex.1006, 3. Each position marker has a “barcode” which “encode[s] the identity of each position marker of the coordinate reference.” Ex.1005, 6:55-57; Ex.1006, 6. Figure 1 of Emanuel shows elements of the system including the “position markers 2, machine vision camera 4, [and] data processing device 5.” Ex.1005, 5:40-44; Ex.1006, 4:



Ex.1005, Fig. 1; Ex.1006, Fig. 1

2. Ihara

Ihara relates to a computer system for “recognizing code data...from image data representing two-dimensional [bar]codes.” Ex.1007, 2:13-17. In Ihara, a “video camera” built-in to the body of a “personal computer” captures image data of a barcode, such as a “two-dimensional code label.” Ex.1007, 6:21-25. After capturing an image, the computer “proceeds to recognize code data of the captured two-dimensional code label.” Ex.1007, 6:24-26.

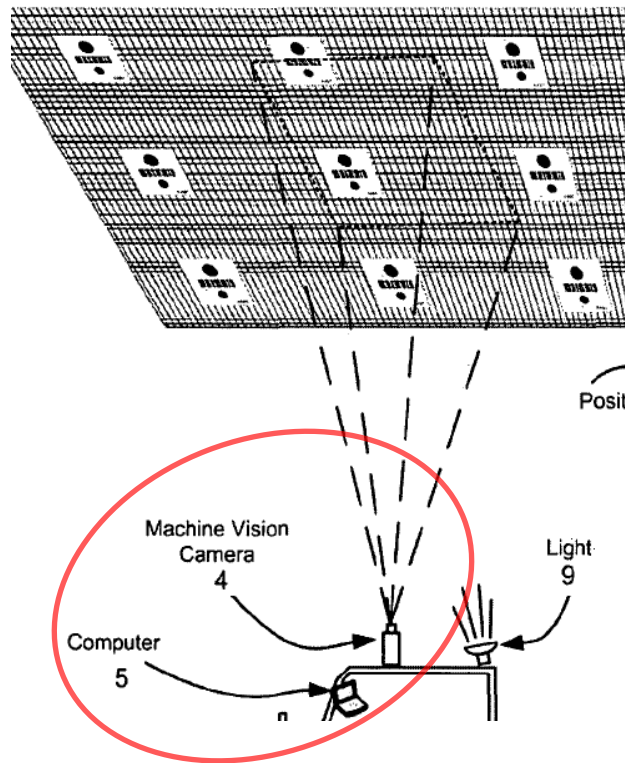
3. Reasons to Combine Emanuel and Ihara

A POSITA would have been motivated to combine the teachings of Emanuel with those of Ihara. *See* Ex.1003, ¶¶71-84. It would have been obvious, beneficial,

and predictable to incorporate a built-in camera—as disclosed by Ihara—into Emanuel’s machine-vision system, for example, to reduce the number of components and simplify configuration of its machine-vision system. Ex.1003, ¶71.

A POSITA, when considering the teachings of Emanuel would have also considered the teachings of Ihara. Ex.1003, ¶72. Both Emanuel and Ihara relate to capturing images of and processing barcodes using a camera. Ex.1005, 10:1-6; Ex.1006, 7-8; Ex.1007, 1:39-44. As such, both Emanuel and Ihara are analogous art to the ’001 patent. *See, e.g.,* Ex.1001, Abstract, Fig. 6; Ex.1003, ¶72.

Emanuel describes a “computational device 5,” such as a computer, that is connected to an external “camera 4” for capturing images. Ex.1005, 10:1-4; Ex.1006, 8.

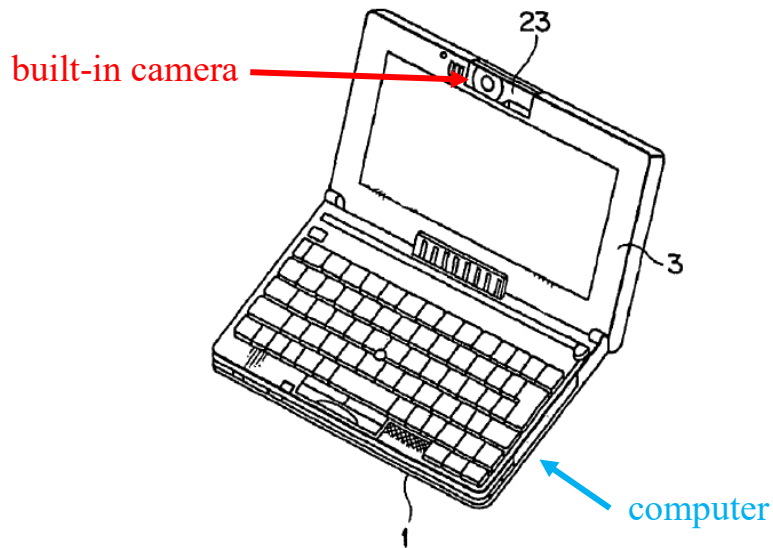


Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶73-74

“When the camera 4 captures an image of the overhead position reference 1 the image is transmitted to the machine vision system computational device 5 for analysis.” Ex.1005, 10:3-6; Ex.1006, 8. “Analysis begins by locating 120 a readable position marker image (image in which the bar code can be decoded)” and decoding it. Ex.1005, 10:33-34; Ex.1006, 9.

To the extent Emanuel does not expressly teach that its camera is “*built-in*” to the computer, it was well-known to a POSITA that computers with built-in cameras were used to capture images of and decode barcodes. Ex.1003, ¶75. In particular, Ihara discloses a “personal computer 1” with a built-in “video camera

23” that captures images of a “two-dimensional code label” and “recognize[s] code data of the captured two-dimensional code label.” Ex.1007, 6:22-26, 7:4-5.



Ex.1007, Fig. 1 (annotated); Ex.1003, ¶¶75-76

A POSITA would have been motivated to combine Emanuel with Ihara and doing so would have been within a POSITA’s skillset. Ex.1003, ¶72. The combination would have been obvious because it represents merely the use of Ihara’s known technique for integrating a camera and computer into a single device to improve Emanuel’s machine-vision system comprising a separate camera and computer. Ex.1003, ¶76. A POSITA wanting to implement Emanuel’s machine-vision system as a single, integrated device would look to Ihara for details on how a camera could be built into a computer. Ex.1003, ¶¶76-80.

The combination would have also been obvious because the application of

Ihara's technique (integrating a camera into computer) to improve Emanuel's machine-vision system (comprising a camera and a computer) ready for improvement would yield predictable results. Ex.1003, ¶¶79-80. Here, the improvement provided to Emanuel's machine-vision system is a reduction in the number of separate components required to implement its position determining system. Ex.1003, ¶¶79-80.

Emanuel's machine-vision system would also be improved because the use of an integrated camera and computer would reduce the number of external connections required to communicate image data between the camera and computer, thus reducing the number of possible points of failure and maintenance costs. Ex.1003, ¶¶79-80 (citing Ex.1013).

Notably, Ihara teaches that its built-in camera may be pointed in any direction, including towards the ceiling. Ex.1007, 6:66-7:5. Ihara's camera rotates "to any position within a range of 180 degrees in the same direction as the LCD 21 and in the opposite direction thereof (i.e. toward the back)." Ex.1007, 6:67-7:5. Thus, another improvement provided to Emanuel's machine-vision system is the ability to rotate the camera towards the position markers, regardless of how the computer is attached to the vehicle. Ex.1003, ¶81. This flexibility would simplify installation and allow for easy adjustments by rotating the camera toward the intended direction, for example, if the computer is relocated on the vehicle.

Ex.1003, ¶79-81.

A POSITA would have had a reasonable expectation of success in combining the teachings of Emanuel and Ihara. Ex.1003, ¶¶82-83. For example, Emanuel discloses that a “preferred embodiment” utilizes a commercial machine-vision system with a built-in camera (“Model 5100 or Model 5100 from Cognex, Incorporated”). Ex.1005, 10:13-16; Ex.1006, 8. The 5100 model includes a camera that is integrated into the machine-vision system for capturing and processing images of barcodes:

		HIGH-RES		COLOR	HIGHEST PERFORMANCE
					
		5100	5101	5100C	5400
Memory	Firmware & Use	16MB	16MB	16MB	16MB
Camera	Resolution	640 x 480	1024 x 768	640 x 480	640 x 480
	Color	No	No	Yes	No
	Acquisition Rate (Max.)	60fps	20fps	60fps	60fps
	Partial Image Acquisition	Yes	Yes	Yes	Yes
	Max. Distance (camera to processor)	N/A	N/A	N/A	N/A
	NEMA/IP Ratings (camera)	NEMA 6/IP67 ⁴	NEMA 6/IP67 ⁴	NEMA 6/IP67 ⁴	NEMA 6/IP67 ⁴
	Max. Operating Temperature	45°C	45°C	45°C	45°C
Display Options	VGA Port	No	No	No	No
	PC (via In-Sight Explorer)	Yes	Yes	Yes	Yes
I/O Options	Trigger	Yes	Yes	Yes	Yes
	Strobe	Yes ¹	Yes ¹	Yes ¹	Yes ¹
	No. of Outputs	2	2	2	2
	I/O Breakout Module (CIO-1350-XX) Support	Yes	Yes	Yes	Yes
	I/O Expansion Module (CIO-1450-XX) Support (adds 8in/8out)	Yes	Yes	Yes	Yes
	I/O Expansion Module (CIO-1460-XX) Support (adds 8in/8out)	Yes	Yes	Yes	Yes
	Ethernet I/O Support (up to 512in/ 512out)	Yes	Yes	Yes	Yes
Communication Options	RS232 Port (w/ Rx/Tx & RTS/CTS)	1 ²	1 ²	1 ²	1 ²
	Ethernet Port	1	1	1	1
Lighting Options	Direct Power	No	No	No	No
Application Development	Control Pad	No	No	No	No
	In-Sight Explorer	Yes	Yes	Yes	Yes
Lens Mount	C or CS ⁵	C	C	C	C
Vision Tool Support	PatMax (optionally available)	Yes	Yes	Yes	Yes
	PatFind	Yes	Yes	Yes	Yes
	IDMax (for Data Matrix 2D codes)	Yes	Yes	Yes	Yes
	Edge	Yes	Yes	Yes	Yes
	Blob	Yes	Yes	Yes	Yes
	Histogram	Yes	Yes	Yes	Yes
	Image Processing	Yes	Yes	Yes	Yes
	OCV/OCR	Yes	Yes	Yes	Yes
	1D Codes: Code 3 of 9, Code 128, Interleaved 2 of 5, Reduced Space Symbology (RSS), UPC/EAN, PostNet, Planet Code, Pharma Code, UPU-57	Yes	Yes	Yes	Yes

Ex.1009, 65 (annotated); Ex.1003, ¶¶82-83

Because Ihara also describes a camera built into a computer for capturing and processing images of barcodes, a POSITA would have understood readily that the teachings described in Ihara are applicable to Emanuel. Ex.1003, ¶83; Ex.1007, (“[T]he Video camera picks up an image of a two-dimensional [bar]code 600 for code recognition”); Ex.1005, 10:31-34 (“Upon internal or external command, an

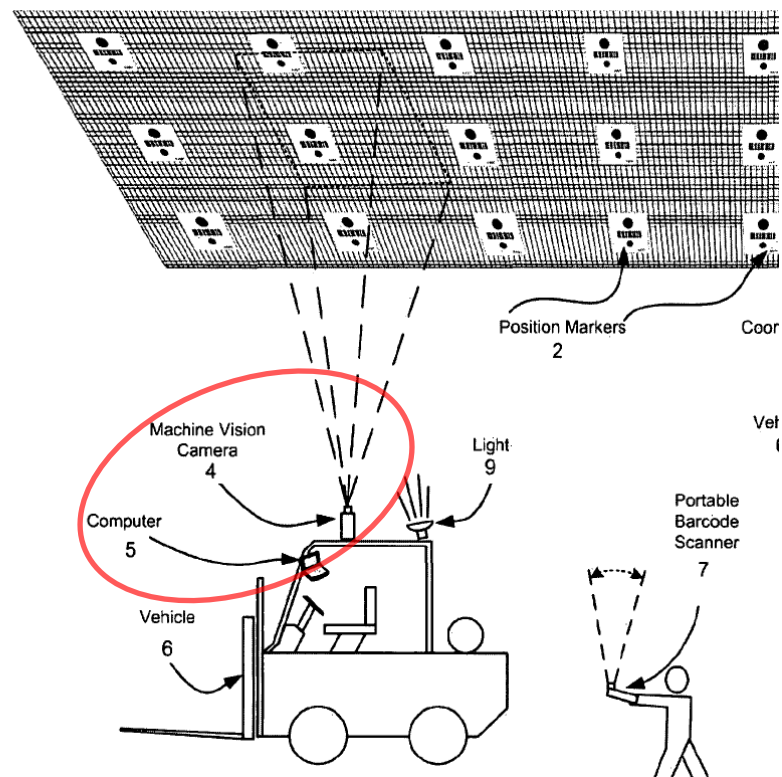
image is captured 110 by the machine-vision camera...Analysis begins by locating 120 a readable position marker image (image in which the bar code can be decoded)"); Ex.1006, 7-9; Ex.1003, ¶¶71-84.

4. Claim 1

[1.0] *A method for recognizing a location by a mobile terminal having a built-in camera, the method comprising:*

Emanuel teaches “a method...for **determining position...of an object within a predetermined area.**” Ex.1005, Abstract; Ex.1006, 1, 3. Specifically, Emanuel’s method “accurately determine[s] [a] camera’s position and orientation.” Ex.1005,12:11-14; Ex.1006, 1, 5.

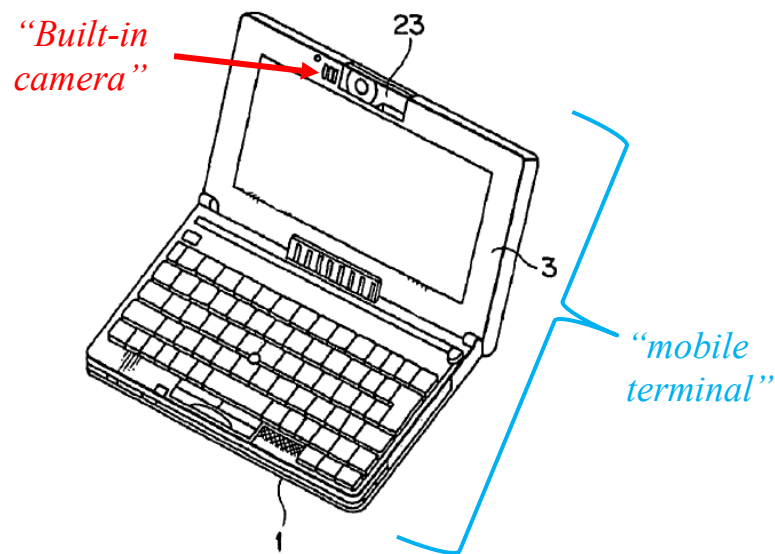
Figure 1 of Emanuel illustrates “a machine vision system” where “a machine vision camera” mounted to a vehicle captures an overhead image and transmits the image to an on-board “machine vision system computation device 5” for analysis. Ex.1005, 10:3-6, Fig. 1; Ex.1006, 8. Fig. 1.



Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶86-87

Emanuel's machine-vision system is “*mobile*” because it moves with the vehicle 6. Ex.1003, ¶87.

Further, although Emanuel's Fig. 1 depicts the machine-vision system as comprising separate camera 4 and computational device 5, it would have been obvious to implement the system as a single computational device with a built-in camera, as was well-known in the art. Ex.1003, ¶¶88-90. As discussed *supra*, Ihara teaches a laptop computer having built-in camera designed for reading barcodes:



Ex.1007, Fig. 1 (annotated); Ex.1003, ¶¶88-89

In Ihara, the “personal computer 1 is capable of picking up...the object 100 and two-dimensional code label 101 using the CCD video camera.” Ex.1007, 6:22-25. The built-in camera is “is rotatable to any position within a range of 180 degrees in the same direction as the LCD 21.” Ex.1007, 6:67-7:5.

As discussed in Section IX-D, it would have been obvious to implement Emanuel’s machine-vision system as *a mobile terminal having a built-in camera*, as taught by Ihara. Ex.1003, ¶¶91-92. This is especially true given that Emanuel’s “preferred embodiment” is based upon a “commercial machine-vision system such as Model 5100 or Model 5400 from Cognex Incorporated,” which *is* a mobile terminal having a built-in camera, as illustrated below. Ex.1005, 10:13-16; Ex.1006, 8.

In-Sight 5100 and 5400



The rugged 5100 and 5400 In-Sight vision sensors provide unmatched performance, reliability, and ease of use. The included lens cover is used in applications where wash-down or dust protection is required.

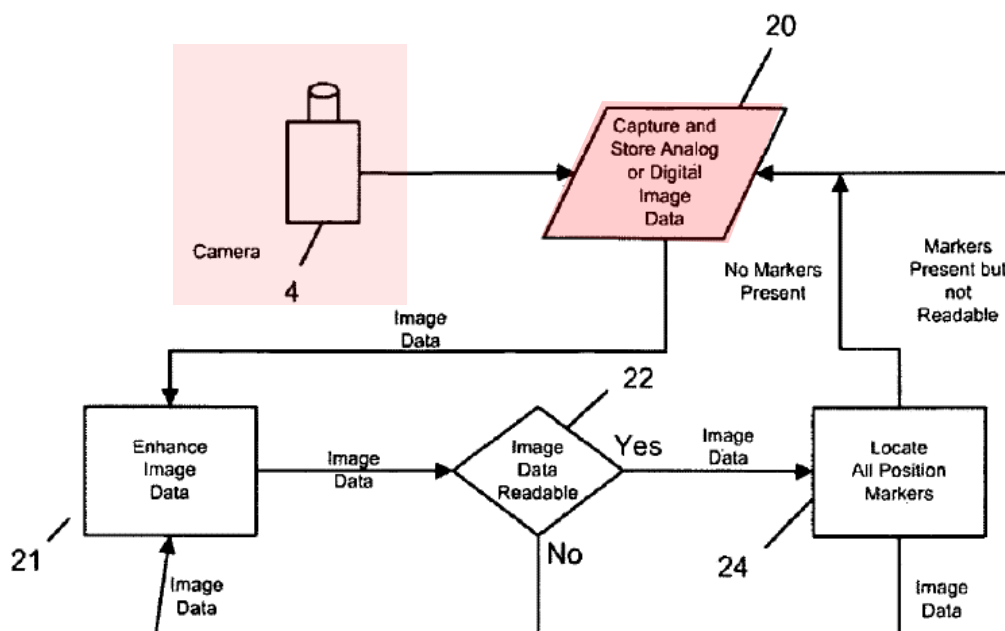
Ex.1010, 1

In particular, Models 5100 and 5400 include not only a “camera” but also “powerful processing” and image analysis capabilities, including “a full library of Cognex vision tools...provid[ing] image processing and analysis tools.” Ex.1009, 65; Ex.1010, 1. Further, Models 5100 and 5400 included IDMax Data Matrix code reading software, allowing for one-dimensional and two-dimensional barcodes to be read and processed, “measurement tools” for measuring “distance between image features,” a “high performance processor” and 64MB of image processing memory. Ex.1009, 5, 7, 22, 26.

Thus, Emanuel’s method for recognizing a camera’s location by a mobile machine-vision system that may be implemented as an integrated system, in view of Ihara’s laptop with built-in camera, renders obvious “*a method for recognizing a location by a mobile terminal having a built-in camera.*” Ex.1003, ¶¶85-93.

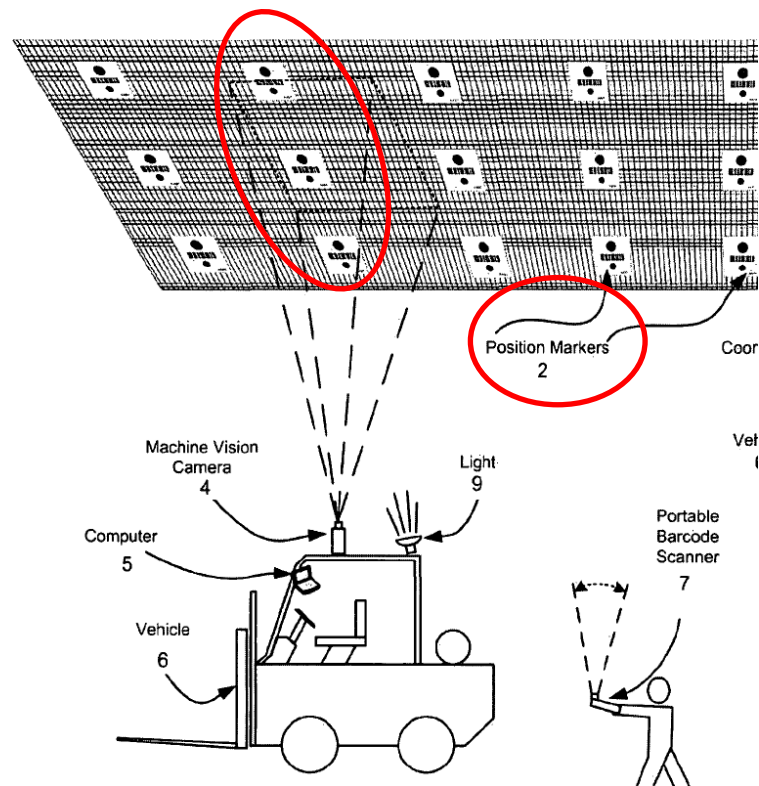
[1.1] a) photographing a location recognition tag storing location recognition information;

Emanuel's method begins when the “**machine vision camera...captures...digital images**” of “**position markers**” (*location recognition tag*) within the camera's field of view. Ex.1005, 11:19-21; Ex.1006, 9. This step is depicted in the flowchart provided in Fig. 9 of Emanuel:



Ex.1005, Fig. 9 (annotated); Ex.1006, Fig. 12; Ex.1003, ¶¶94-95

The “position markers...are placed at known locations in...[a] coordinate space.” Ex.1005, 5:13-15; Ex.1006, 3. In one example, Emanuel describes that the position markers are placed on the ceiling within the coordinate space, as illustrated in Figure 1:



Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶95-96

The position markers “stor[e] location recognition information” using “**barcodes**” imprinted on them that “**encode[] the marker location...**in any of several common barcode symbologies.” Ex.1005, 8:5-7, 10:46-50 (barcodes “**may be directly encoded with [marker] position information**”); Ex.1006, 6, 7. The barcodes may be one-dimensional or two-dimensional barcodes, as illustrated in Figure 2:

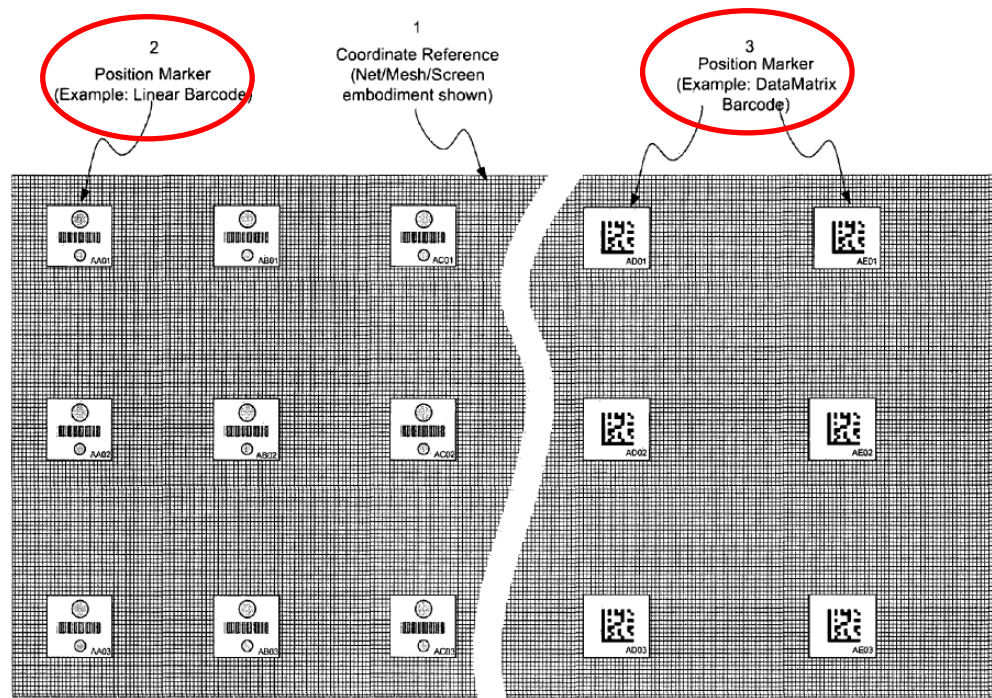


Figure 2

Ex.1005, Fig. 2 (annotated); Ex.1006, Fig. 2; Ex.1003, ¶¶96-97

Accordingly, Emanuel’s teaching of capturing an image of a position marker imprinted with a barcode encoding its position information renders obvious, “*photographing a location recognition tag storing location recognition information.*” Ex.1003, ¶¶94-100.

[1.2] b) measuring a distance to the location recognition tag;

Emanuel describes determining “**the distance from the camera 4 to the position marker.**” Ex.1005, 12:64-67; Ex.1006, 10. In particular, Emanuel teaches comparing a known distance between two points (AB) on the position marker to the apparent distance between those points in the camera image. Ex.1003, ¶¶101-

102. This comparison is performed by comparing “the ratio of Line Segment AB in the image to the distance AB on the position marker 3.” Ex.1005, 12:62-65; Ex.1006, 10; Ex.1003, ¶¶101-102. Emanuel discloses that “[s]ince the distance AB on the position marker [] is known and the focal length of the lens of the camera [] is known, **the distance from the camera [] to the position marker can be determined** from the ratio of Line Segment AB in the image to the distance AB on the position marker [].” Ex.1005, 12:62-67; Ex.1006, 10. The Line Segment AB in the image is depicted below:

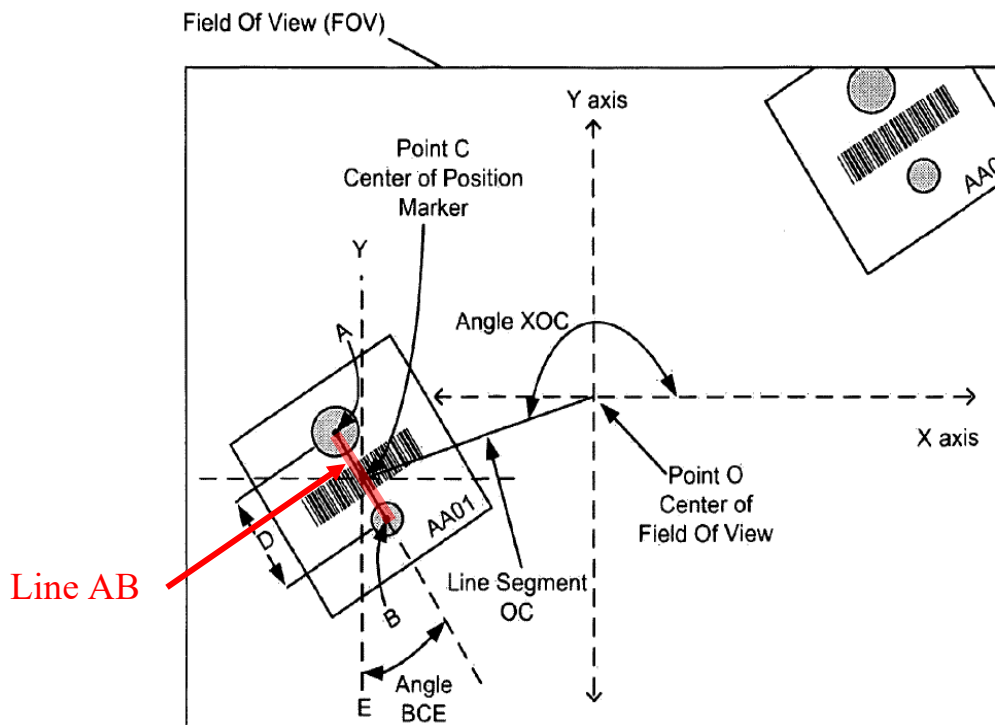
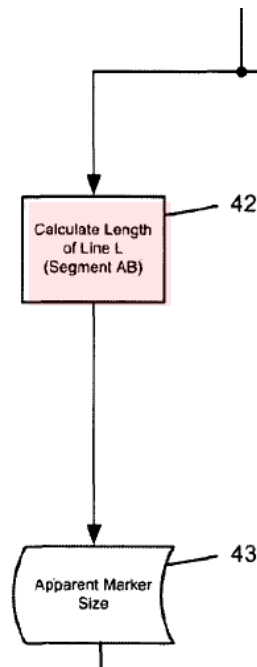


Figure 6

Ex.1005, Fig. 6 (annotated); Ex.1006, Fig. 11; Ex.1003, ¶¶102-103

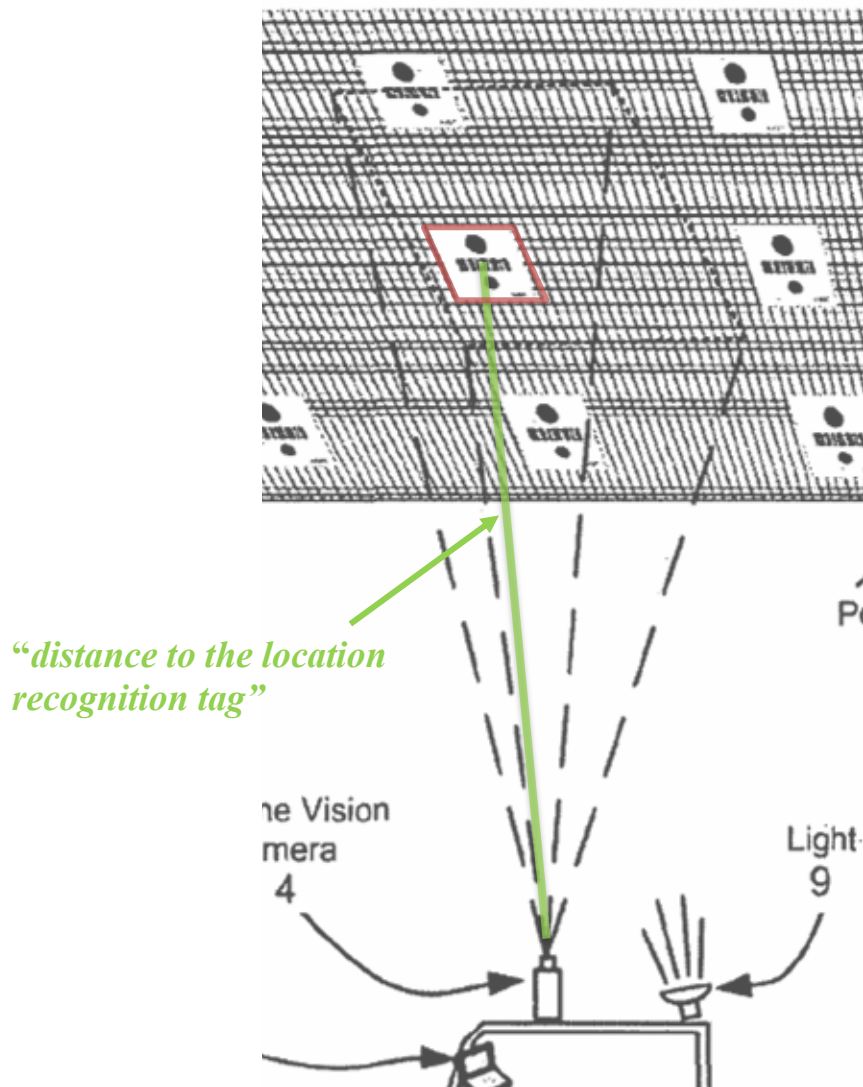
The apparent length of Line Segment AB in the image is calculated at step

42 in the flowchart:



Ex.1005, Fig. 10 (annotated); Ex.1006, Fig. 13; Ex.1003, ¶¶103-104

Annotated Fig. 1 of Emanuel illustrates “the distance from the camera 4 to the position marker” that is calculated using the ratio of the known length of line segment AB and the apparent length of line segment AB in the image in green below:

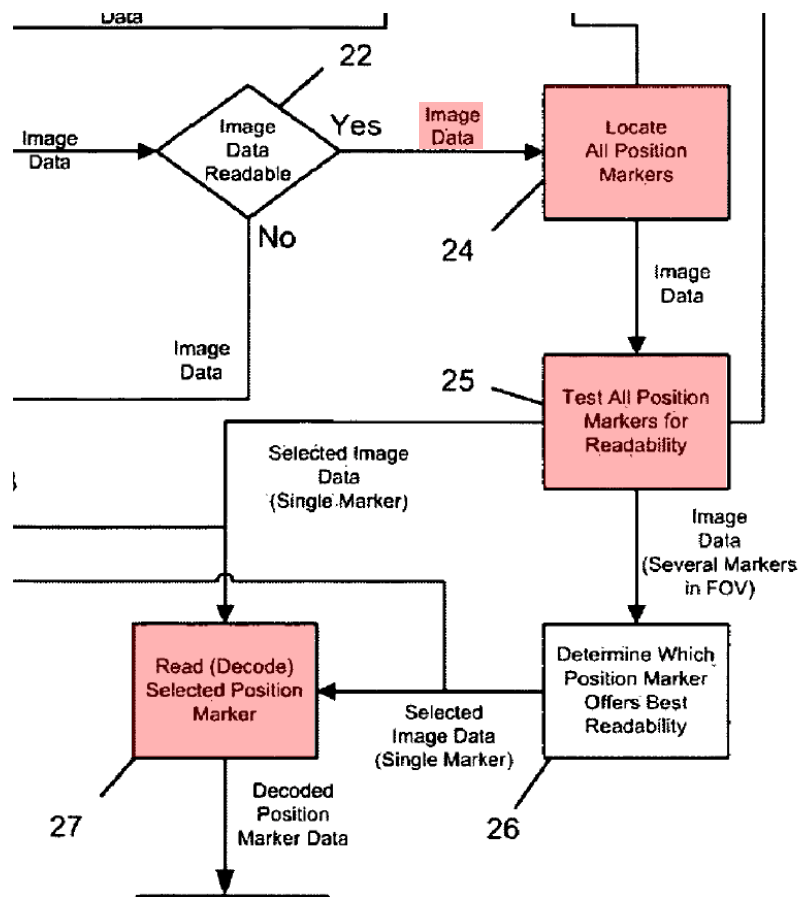


Ex.1005, Fig. 1 (annotated); Fig. 1006, Fig. 1; Ex.1003, ¶¶104-105

Thus, the method through which Emanuel's machine-vision system calculates the distance from the camera 4 to the position marker renders obvious *"measuring a distance to the location recognition tag."* Ex.1003, ¶¶101-105.

[1.3] c) analyzing an image of the photographed location recognition tag, and obtaining location information corresponding to the location recognition tag;

Emanuel's machine-vision system “**analyz[es] the image within the field of view, identif[ies] position markers, [and] decod[es] the position markers’ encoded position information.**” Ex.1005, 10:20-24; Ex.1006, 8. Emanuel’s Figure 9 is a flow diagram of this process:



Ex.1005, Fig. 9 (annotated); Ex.1006, Fig. 12; Ex.1003, ¶¶107-108

Specifically, “an image is captured...by the machine vision camera and stored into its memory.” Ex.1005, 10:31-32; Ex.1006, 9. Then, “[image] [a]nalysis begins by locating...a readable position marker image (image in which the barcode can be decoded) within the field of view.” Ex.1005, 10:31-37; Ex.1006, 8-9.

Thereafter, “if a single marker is found, selected image data are passed to a decoder 27.” Ex.1005, 11:38-39; Ex.1006, 9. This **“Decoder 27 ‘reads’ the 45 encoded unique identification code of the position marker and returns alphanumeric data which are stored as decoded position marker identification data 300.”** Ex.1005, 11:44-47; Ex.1006, 9.

This “marker identification” data is **“translated directly into real X and Y position data for markers that are directly encoded.”** Ex.1005, 12:1-8; Ex.1006, 3-4, 8, 12. Emanuel provides an example, where “marker ID 100250 might translate directly as ‘100 feet south and 250 feet west.’” Ex.1005, 12:1-8; Ex.1006, 3-4, 8, 12.

The marker may alternatively be serially encoded, where the decoded marker ID has “no inherent meaning.” Ex.1005, 10:52-55; Ex.1006, 10, 13-14. In this alternative example, the marker ID is stored in a look-up table and associated with the position of the marker (Ex.1005, 10:37-45, 12:36-49; Ex.1006, 10, 13-14, Fig. 13 (refs 31, 32)):

Marker ID	Actual X (feet)	Actual Y (feet)	Actual Z (feet)	Actual θ (degrees)	Actual Size (inches)
AA01	1.0	1.0	22.0	0.0	8.0
AA02	1.0	4.0	22.1	+0.8	8.0
AA03	1.1	7.0	21.9	+1.2	8.0
AB01	4.0	1.0	22.0	-1.0	8.0
AB02	4.1	4.0	22.0	-0.4	8.4
AB03	4.2	7.1	22.1	0.0	8.1
AC01	7.1	1.1	22.2	0.0	8.0
AC02	7.2	4.1	22.1	-0.5	8.0
AC03	7.0	7.2	21.9	+2.2	7.8

Figure 7

Ex.1005, Fig. 7; Ex.1006, 10, 13-14, Fig. 13

Using the decoded Marker ID “AA01,” the “Actual X,” “Actual Y,” and “Actual Z coordinates of the position marker can be obtained. Ex.1005, 12:36-40; Ex.1006, 10, 13-14, Fig. 13 (refs 31, 32).

In this way, when Emanuel’s machine-vision system captures an image of a barcode, and decodes the barcode to obtain the coordinates or location of the position marker (which is either directly encoded or serially encoded), Emanuel’s machine-vision system is “*analyzing an image of the photographed location recognition tag, and obtaining location information corresponding to the location recognition tag.*” Ex.1003, ¶¶106-113.

[1.4] d) obtaining direction information of the photographed location tag;

As discussed in [1.3], Emanuel’s camera captures a photograph of a position

marker (“the photographed location tag”).

Emanuel teaches obtaining “*direction information*” of the photographed position marker by calculating its radial angle relative to the center of the field of view of the camera (Ex.1003, ¶115):

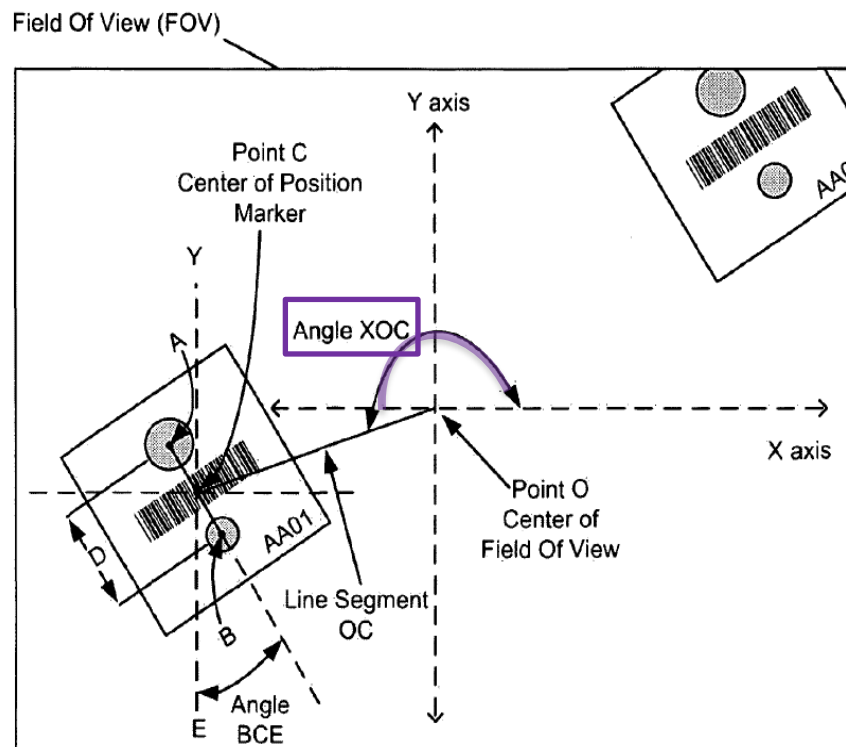
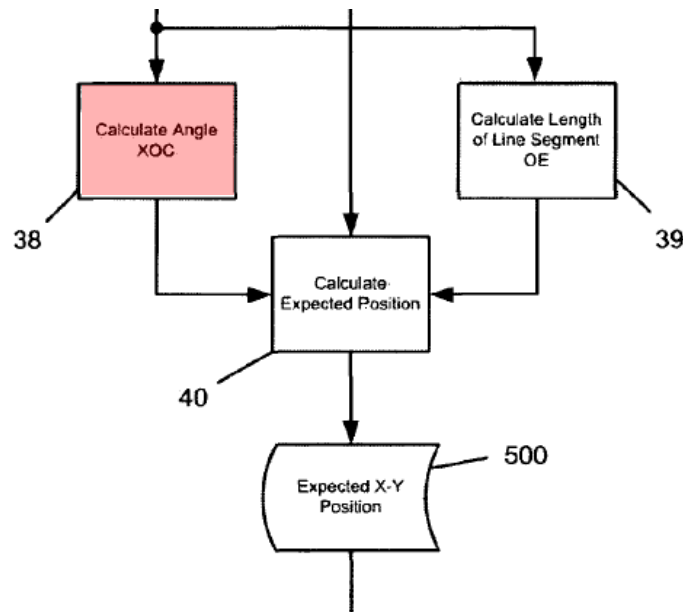


Figure 6

Ex.1005, Fig. 6 (annotated); Ex.1006, Fig. 11; Ex.1003, ¶¶115-116

Within the “camera’s field of view,” the “angle XOC” is calculated.
Ex.1005, 12:18-27; Ex.1006, 10. Specifically, “X and Y values of pixel coordinates A and [B], 30 are summed and divided by two (37) to establish Point E [sic, Point C]...the midpoint of line segment [AB] and the center of the position

marker.” Ex.1005, 12:19-24; Ex.1006, 10. Then, angle XOC is calculated as “the radial angle between the center of the image and the center of the position marker.” Ex.1005, 12:24-26; Ex.1006, 10.



Ex.1005, Fig. 11 (annotated); Ex.1006, Fig. 13; Ex.1003, ¶¶118-119

Angle XOC is “*direction information*” because it defines the marker’s direction relative to the camera’s center of field of view (as illustrated in Fig. 6 above). Ex.1003, ¶¶119-120.

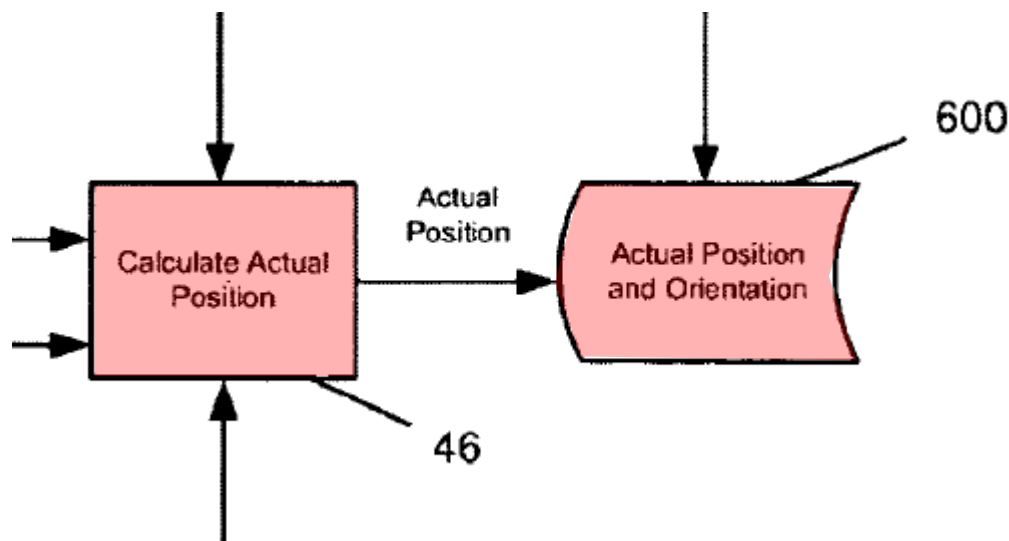
Therefore, Emanuel’s disclosure of capturing a photograph of a position marker and calculating its direction (“radial angle”) relative to the camera’s field of view (e.g. angle XOC), renders obvious “*obtaining direction information of the photographed location tag.*” Ex.1003, ¶¶114-121.

[1.5] e) calculating a mobile terminal location by using the distance information measured in b), the location information obtained in c), and the direction

information obtained in d).

As described in [1.0], Emanuel's machine-vision system "determine[es] position...of an object within a predetermined area." Ex.1005, Abstract; Ex.1006, 1, 3. **"To more accurately determine the camera's position"** (*calculating a mobile terminal location*), Emanuel describes calculating the X, Y, and Z coordinate location of the camera using the distance information measured in [1.2], the location information obtained in [1.3], and the direction information obtained in [1.4]. Ex.1005, 12:11-14, 12:18-33 ("it is possible to calculate 40 a more accurate X, Y camera position"), 12:66-13:2 ("the Z coordinate of the object may be readily calculated"); Ex.1003, ¶¶122-123.

Emanuel's flowchart across Figs. 9-11 illustrates how the position of the camera ("*mobile terminal location*") is calculated, with the final step representing the "actual position" of the camera:



Ex.1005, Fig. 11 (annotated); Ex.1006, Fig. 14; Ex.1003, ¶¶123-124

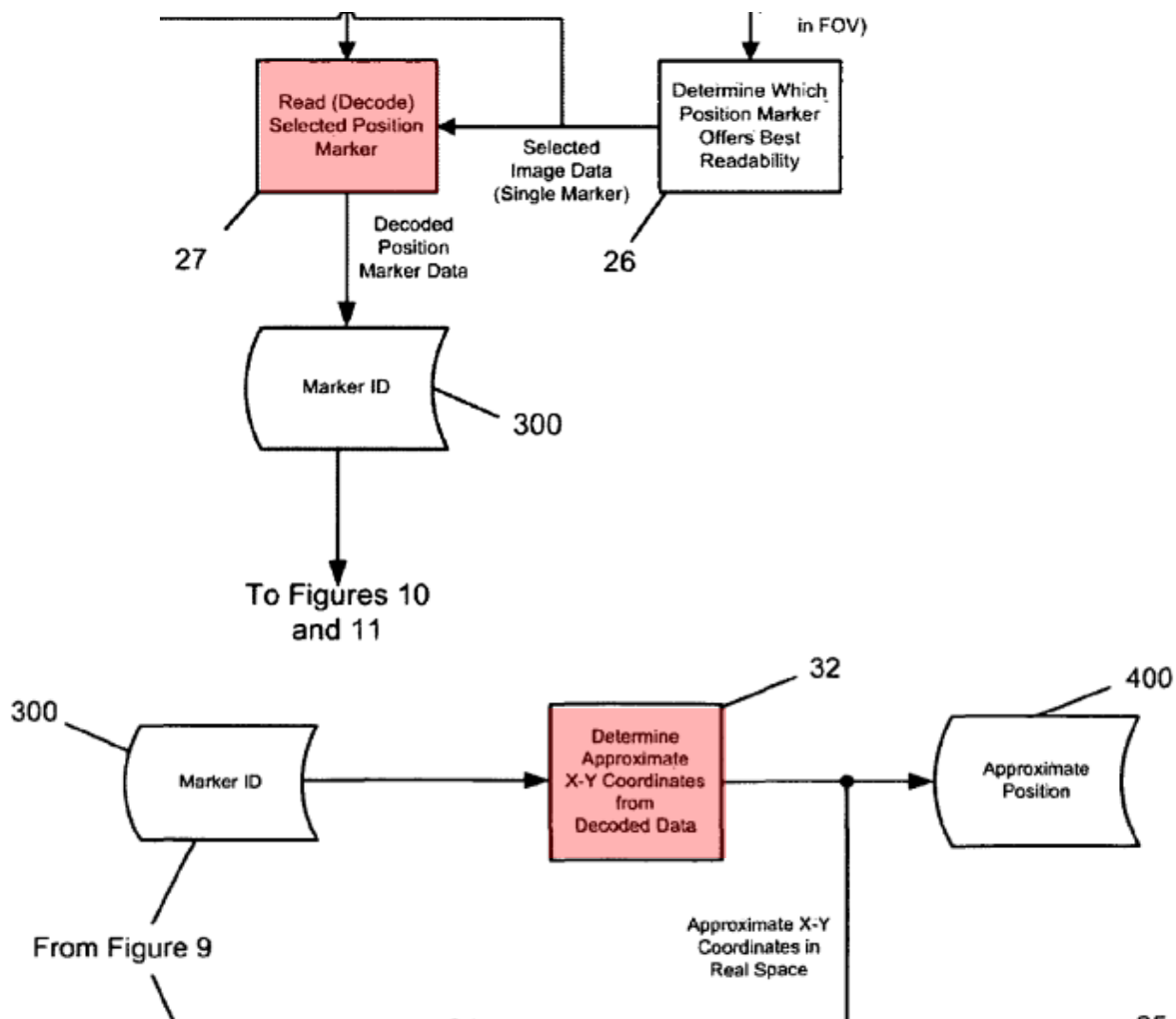
Each of the claimed pieces of information (“*location information*,” “*the distance information*,” and “*direction information*”) are obtained and utilized within the flowchart to arrive at the final step of determining the “actual position” of the camera, as discussed below. Ex.1005, Figs. 9-11; Ex.1003, ¶124.

First, as discussed in [1.3], the “*location information*” are the coordinates of the position marker obtained by decoding the position marker barcode or ID. Ex.1003, ¶125. Emanuel’s machine-vision system “**analyz[es] the image within the field of view, identif[ies] position markers, [and] decod[es] the position markers’ encoded position information.**” Ex.1005, 10:20-24; Ex.1006, 8.

As discussed in [1.3], the position markers that are “directly encoded with position information” are then “translate[d] directly into real coordinates.” Ex.1005, 10:46-49; Ex.1006, 3-4, 8, 12. For example, “marker 100250 maybe

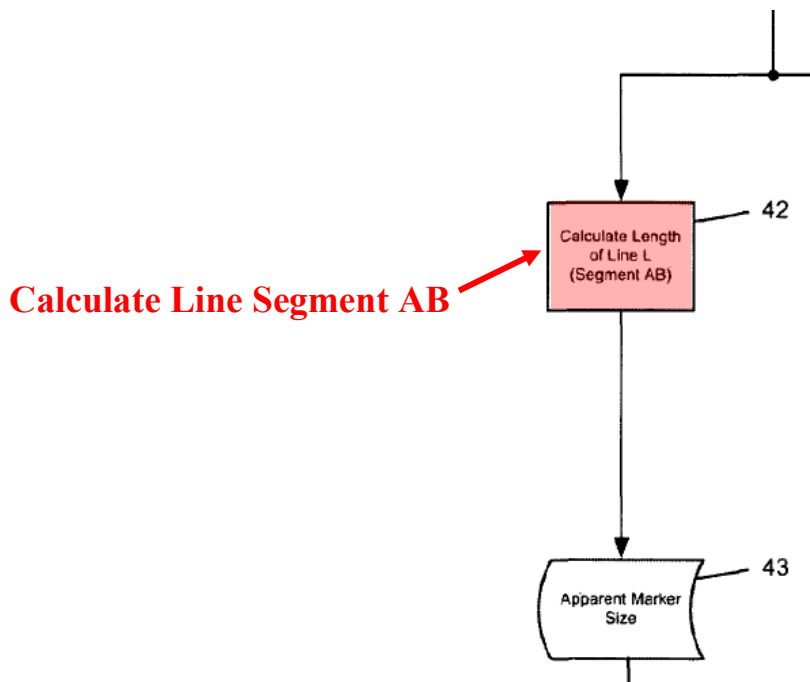
encoded to mean ‘100 feet south, 250 feet west.’” Ex.1005, 12:2-4; Ex.1006, 3-4, 7-8. Alternatively, the position markers that are “serially encoded” require the use of a “look-up table” that stores “marker positions” and is “accessed to return the approximate camera position 400.” Ex.1005, 12:39-42, 10:47-49; Ex.1006, 10, 13-14.

In either case, the flowchart of Figs. 9-11 uses the decoded *location information* in its overall goal to calculate camera position:



Ex.1005, Figs. 9-10 (annotated, partial); Ex.1006, Figs. 12-13; Ex.1003, ¶127

Second, as discussed in [1.2], in Emanuel “**the distance between the camera 4 to the position marker can be determined**” (“*the distance information*”) by using “the ratio of the length of Line Segment AB in the image to the distance AB on the position marker.” Ex.1005, 12:64-67; Ex.1006, 10. This is further illustrated in the flowchart spanned across Figs. 9-11, specifically in Fig. 10:



Ex.1005, Fig. 10 (annotated); Ex.1006, Fig. 13; Ex.1003, ¶¶128-129

Thus, when “the Z coordinate of the position marker... [is] known” – using either position markers “directly encoded with position information” or “serially encoded” as discussed above – “the Z coordinate **of the object [i.e. the camera]** may be readily calculated,” using the measured distance between the camera to the

position marker (“*the distance information*”). Ex.1005, 12:60-13:2; Ex.1006, 10. In other words, the distance between the camera and position marker is used to calculate the Z coordinate of the “*mobile terminal location.*” Ex.1003, ¶¶128-129.

Third, as discussed in [1.4], the “*direction information*” obtained by Emanuel’s machine vision system includes the angle XOC. Ex.1003, ¶130. Emanuel discloses that “angle XOC” along with “the length of line segment OC, which is the radial distance from the center of the image (center of the camera), Point O, to the center of the position marker, Point E [sic, Point C],” (Ex.1005, 12:24-28; Ex.1006, 10) can be used to calculate the position of the camera as illustrated in Figure 6:

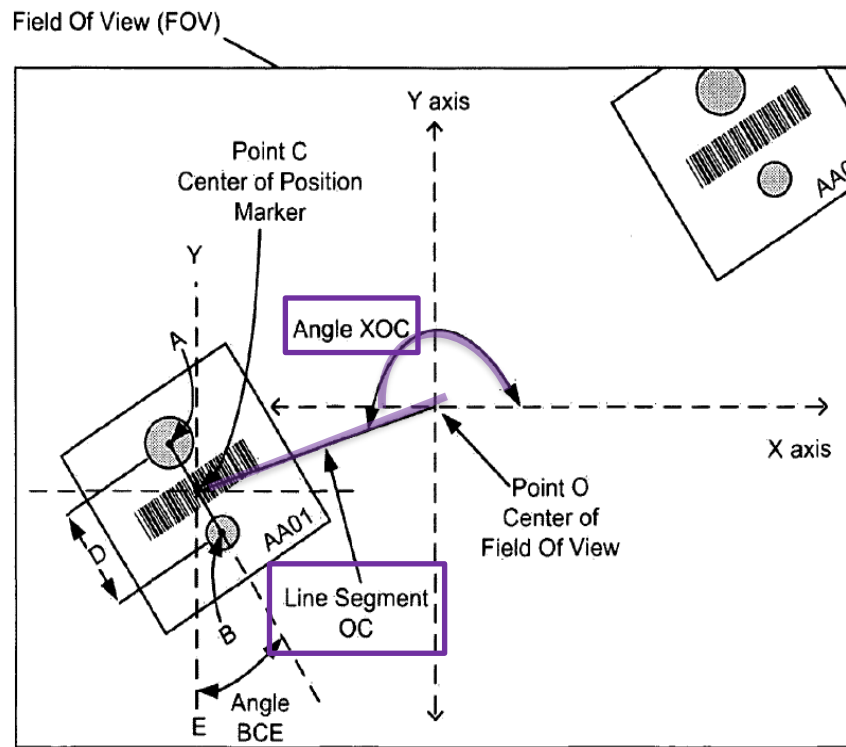


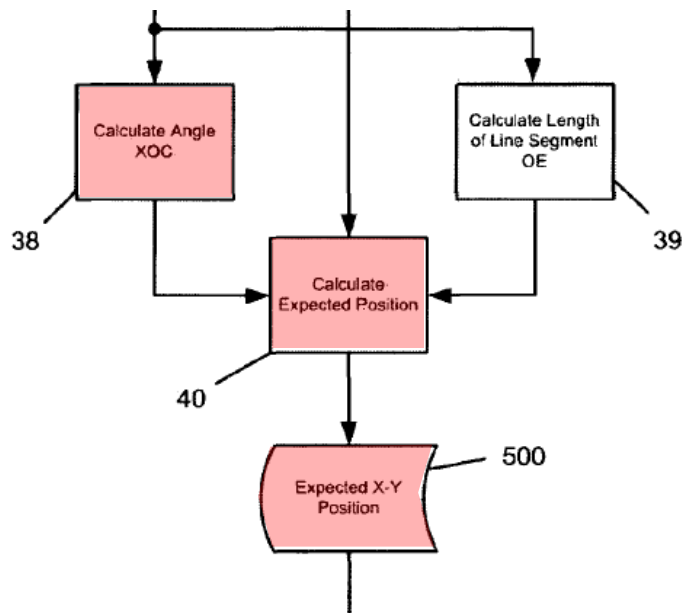
Figure 6

Ex.1005, Fig. 6 (annotated); Ex.1006, Fig. 11; Ex.1003, ¶¶130-131

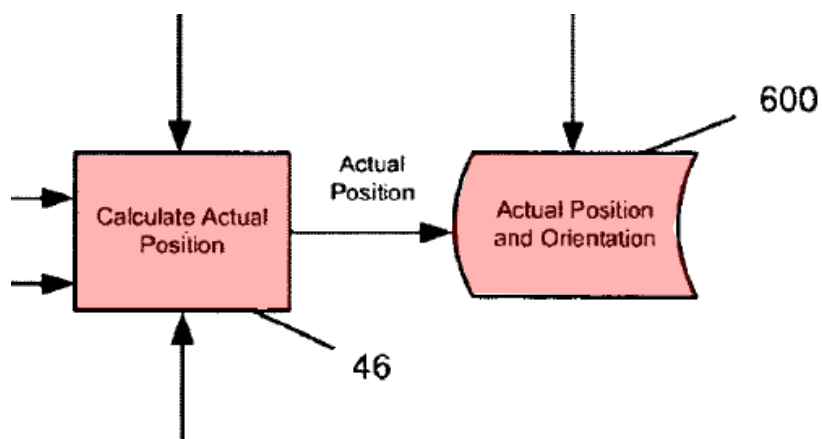
“Once these two values [i.e. angle XOC and the length of line segment OC] have been established, it is possible to calculate...**a more accurate X, Y camera position using plane geometry.**” Ex.1005, 12:24-31; Ex.1006, 10. In other words, by using angle XOC and the length of line segment OC, Emanuel’s machine-vision system calculates the X, Y coordinates of the “*mobile terminal location*” based on the known coordinates of the position marker using plane geometry. Ex.1003, ¶¶131-132.

This calculation is further illustrated in the flowchart spanning across

Figures 9-11, where Figure 10 shows using the “Angle XOC” (*direction information*) in calculating the camera’s “expected position” using “directly encoded markers”, and where Figure 11 shows calculating the camera’s “actual position” using a look-up table to obtain marker position information (i.e. X, Y, and Z coordinates), each of which a POSITA would understand to be a “*mobile terminal location*” (Ex.1003, ¶132):

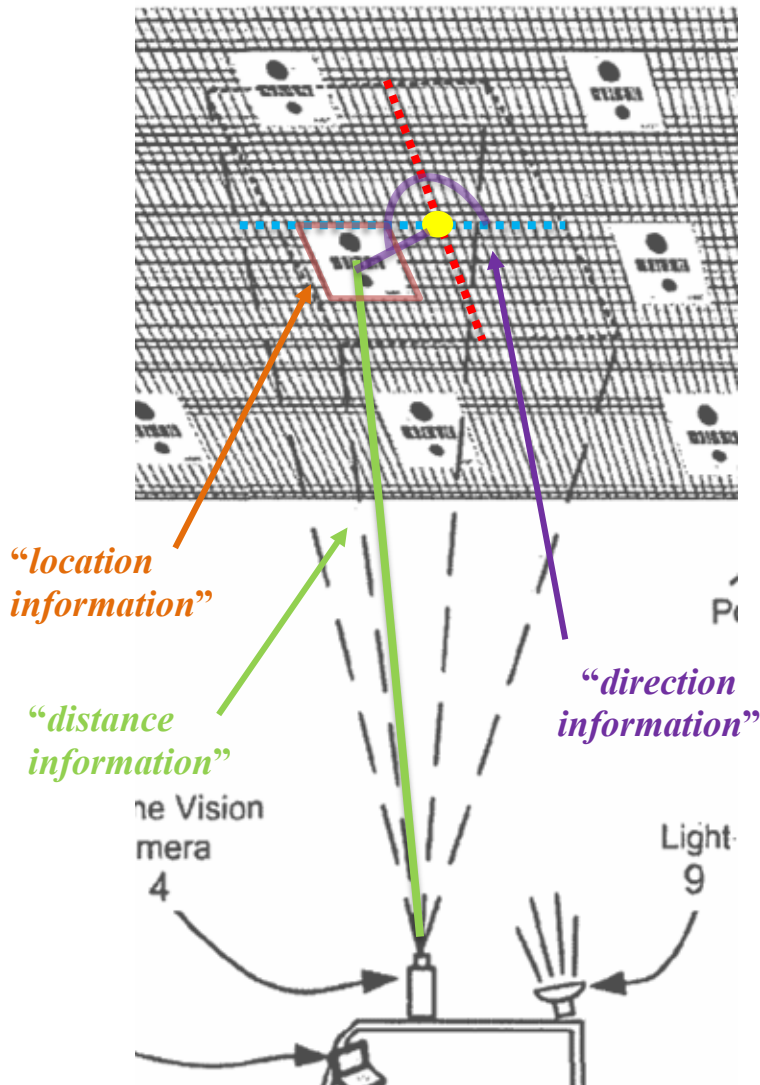


Ex.1005, Fig. 10 (annotated); Ex.1006, Fig. 13; Ex.1003, ¶¶132-133



Ex.1005, Fig. 11 (annotated); Ex.1006, Fig. 14; Ex.1003, ¶¶132-133

All three pieces of information are also demonstrated in the annotated Figure 1 of Emanuel below:



Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶133-134

Thus, Emanuel’s teaching of calculating the “expected” or “actual” camera location (e.g. camera’s X, Y, and Z coordinates) using the three types of information obtained by Emanuel in [1.2], [1.3], and [1.4] respectively renders obvious “calculating a mobile terminal location by using the distance information measured in b), the location information obtained in c), and the direction

information obtained in d).” Ex.1003, ¶¶122-134.

5. Claim 2

[2.0] The method of claim 1, wherein the direction information obtained in d) is offset information of an offset state of the location recognition tag based on the mobile terminal,

As described in [1.4], angle XOC is “*direction information.*” Emanuel discloses that angle XOC is the “radial angle between the center of the image and the center of the position marker” within the camera’s field of view. Ex.1005, 12:24-27; Ex.1006, 10, 13-14.

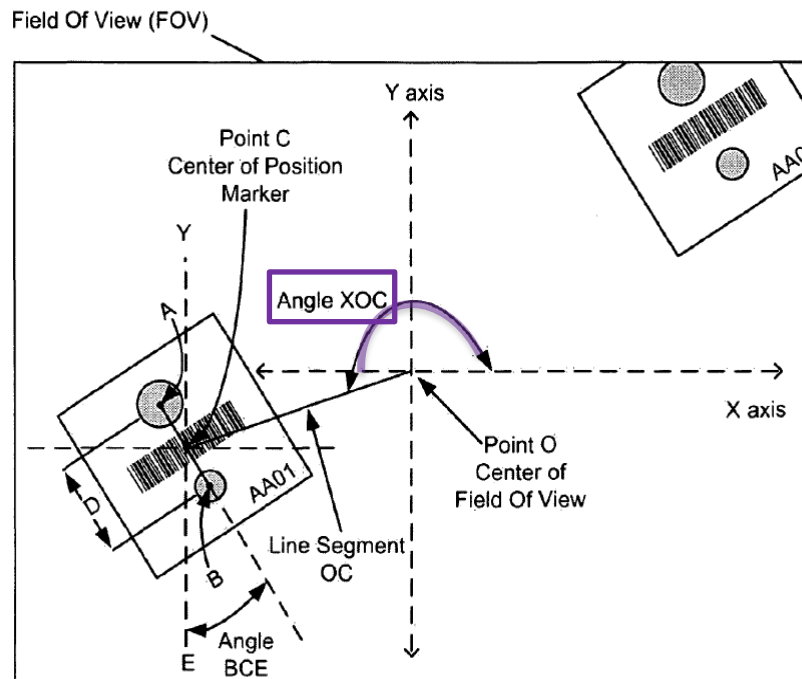


Figure 6

Ex.1005, Fig. 6 (annotated); Ex. 1006, Fig. 11; Ex.1003, ¶¶136-137

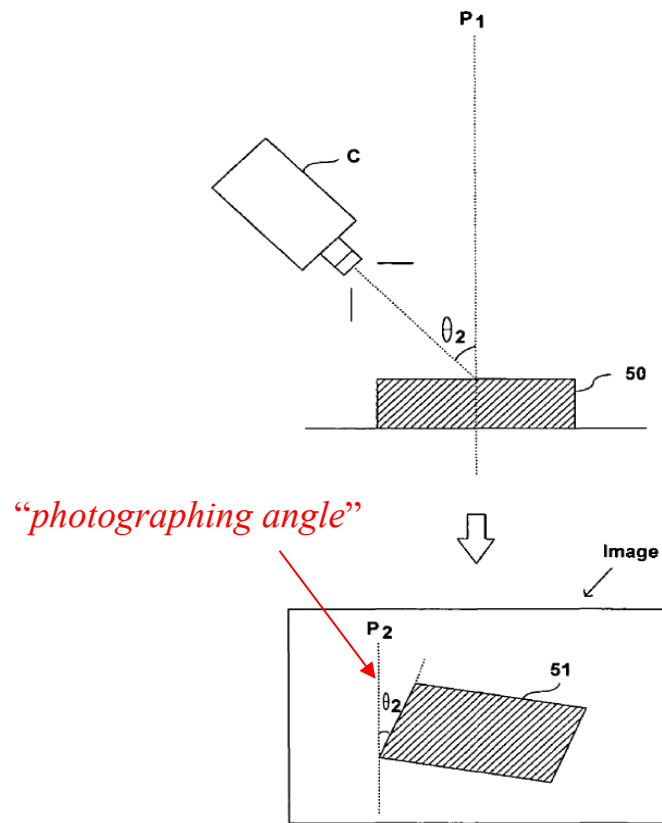
Thus, Emanuel’s angle XOC renders obvious “*offset information of an offset state of the location recognition tag based on the mobile terminal*” because it is the

angle by which the center of the position marker is offset from the center of the camera's field of view. Ex.1003, ¶¶135-144.

[2.1] and the offset information is obtained by analyzing a photographing angle of the photographed location recognition tag.

Emanuel discloses that angle XOC is obtained through “a geometric analysis of the marker's position...relative to the [camera's] field of view.” Ex.1005, 12:13-15. In other words, angle XOC is obtained by analyzing **within the image itself** “the radial angle between the center of the image and the center of the position marker.” Ex.1005, 12:24-27; Ex.1006, 10.

Angle XOC is much like the example of a photographing angle described in '001 patent, as illustrated in Figure 6B (Ex.1003, ¶¶147-148):

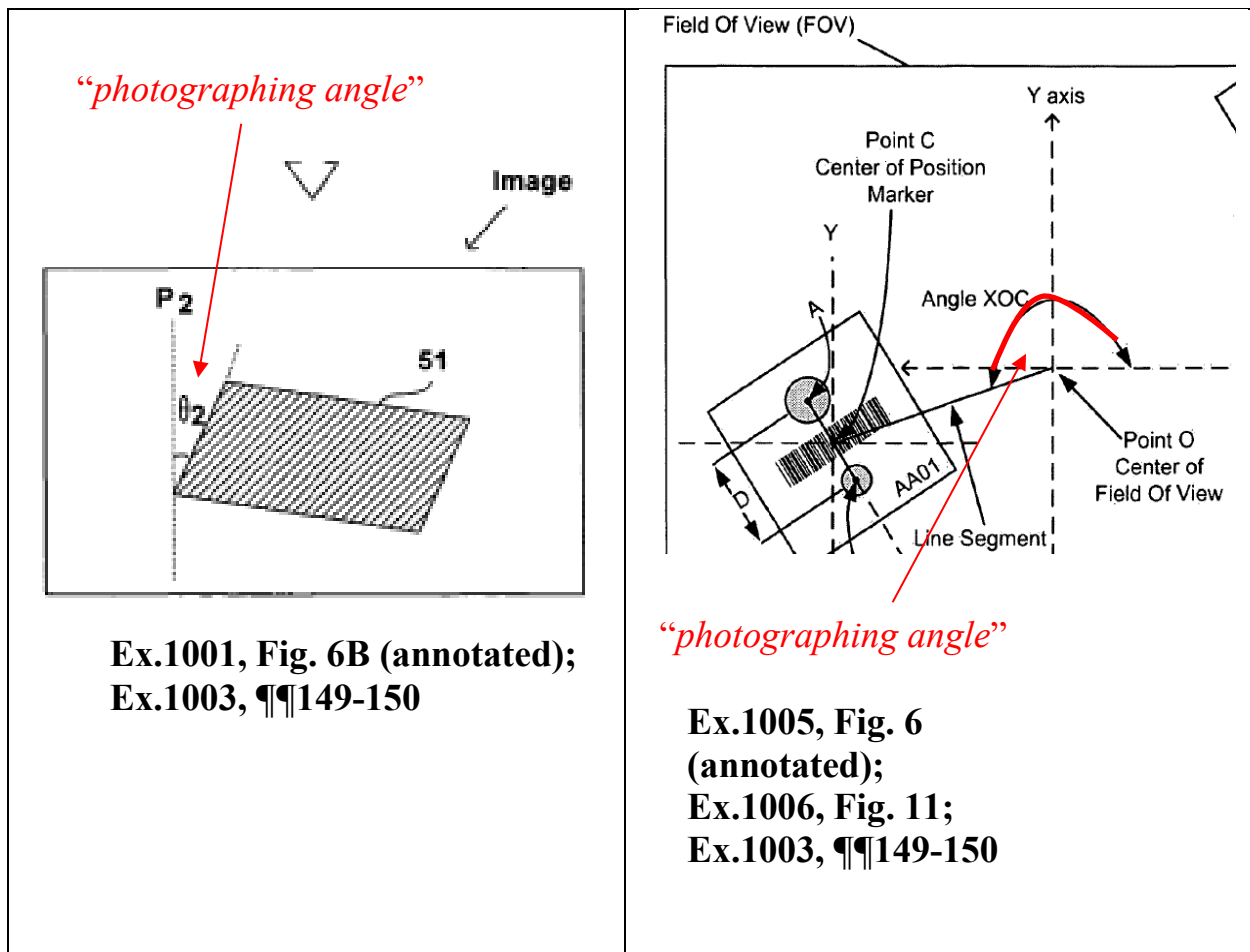


Ex.1001, Fig. 6B (annotated); Ex.1003, ¶¶147-148

In particular, as shown in Figure 6B of the '001 patent, when an “offset angle θ_2 of the image increases as the camera C deviates from the axis P1, a **photographing angle of the image 51** may be determined from the offset angle θ_2 [of P1].” Ex.1001, 6:65-67. The “*photographing angle*” described in the '001 patent is the radial angle of image 51 relative to the P₂ axis within the camera’s field of view. Ex.1001, 6:65-67; Ex.1003, ¶¶145-148.

Accordingly, angle XOC in Emanuel is much like the photographing angle described in the '001 patent which describes the marker’s position relative to the

camera's field of view as shown below (Ex.1003, ¶¶149-150):



Thus, Emanuel's disclosure of analyzing an image to determine the radial angle (angle XOC) of a marker's position relative to the camera's field of view renders obvious *"the offset information is obtained by analyzing a photographing angle of the photographed location recognition tag."* Ex.1003, ¶¶145-151.

6. Claim 5

[5.0] The method of claim 1, wherein the location recognition tags are arranged so that a desired precision for using the location recognition tags at a predetermined physical area may be achieved, and

Emanuel discloses “a plurality of individually unique position markers... **arranged in a predetermined positional pattern** within the coordinate space so **that at least one position marker is within view of the object** [i.e. camera].” Ex.1005, 4:56-59; Ex.1006, 15. For example, the position markers can be positioned “in rows and columns corresponding to a **desired coordinate plan for the designated area.**” Ex.1005, 7:67-8:2, Ex.1006, 7. The position markers (“*location recognition tags*”) are used “**for accurately determining position...within a predefined space**, such as a designated area or volume inside a building.” Ex.1005, 4:23-26; Ex.1006, 1, 7. In some instances, when calculating position, “more than one position marker may be selected . . . **to verify the calculation and improve the precision** of the position.” Ex.1005, Ex.1006, 3.

Accordingly, Emanuel’s disclosure of arranging position markers in a “predetermined positional pattern” according to a “desired coordinate plan” for “accurately determining position...within a predefined space” such as a “building,” renders obvious “*location recognition tags are arranged so that a desired precision for using the location recognition tags at a predetermined physical area may be achieved.*” Ex.1003, ¶¶152-157.

[5.1] the location recognition tags are formed as one-dimensional or two-dimensional barcode types.

Emanuel’s discloses that its position markers may include “[m]achine

readable symbols, such as **one-dimensional or two-dimensional barcodes**,
encod[ing] the identity of each position marker of the coordinate reference.”

Ex.1005, 6:55-57; Ex.1006, 12. The one-dimensional and two-dimensional
barcodes on position markers are illustrated in Figures 2, 4, and 12:

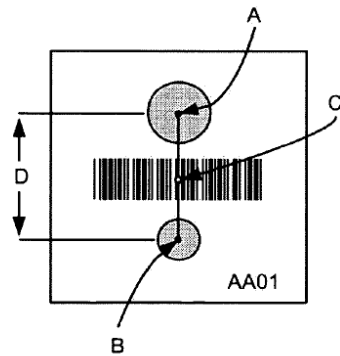


Figure 4

Ex.1005, Fig. 4; Ex.1006, Fig. 4

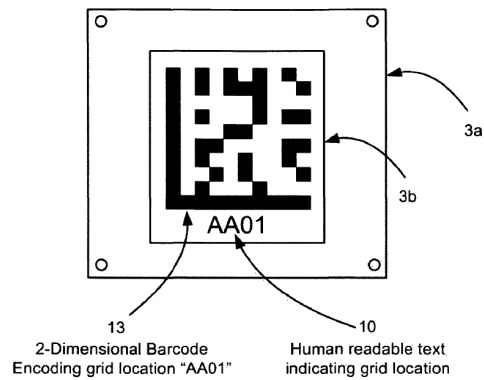


Figure 12

Ex.1005, Fig. 12; Ex.1006, Fig. 5

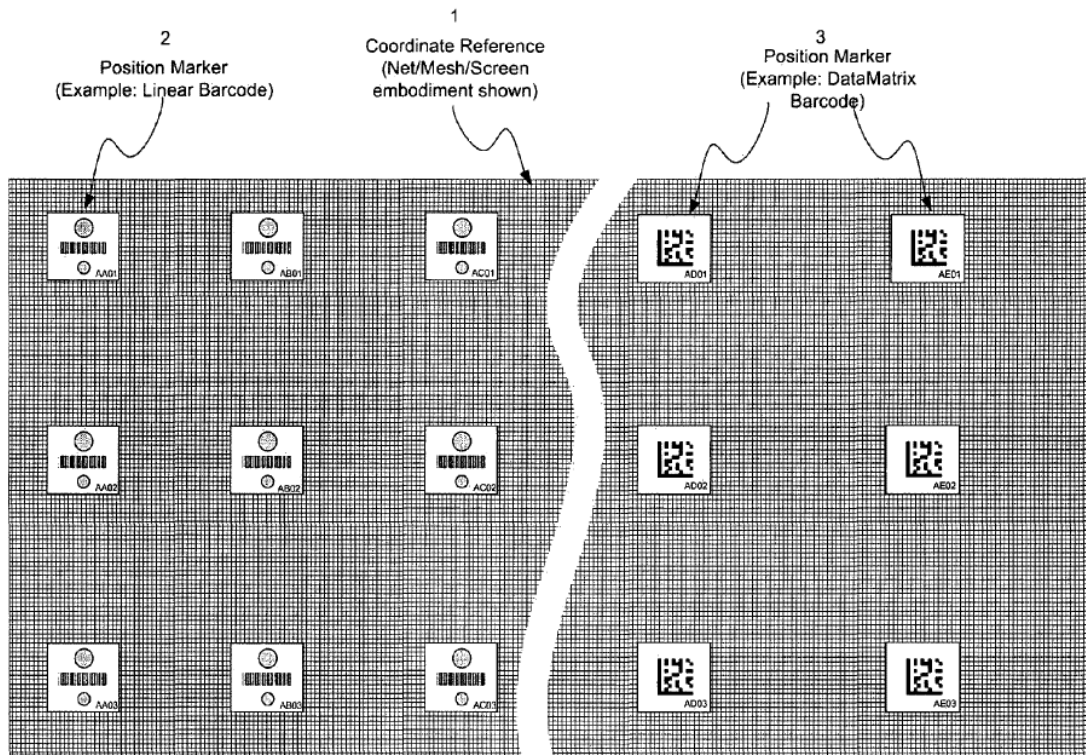


Figure 2

Ex.1005, Fig. 2; Ex. 1006, Fig. 2

Thus, the barcodes on Emanuel’s position markers render obvious “*the location recognition tags are formed as one-dimensional or two-dimensional barcode types.*” Ex.1003, ¶¶158-159.

7. Claim 7

[7.0]

A position marker (“*location recognition tag*”) in Emanuel may store data in the form of a “bar code” which “can be decoded.” Ex.1005, 10:32-34; Ex.1006, 9. The stored data can be location information that is “directly encoded” that “allows

the decoded ID to translate directly into real coordinates.” Ex.1005, 10:48-49; Ex.1006, 3-4, 8, 12. For example, the position marker may be directly encoded with a specific position within the pre-defined space, such as “100 feet south, 250 feet west.” Ex.1005, 10:50-51; Ex.1006, 7, 8, 12, 17. A POSITA would understand that this specific position information would be “*an absolute location coordinate*” because the stored values define the position marker’s precise position within the pre-determined physical area. Ex.1003, ¶¶161-162.

Alternatively, Emanuel also discloses that the stored data can be location information that is “serially encoded” on the position marker whereby “the ID has no inherent meaning and a lookup table contains references to the actual position.” Ex.1005, 10:53-55, 12:58-60; Ex.1006, 6-7, 10, 12-14, Fig. 13 (refs 31, 32). For example, a “marker identification” may be stored on the position marker so that the “marker ID...is used...to search [a] look-up table.” Ex.1005, 10:53-55; Ex.1006, 10, 13-14. The “Position Marker Look-Up Table” contains “actual X, Y, and Z coordinates” which have been “recorded for all position markers.” Ex.1005, 12:36-40; Ex.1006, 10, 13-14, Fig. 13. A POSITA would understand that a serially encoded marker ID is a “*logic location coordinate*” because it is used to access actual X, Y, and Z coordinates in a lookup table that correspond logically to the marker ID. Ex.1003, ¶¶163-166 (citing Ex.1029).

Thus, Emanuel’s disclosure of position makers including bar codes that

“directly encode” and “serially encode” location information renders obvious
“*wherein the location recognition tag stores location information of one among an
absolute location coordinate and a logic location coordinate.*” Ex.1003, ¶¶160-
167.

8. Claim 8

[8.0] *A location recognition device for recognizing a location by using a built-in camera, the location recognition device comprising:*

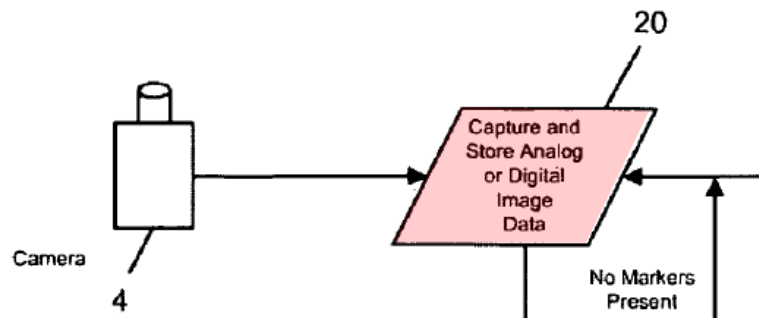
As discussed in [1.0], Emanuel discloses “a machine vision system”
(*location recognition device*) for “determining position...of an object within a
predetermined area” (*recognizing a location*). Ex.1005, Abstract; Ex.1006, 1, 3.
Emanuel’s machine-vision system may be implemented as an integrated system, in
view of Ihara’s laptop with built-in camera (*using a built-in camera*). Ex.1003,
¶168.

Thus, for the same reasons as discussed in association with [1.0], Emanuel
and Ihara render obvious this limitation. Ex.1003, ¶¶168-169.

**[8.1] *an image photographing unit for photographing a plurality of location
recognition tags that are arranged in a predetermined physical area and
respectively store location recognition information, and for performing a digital
image process;***

First, as discussed in [1.0] and [1.1], Emanuel’s machine-vision system
includes a “machine vision camera...[that] “captures...**digital** images” (*image
photographing unit*) of “position markers 2” (*location recognition tags*). Ex.1005,

11:19-21; Ex.1006, 9. In particular, Emanuel describes that “**an image is captured**
110 by the machine vision camera and **stored into its memory**” (*performing a*
digital image process). Ex.1005, 10:31-32; Ex.1006, 9-10.



Ex.1005, Fig. 9 (annotated); Ex.1006, Fig. 12; Ex.1003, ¶¶170-171

Emanuel’s disclosure of capturing an image and storing the respective digital image data in memory, is much like the example of the image photographing unit in the ’001 patent that “forms an image...and generates digital image data of the subject.” Ex.1001, 5:35-40. Accordingly, Emanuel renders obvious “*a digital image process.*” Ex.1003, ¶¶170-171.

Second, as discussed in [1.1] and [1.3] Emanuel teaches that the “position markers...are placed at known locations in or near [a] coordinate space” (*arranged in a predetermined physical area*). Ex.1005, 5:13-15; Ex.1006, 3. These position markers “*stor[e] location recognition information*” because they have “barcodes” which “*encode[] the marker location...in any of several common barcode*

symbolologies” (*respectively store location recognition information*). Ex.1005, 8:5-7, 10:46-50; Ex.1006, 6.

Thus, for the same reasons as discussed in association with [1.0], [1.1], and [1.3], Emanuel and Ihara render obvious this limitation. Ex.1003, ¶¶170-173.

[8.2] *a distance measuring unit for measuring a distance to the location recognition tag:*

Emanuel discloses that its machine vision system includes “machine vision software” for determining “the distance from the camera 4 to the position marker,” as discussed in [1.2] (*distance measuring unit for measuring a distance to the location recognition tag*). Ex.1005, 11:19-24, 12:64-65; Ex.1006, 9, 10.

Thus, for the same reasons as discussed in association with [1.2], Emanuel and Ihara render obvious this limitation. Ex.1003, ¶¶174-175.

[8.3] *an image analyzing unit for analyzing an image of the location recognition tag processed by the image photographing unit, and obtaining corresponding location information and direction information of the location recognition tag; and*

As discussed in [1.3] and [1.4] Emanuel discloses that its machine vision system includes “machine vision software” for analyzing a digital image and obtaining location and direction information (“*image analyzing unit for analyzing an image*”).

First, as discussed in [1.3], Emanuel’s machine-vision system “analyz[es] the image within the field of view, identif[ies] position markers, [and] decod[es]

the position markers' encoded position information" (*analyzing an image of the location recognition tag...and obtaining corresponding location information*).

Ex.1005, 10:20-24; Ex.1006, 8. The "Decoder 27 'reads' the 45 encoded unique identification code of the position marker and returns alphanumeric data which are stored as decoded position marker identification data 300" (*location information...of the location recognition tag*). Ex.1005, 11:44-47; Ex.1006, 9.

Second, as discussed in [1.4], Emanuel's machine vision-system calculates "angle XOC" of the photographed position marker using the marker's distance and radial angle relative to the center of the field of view (*direction information of the location recognition tag*). Ex.1005, 12:24-26; Ex.1006, 10.

Thus, for the same reasons as discussed in association with [1.3] and [1.4], Emanuel and Ihara render obvious this limitation. Ex.1003, ¶¶176-180.

[8.4] a location recognizing unit for recognizing a user location by using distance information measured by the distance measuring unit, and the location information and the direction information obtained by the image analyzing unit.

Emanuel discloses that its machine vision system includes "machine vision software" for "determining [the] position...of an object within a predetermined area," as discussed in [1.5] (*a location recognizing unit for recognizing a user location*). Ex.1005, Abstract, 11:19-24; Ex.1006, 1, 3, 9. **"To more accurately determine the camera's position,"** Emanuel describes calculating the X, Y, and Z coordinate location of the camera using the distance information measured in [1.2],

the location information obtained in [1.3], and the direction information obtained in [1.4]. Ex.1005, 12:11-14, 12:18-33 (“it is possible to calculate 40 a more accurate X, Y camera position”), 12:66-67 (“the Z coordinate of the object may be readily calculated”); Ex.1003, ¶181.

Emanuel discloses that the machine vision system can be used to determine the location of any object, including a user (*a user location*). Ex.1005, 4:44-47(“While the specific purpose is to track industrial vehicles indoors, it can be applied to track objects of almost any sort, including...people, animals, and so on.”); Ex.1006, 1, 3-4. Additionally, in the example given in Emanuel Figure 1, the position of the camera corresponds to the location of *a user* (e.g., the person walking in the figure, or the operator of the forklift or truck). *See* Ex.1005, Fig. 1; Ex.1006, Fig. 1.

Further, described in [1.5], each of the claimed pieces of information (“*the distance information*,” “*location information*,” and “*direction information*”) are obtained and utilized within the flowchart to calculate and “expected” or “actual” position. Ex.1005, Figs. 9-11; Ex.1003, ¶183.

Thus, for the same reasons as discussed in association with [1.5], Emanuel and Ihara render obvious this limitation. Ex.1003, ¶¶181-183.

9. Claim 10

[10.0]

As discussed in [1.1], Emanuel’s system is comprised of position markers, each of “which corresponds to a particular location on the warehouse floor, and a **database of these locations is created and stored** in a computational device (digital computer) 5.” Ex.1005, 9:38-41; Ex.1006, 10. This database is referred to as a “Position Marker Look-Up Table” (“*tag location information storage unit*”) which contains “**actual X, Y, and Z coordinates...that have been measured and recorded for all position markers**” (“*location coordinate information*”). Ex.1005, 12:36-40; Ex.1006, 10, 13-14, Fig. 13 (refs 31, 32).

Figure 7 includes one example of a Position Marker Look-Up Table:

Marker ID	Actual X (feet)	Actual Y (feet)	Actual Z (feet)	Actual θ (degrees)	Actual Size (inches)
AA01	1.0	1.0	22.0	0.0	8.0
AA02	1.0	4.0	22.1	+0.8	8.0
AA03	1.1	7.0	21.9	+1.2	8.0
AB01	4.0	1.0	22.0	-1.0	8.0
AB02	4.1	4.0	22.0	-0.4	8.4
AB03	4.2	7.1	22.1	0.0	8.1
AC01	7.1	1.1	22.2	0.0	8.0
AC02	7.2	4.1	22.1	-0.5	8.0
AC03	7.0	7.2	21.9	+2.2	7.8

Figure 7

Ex.1005, Fig. 7 (annotated); Ex.1006, 10, 13-14, Fig. 13; Ex.1003, ¶¶185-186

As shown in the table above, the first column corresponds to encoded “Marker ID” (e.g. AA01), which as discussed in [7.0] is “*logic location coordinate*

information” because it corresponds logically to the actual X, Y, and Z coordinates in the second (e.g. X=1.0 ft), third (e.g. Y=1.0 ft), and fourth (e.g. Z=22.0 ft) columns for the Marker ID (*“location coordinate information of a location of the location recognition tag”*). Ex.1005, 12:36-49; Ex.1006, 10, 13-14; Ex.1003, ¶185-186.

Therefore, Emanuel’s position marker look-up table renders obvious *“a tag location information storage unit for storing location coordinate information of a location of the location recognition tag, and logic location coordinate information corresponding to the location coordinate information.”* Ex.1003, ¶¶184-187.

E. Ground 2: Claims 3, 4 and 9 are obvious under §103 over Emanuel, Ihara, and Tanaka.

1. Tanaka

Tanaka illustrates that it was well-known for cameras that are built into portable devices to include an “automatic focusing function” or AF (Auto Focus). Ex.1018, [0007], [0072]. The AF process employed “various kinds of active systems which measure a distance to the photographic subject,” for example “by emitting infrared rays or an ultrasonic wave.” Ex.1018, [0278].

2. Reasons to Combine Emanuel, Ihara, and Tanaka

For the reasons set forth below, a POSITA would have been motivated to combine the teachings of Tanaka with the teachings of Emanuel and Ihara. *See*

Ex.1003, ¶¶190-196. It would have been obvious, beneficial, and predictable to apply Tanaka’s teachings of autofocusing for distance measurement to the machine-vision system of Emanuel and Ihara—for example, to enhance the ability to measure the distance between a camera and an object. Ex.1003, ¶190.

A POSITA, when considering the teachings of Emanuel and Ihara, would have also considered the teachings of Tanaka. Ex.1003, ¶191. Tanaka relates to a camera that captures and records an image of a photographic subject. Ex.1018, Title (“Apparatus and Method for Imaging, and Computer Program”), [0159] (“[C]amera control section 210 controls each part of the camera section 22 so as to capture the still image”). As such, Tanaka is analogous art to Emanuel, Ihara, and the ’001 patent. *See*, e.g., Ex.1001, Abstract; Ex.1005, Abstract; Ex.1006, 1-2; Ex.1007, 6:22-26; Ex.1003, ¶191.

A POSITA would have been motivated to combine the teachings of Tanaka with the built-in camera of Emanuel and Ihara, and doing so would have been within a POSITA’s skillset. Ex.1003, ¶192. The combination would have been obvious because it represents merely the use of Tanaka’s known technique of using camera autofocusing (“AF process”) to “measure a distance to the photographic subject” to improve the built-in camera of Emanuel and Ihara camera in the same way. Ex.1018, [0278]; Ex.1003, ¶192.

Specifically, a POSITA would have been motivated to augment Emanuel’s

distance measuring method (using the ratio of the length of a line segment in the image to the actual distance on the position marker) with Tanaka's technique (distance measurement using autofocusing) to confirm the distance measurements to enhance accuracy. Ex.1003, ¶193.

For example, as discussed in [1.2] the built-in camera of Emanuel and Ihara measures the distance to the photographic subject (e.g. position marker) based on a known distance of two points (AB) in the image. In contrast, Tanaka's technique employs an autofocus process to measure the distance to the photographic subject "by emitting infrared rays or an ultrasonic wave." Ex.1018, [0278]. Accordingly, Tanaka provides a method of confirming or verifying the distance measured by Emanuel and Ihara using an autofocus process. Ex.1003, ¶194. Doing so would further Emanuel's objective of offering "high accuracy" or "improve[d] precision" in position determination. Ex.1005, 4:16-18, 5:11-12; Ex.1006, 1-2.

Additionally, it would have been beneficial to use Tanaka's AF process for measuring distance so that a diverse set of position markers may be used. Ex.1003, ¶195. For example, as discussed in [1.2], Emanuel uses "geometric position references" such as the centers of "blobs" or dark circles to calculate the length of line segment AB in the image and measure the distance to the position marker. Ex.1005, 5:52-53, 11:57-59; Ex.1006, 9. Tanaka's AF process, however, would not rely on geometric position references imprinted on the photographic subject to

calculate distance; instead, Tanaka would measure distance to the photographic “by emitting infrared rays or an ultrasonic wave.” Ex.1003, ¶¶195-196. In other words, by using Tanaka’s AF process for calculating distance, a more diverse set of position markers may be used to calculate distance to the position markers in Emanuel – position markers that do not require geometric position references imprinted upon them. Ex.1003, ¶¶195-196.

A POSITA would have had a reasonable expectation of success in applying Tanaka’s autofocusing technique to the built-in camera of Emanuel and Ihara. Ex.1003, ¶196. In particular, the AF process in Tanaka is specifically designed for portable devices such as “a notebook type personal computer” or a “PDA” having an “imaging function” that can “easily carry out operations for the AF frame.” Ex.1018, [0284]. Thus, a POSITA applying Tanaka’s autofocusing technique to the camera built-in to the personal computer of Emanuel and Ihara, would be using Tanaka precisely as it was intended – to measure distance to a photographic subject (e.g. position marker) using an AF process. Ex.1003, ¶196.

3. Claim 3

[3.0] The method of claim 1, wherein the distance information in b) is measured by the camera when an auto focusing operation of the camera is performed.

As discussed in [1.2], Emanuel teaches determining “the distance from the camera...to the position marker” by analyzing the elements in the photographed

posiiton marker. Ex.1005, 12:64-65; Ex.1006, 10. It was well-known, however, that when using a camera to determine distance to an object, such distance may also be determined using the camera’s auto focusing system. Ex.1003, ¶197. (citing Ex.1008, [0278]). For example, as described in Tanaka, “various kinds of active [AF] systems...**measure a distance to the photographic subject by emitting infrared rays or an ultrasonic wave.**” Ex.1008, [0278]. As discussed in Section IX-E-2, a POSITA would have been motivated to use Tanaka’s camera auto focusing operation to determine distance—for example, to confirm existing distance calculations to enhance accuracy. Ex.1003, ¶197.

Thus, the combination of Emanuel’s method of distance measurement with Tanaka’s AF process technique renders obvious “*wherein the distance information in b) is measured by the camera when an auto focusing operation of the camera is performed.*” Ex.1003, ¶¶197-198.

4. Claim 4

[4.0] The method of claim 1, wherein the distance information in b) is measured by a distance measuring sensor using infrared rays or ultrasonic waves.

As discussed in [3.0], Tanaka describes an “AF process” which “measure[s] a distance to the photographic subject by **emitting infrared rays or an ultrasonic wave**” (*distance information in b) is measured...using infrared rays or ultrasonic waves*). Ex.1008, [0278]. Tanaka’s disclosure of measuring distance by “emitting

infrared rays or an ultrasonic wave” renders obvious “*a distance measuring sensor.*” It was well-known and obvious to a POSITA that when Tanaka is measuring distance by emitting infrared light or an ultrasonic wave, a sensor would be used to receive “the reflected beam or wave for measuring the distance from the camera to the object by measuring elapsed time from transmission to receipt.” Ex.1003, ¶199 (quoting Ex.1018, 1:29-35). Such sensors were referred to as “photosensing element[s]” for detecting the reflected light (*distance measuring sensor*). Ex.1018, 7:2-6. Accordingly, Tanaka’s teaching of measuring distance by emitting infrared light or an ultrasonic wave renders obvious “*wherein the distance information in b) is measured by a distance measuring sensor using infrared rays or ultrasonic waves.*” Ex.1003, ¶199.

5. Claim 9

[9.0] *The location recognition device of claim 8, further comprising a distance measuring sensor for measuring a distance to the location recognition tag by using infrared rays or ultrasonic waves.*

See limitations [3.0] and [4.0].

F. Ground 3: Claims 6 and 12 are obvious under §103 over Emanuel, Ihara, and deVos.

1. deVos

DeVos discloses a “position sensing system” that “calculates the X-Y-Z coordinates of a point in space using triangulation.” Ex.1011, Abstract. Through

triangulation, the system in deVos “determines the orientation of an object located at that point.” Ex.1011, Abstract. The “triangulation calculation is based on the coordinates of at least three retroreflective elements spaced apart from each other.” Ex.1011, Abstract. The “retroreflective elements” used for the triangulation each “have a unique bar code in order to differentiate one element from the others.” Ex.1011, 5:24-26.

2. Reasons to combine Emanuel with deVos

For the reasons set forth below, a POSITA would have been motivated to combine the teachings of deVos with the teachings of Emanuel. *See* Ex.1003, ¶¶203-208. It would have been obvious, beneficial, and predicable to apply deVos’s teachings of triangulation to Emanuel’s machine-vision system (as modified by Ihara)—for example, to further Emanuel’s goals of capturing an image of a position marker and accurately recognizing the location of the camera. Ex.1003, ¶203.

As an initial matter, a POSITA, when considering the teachings of Emanuel, would have considered the teachings of deVos. Ex.1003, ¶204. DeVos relates to spatial positioning through the use of an optical system. Ex.1011, 2:33-35 (“In accordance with one aspect of the present invention, a system for determining the position of a point in space”). As such, deVos is analogous to art to Emanuel and the ’001 patent. *See, e.g.,* Ex.1001, Abstract; Ex.1003, ¶204.

As discussed *supra*, Emanuel “provides a method and an apparatus for accurately determining position and rotational orientation within a predefined space.” See Ex.1005, 4:23-25; Ex.1006, 1. While in some embodiments a single position marker is used for the calculation of the camera’s position, in alternative embodiments, Emanuel teaches that “**more than one position marker may be selected**, and the position and rotational orientation of the object may be calculated for each selected position marker to verify the calculation and improve the precision of the position and rotational orientation determination.” Ex.1005, 5:8-12; Ex.1006, 3. A well-known method of using more than one position marker to calculate the position of an object was triangulation, as confirmed by deVos. Ex.1003, ¶205-206.

For example, deVos teaches that teaches that the position of an object in space can be calculated using a “triangulation calculation” using the known coordinates of at least three “retroreflective elements” with unique barcodes. Ex.1011, 2:22-25. The “triangulation calculation” is used to determine “the exact location” of an object. Ex.1011, Abstract, 4:35-38. Accordingly, a POSITA applying Emanuel’s teaching to use “more than one position marker” would have been motivated to combine Emanuel with deVos to “improve the precision of the position” determination. Ex.1005, 5:8-12; Ex.1006, 3; Ex.1003, ¶206.

A POSITA would have had a reasonable expectation of success applying

deVos's technique to Emanuel because Emanuel encourages the use of using multiple position markers to verify and improve precision when recognizing the location of the camera. Ex.1003, ¶207; Ex.1011, Abstract (The "triangulation calculation is based on the coordinates of at least three...elements spaced apart from each other"). Moreover, the combination would not change the intended functionality of Emanuel's machine-vision system, it would simply improve it by increasing precision when determining the location of the camera. Ex.1003, ¶207. Emanuel's system and method would still operate to accurately determine the position of the camera, but would do so with multiple position markers through triangulation, as taught by deVos. Ex.1003, ¶207.

Accordingly, a POSITA would have found it obvious to apply deVos' teachings to the system and methods taught by Emanuel because the combination merely amounts to applying a known technique to a system and methods ready for improvement. Ex.1003, ¶208.

3. Claim 6

[6.0] The method of claim 1, wherein, in e), the mobile terminal location is calculated through a triangulation measuring algorithm by using the distance information, the location information, and the direction information corresponding to the three or more location recognition tags.

First, for a position marker in Emanuel's machine-vision system, the "distance information" is obtained as described in [1.2], the "location information"

is obtained as described in [1.3], and the “*direction information*” is obtained as described in [1.4]. Ex.1003, ¶209.

Second, in one embodiment within Emanuel’s machine-vision system, **“more than one position marker may be selected”** and “each selected position marker” may be used “to verify the calculation and improve precision of the position... determination” of the object. Ex.1005, 5:5-12; Ex.1006, 3.

In view of Emanuel’s teaching of using “more than one” position marker to calculate location, a POSITA would have found it obvious to utilize triangulation, which was a well-known way to calculate the position of an object using more than one element, as illustrated by deVos. Ex.1003, ¶211. In deVos, “the X-Y-Z coordinates of a point in space” can be determined using “triangulation.” Ex.1011, Abstract. This “triangulation calculation is based on the coordinates of at least three...elements spaced apart from each other.” Ex.1011, Abstract. Like Emanuel’s system, deVos’s system uses multiple elements for its triangulation calculation, where each element has “a unique bar code in order to differentiate one element from the others.” Ex.1011, 5:18-25.

Thus, Emanuel’s teaching of using multiple position markers to calculate the position of the object, in light of deVos’s teachings of triangulation, renders obvious this limitation. Ex.1003, ¶¶209-212.

4. Claim 12

[12.0]

Claim [12.0] is substantially similar to limitation [6.0], except with reference to photographing “*three or more location recognition tags from one position.*”

Emanuel teaches that “one or more position markers 2 are partially or fully visible within the camera’s field of at any given time.” Ex.1005, 11:22-25; Ex.1006, 9.

Further, Emanuel teaches that, within “an image that is captured,” there may be “multiple markers...present.” Ex.1005, 11:19-21, 11:39-40; Ex.1006, 9.

Thus, in view of the teachings cited above with reference to limitation [6.0], Emanuel’s disclosure of photographing multiple position markers and deVos’s teachings of triangulation using at least three objects to calculate position render obvious this limitation. Ex.1003, ¶¶213-214.

G. Ground 4: Claim 11 is obvious under 35 U.S.C. §103 over Emanuel, Ihara, and Sheynblat.

1. Sheynblat

Sheynblat discloses methods and apparatuses related to a “distributed processing system...for a location-based service.” Ex.1012, 4:3-5. Within Sheynblat’s system, a “client provides information about its location and/or a location of interest to a Web server.” Ex.1012, Abstract. Thereafter, “the Web server, based on the information, provides via the Internet information relating to

the client’s location.” Ex.1012, Abstract. This server is based at a “remote site” and “perform[s] further processing on such data to complete or refine a position calculation.” Ex.1012, 1:67-2:5. Sheynblat further describes a remote server which offloads processing that would be done by a client in order to determine the final position of the client. Ex.1012, 2:45-59 (“[A] system in which...data is sent from the trucks to the remote basestation which computes the final position”).

2. Reasons to combine Emanuel with Sheynblat

For the reasons set forth below, a POSITA would have been motivated to combine the teachings of Sheynblat with the teachings of Emanuel. *See* Ex.1003, ¶¶217-223. It would have been obvious, beneficial, and predictable to apply Sheynblat’s teachings of a remote server processing location information to Emanuel’s machine-vision system—for example, to further Emanuel’s goals of capturing and processing an image of a position marker (“*location recognition tag*”). Ex.1003, ¶217.

As an initial matter, a POSITA, when considering the teachings of Emanuel, would have also considered the teachings of Sheynblat. Ex.1003, ¶218. Sheynblat relates to location-based systems and information processing. Ex.1012, Abstract. As such, Sheynblat is analogous art to Emanuel and the ’001 patent. *See, e.g.,* Ex.1001, Abstract; Ex.1005, Abstract; Ex.1006, 1; Ex.1003, ¶218.

In particular, a POSITA considering Emanuel would understand that the

machine-vision system in Emanuel handles extensive computation and processing. *See* Ex.1005, 8:27-31 (Machine vision systems “[o]ffer sophisticated image processing capabilities such as presence or absence detection, dimensional measurement, and object shape identification”); Ex.1006, 8; Ex.1003, ¶¶219-221. At the time of the ’001 patent, a well-known way of offloading processing was through the use of a remote or external server, as taught by Sheynblat. Ex.1003, ¶221. Sheynblat teaches that **“systems may benefit by communicating with the resources of a remote site, or ‘server’... Such a server may...perform further processing on such data to complete or refine a position calculation, etc.”** Ex.1012, 1:66-2:6. A POSITA would have been motivated to use Sheynblat’s remote server technique to offload processing to a remote or external server. Ex.1003, ¶¶219-221. Doing so would reduce the computational burden on Emanuel’s local machine-vision hardware. Ex.1003, ¶221. A POSITA would have been motivated to use Sheynblat’s remote server technique to further “refine” data sent to it as well. Ex.1003, ¶221.

A POSITA would have had a reasonable expectation of success applying Sheynblat’s offloading technique to Emanuel. Ex.1003, ¶222. For example, Emanuel’s machine-vision system contemplates embodiments which “provide local image capture and transmission of the image information for remote processing.” Ex.1005, 5:33-35; Ex.1006, 4. Moreover, the combination would not

change the intended functionality of Emanuel’s machine-vision system, it would simply improve it. Ex.1003, ¶222. Emanuel’s system and method would still operate to capture an image of a position marker in order to determine the location of the camera or user, but would do so with improved efficiency and accuracy due to more availability of computational resources, as taught by Sheynblat, resulting in higher-quality image analysis and precision. Ex.1003, ¶222.

3. Claim 11

[11.0] The location recognition device of claim 8 or claim 10, wherein the location recognizing unit transmits the information obtained by the image analyzing unit to an external location managing server, receives location information calculated by the external location managing server, and recognizes a user location.

First, Emanuel teaches that “marker positions are stored in a look-up table...in [a] computer...and the table can be accessed to return the approximate camera position.” Ex.1005, 10:40-42; Ex.1006, 10, 13-14. As described in [7.0], through the “decoded ID,” Emanuel’s machine-vision system obtains “true marker position data...which is obtained from a lookup table in [a] second computer.” Ex.1005, 11:3-5; Ex.1006, 10, 13-14. This “computer 5” may “reside on-board.” Ex.1005, 9:56-57; Ex.1006, 4. However, in the alternative, such as “vehicles not equipped with on-board computers,” this “computer 5 [may be] stationed remotely.” Ex.1005, 9:59-61; Ex.1006, 4.

When Emanuel’s machine-vision system (“*the location recognition device*”)

uses the decoded ID to access the look-up table in a computer that is stationed remotely, the machine-vision system is “*transmitting information obtained by image analyzing unit*” to the remotely stationed computer. Ex.1003, ¶224.

Second, transmitting information to “*an external location managing server*” was a well-known technique in the art, as illustrated in Sheynblat. Ex.1003, ¶225. Sheynblat teaches that “systems may benefit by communicating with the resources of a remote, or ‘**server**’ utilizing a wireless communications system.” Ex.1012, 1:66-2:6. This “**server** may provide assistance data...and **perform further processing on such data to complete or fine a position calculation.**” Ex.1012, 1:66-2:6. Further in Sheynblat’s system, “in response to receiving information relating to the location of the client...the Web **server provides location-based information to the client.**” Ex.1012, 20:57-21:16. After receiving information back from the remote server, “the client may...use such information to determine navigational information (e.g., its position...etc.).” Ex.1012, 20:57-21:16. In this way, Sheynblat demonstrates the well-known technique of employing external or remote servers that process and return received location data. Ex.1003, ¶225.

The combination of Emanuel’s machine-vision system storing a look-up table stored in a remote computer and Sheynblat’s remote server processing data sent by a client and returning information used to locate the position of a client renders obvious this limitation. Ex.1003, ¶¶224-226.

H. Ground 5: Claims 8-10 are obvious under 35 U.S.C. §103 over Emanuel, Ihara, and Tanaka (to the extent claim 8 is interpreted as having means-plus-functions limitations).

1. Claim 8

[8.0] *A location recognition device for recognizing a location by using a built-in camera, the location recognition device comprising:*

See limitation [8.0] from Ground 1.

[8.1] *an image photographing unit for photographing a plurality of location recognition tags that are arranged in a predetermined physical area and respectively store location recognition information, and for performing a digital image process;*

In the event this *image photographing unit* limitation is construed as a means-plus-function limitation, Petitioner adopts the following:

Function: (1) “*photographing a plurality of location recognition tags that are arranged in a predetermined physical area and respectively store location recognition information*” and (2) “*performing a digital image process.*”

Corresponding structure for “*image photographing unit*”: built-in camera. Ex.1001, 2:35-39 (“An exemplary location recognition device according to an embodiment of the present invention recognizes a location by using a built-in camera. The exemplary location recognition device includes an image photographing unit...”), 5:35-40 (“The image photographing unit 110 performs a camera function (i.e., a photographing function). The image photographing unit 110 forms an image from lights that are reflected from a subject, converts the

image into an electrical signal, processes the signal, and generates digital image data.”)

For the first function and corresponding structure, as described in [1.0], [1.1], and [5.0] in Ground 1, Emanuel teaches a “machine vision camera” that “captures...digital images of the positions markers” which are “arranged in a predetermined positional pattern within the coordinate space.” Ex.1005, 11:19-21, 4:56-59; Ex.1006, 9, 12. Further, as described in [1.0], it would have been obvious to implement Emanuel’s system as terminal with built-in camera as taught by Ihara. Ex.1003, ¶231. In addition, as described in [1.1], the position markers in Emanuel (“*location recognition tags*”) store “*location information*” in barcode format. Ex.1003, ¶231.

Accordingly, Emanuel’s machine-vision system implemented using Ihara’s built-in camera, renders obvious “a built-in camera” for “*photographing a plurality of location recognition tags that are arranged in a predetermined physical area and respectively store location recognition information.*” Ex.1003, ¶232.

For the second function, as discussed in [8.1] of Ground 1, Emanuel’s machine-vision system includes a “machine vision camera” that “captures...**digital** images” of “position markers 2.” Ex.1005, 11:19-21; Ex.1006, 9. In particular, Emanuel describes that “**an image is captured** 110 by the machine vision camera and **stored into its memory**” (*performing a digital image process*), Ex.1005,

10:31-32; Ex.1006, 9-10, which is much like the example of the image photographing unit in the '001 patent that “forms an image...and generates digital image data of the subject.” Ex.1001, 5:35-40. Accordingly, Emanuel and Ihara render obvious a built-in camera “*for performing a digital image process.*” Ex.1003, ¶¶228-234.

[8.2] a distance measuring unit for measuring a distance to the location recognition tag;

In the event this limitation is construed as a means-plus-function limitation, Petitioner adopts the following:

Function: “*measuring a distance to the location recognition tag*”

Corresponding structure for “a distance measuring unit”: a camera with a which “uses a conventional distance measuring method” which “uses a frequency reflected after transmitting radio frequencies including high frequency signals or infrared rays to a subject, and it includes a triangulation measuring method, a method for measuring a total amount of incident lights, and a method for measuring an incident time of radiated light.” Ex.1001, 4:17-21. This is “essentially used in a camera performing an active focusing operation.” Ex.1001, 4:25-29.

As discussed in [1.2] of Ground 1, Emanuel teaches that the distance between the position marker (“*location recognition tag*”) is calculated based on the

ratio between known length of line segment AB in the image and focal length of the camera. Ex.1005, 12:64-67; Ex.1006, 10. As described in [3.0] and [4.0], it was well-known in the art that there were a variety of additional ways to perform this distance measurement, such as through auto focusing operation by a camera, as provided in Tanaka. Ex.1008, [0278] (“[V]arious kinds of active [AF] systems...measure a distance to the photographic subject by emitting infrared rays or an ultrasonic wave.”)

Tanaka’s teaching of autofocus systems which measure distance by “emitting infrared rays” is much like the example of an autofocus system in the ’001 patent that “*measur[es] an incident time of radiated light.*” Ex.1003, ¶239. As discussed in [4.0] it was obvious that when Tanaka’s camera measures distance by emitting infrared light, a sensor would be used to receive “the reflected beam or wave for measuring the distance from the camera to the object by measuring elapsed time from transmission to receipt.” Ex.1003, ¶239 (quoting Ex.1018, 1:29-35). A POSITA would understand this elapsed time renders obvious “*an incident time of radiated light*” because it is the time it takes for the infrared ray emitted from the camera (radiated light) to be received back at the camera (an incident time). Ex.1003, ¶239. Further, a POSITA would have been motivated to combine Tanaka with Emanuel for the reasons discussed in Section IX-E-2. Ex.1003, ¶240.

Accordingly, the camera in Emanuel’s machine-vision system, implemented

with auto focusing in view of Tanaka, renders obvious “*a distance measuring unit for measuring a distance to the location recognition tag.*” Ex.1003, ¶¶235-241.

[8.3] *an image analyzing unit for analyzing an image of the location recognition tag processed by the image photographing unit, and obtaining corresponding location information and direction information of the location recognition tag; and*

In the event this limitation is construed as a means-plus-function limitation, Petitioner adopts the following:

Functions: Function (1) “*analyzing an image of the location recognition tag processed by the image photographing unit and obtaining corresponding location information...of the location recognition tag,*” and Function (2) “*analyzing an image of the location recognition tag processed by the image photographing unit, and obtaining corresponding...direction information of the location recognition tag.*”

Corresponding structure for “an image analyzing unit”: Computer-implemented algorithm. Ex.1003, ¶244.

Computer corresponding to Function 1: A general purpose computer such as “mobile terminals having operating functions (e.g., a personal communication system (PCS), a personal digital assistance (PDA), and a cellular phone) or a notebook computer.” Ex.1001, 3:58-65.

Algorithm corresponding to Function 1: The algorithm corresponding to this

element includes several steps. First, the image analyzing unit “read[s] the two-dimensional barcode of the location recognition tag 30 photographed by the image photographing unit 110.” Ex.1001, 7:31-33. Although the specific barcode-reading algorithm is not disclosed, Petitioner reads this as requiring the use of a standard barcode-reading algorithm that existed at the time of the claimed invention or its equivalents.

Second, the image analyzing unit “provides the interpreted location information to the tag location information storage unit 130.” Ex.1001, 7:33-34. As shown in Figure 4, the tag location information storage unit is part of mobile terminal 100 and is not part of location information management server 200. *See also* Ex.1001, 7:44-50 (describing the difference between obtaining location information from the tag location information storage unit 130 (which the image analyzing unit does) vs. obtaining location information from the location information management server 200, which is done by the location recognizing unit and not by the image analyzing unit). Ex.1003, ¶247.

Third, the image analyzing unit “receives the location coordinate of the location of the two-dimensional barcode, and provides it to the location recognizing unit 150.” Ex.1001, 8:26-27. Alternatively, if the location recognition tag “includes the absolute location coordinate,” Ex.1001, 7:39, then the second and third steps are not performed. Ex.1001, 8:29-31.

Computer corresponding to Function 2: The same analysis as the first function is applied here.

Algorithm corresponding to Function 2: The image analyzing unit “recognizes the offset information by analyzing the image of a predetermined location recognition tag 30, and generates direction angle information on the predetermined location recognition tag.” Ex.1001, 5:46-51; 7:4-9.

Computer corresponding to Function 1 in the prior art: Emanuel discloses a “machine vision system computation device 5 for analysis.” Ex.1005, 10:1-6; Ex.1006, 8.

Algorithm corresponding to Function 1 in the prior art: In Emanuel, image analysis is performed on the image of a position marker (“*location recognition tag*”) as discussed in [1.3].

First, Emanuel’s machine-vision system “**Decoder 27 ‘reads’ the 45 encoded unique identification code of the position marker.**” Ex.1005, 11:44-47; Ex.1006, 9. As discussed in [1.1] and [5.1], the position markers may include “one-dimensional or two-dimensional barcodes” that “encode[] the marker location.” Ex.1005, 6:55-57, 10:46-55; Ex.1006, 6.

Second, as discussed in [10.0] Emanuel discloses providing the decoded location information to the “Position Marker Look-Up Table” (“*tag location information storage unit*”). For example, a “[d]ecoded marker ID...is used...to

search [the] look-up table.” Ex.1005, 12:58-59; Ex.1006, 10, 13-14. The Position Marker Look-Up Table contains “**actual X, Y, and Z coordinates...that have been measured and recorded for all position markers.**” Ex.1005, 12:36-40; Ex.1006, 10, 13-14.

Third, Emanuel teaches that after providing the decoded location information to the lookup table, “the table can be accessed to **return the approximate camera position** 400. In other words, by knowing that the camera is viewing **a particular marker** we can place the camera within the approximate region **of that marker.**” Ex.1005, 10:41-45, Ex.1006, 10, 13-14. As discussed in Ground 1 of [8.4], and as further discussed below, the location coordinates of marker are then used by Emanuel’s machine vision system to calculate the position of the camera. Ex.1005, 12:11-14, 12:18-33, 12:66-67; Ex.1006, 10, 13-14; Ex.1003, ¶254.

Accordingly, Emanuel’s disclosure of decoding position information on a marker and obtaining the X, Y, and Z coordinates of that marker from a look-up table, renders obvious “*an image analyzing unit for analyzing an image of the location recognition tag processed by the image photographing unit...and obtaining corresponding location information.*” Ex.1003, ¶255.

Computer corresponding to Function 2 in the prior art: The same analysis from the first function applies here.

Algorithm corresponding to Function 2 in the prior art: Emanuel discloses (1) recognizing the offset information by analyzing the image of a predetermined location recognition tag and (2) generating direction angle information by using the offset information. Ex.1003, ¶257.

First, as discussed in [2.0] of Ground 1, the *offset information* includes “Angle XOC” and is calculated by analyzing the image of the position marker to determine its radial angle relative to the center of the field of view of the camera. Ex.1003, ¶258. Further, as discussed in [1.5] of Ground 1, Emanuel also teaches that “angle XOC” along with “the length of line segment OC, which is the radial distance from the center of the image (center of the camera), Point O, to the center of the position marker, Point E [sic, Point C]... ” is used to calculate the position of the camera as illustrated in Figure 6 (Ex.1003, ¶258):

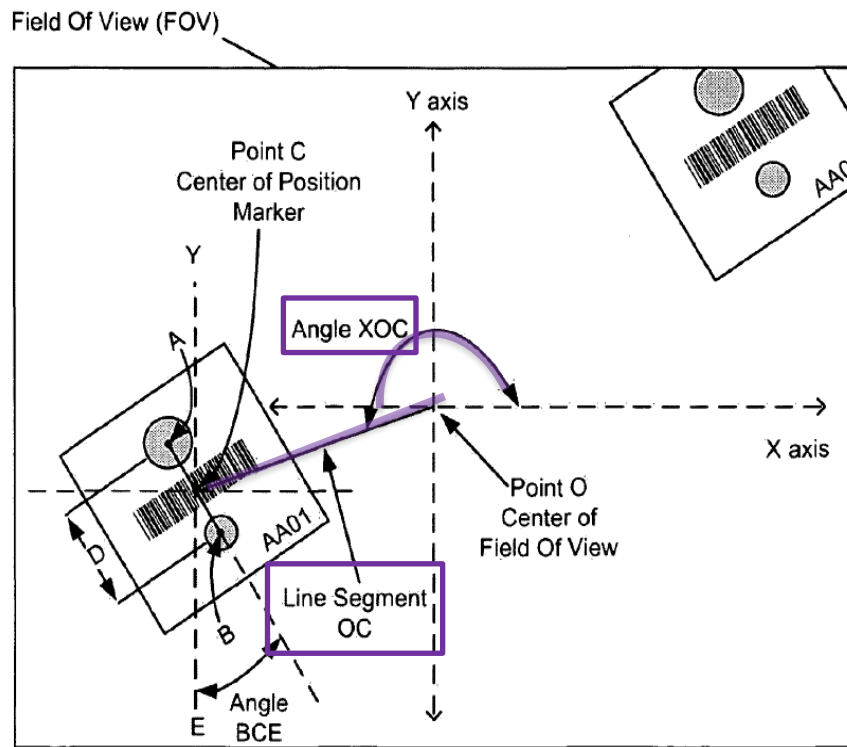
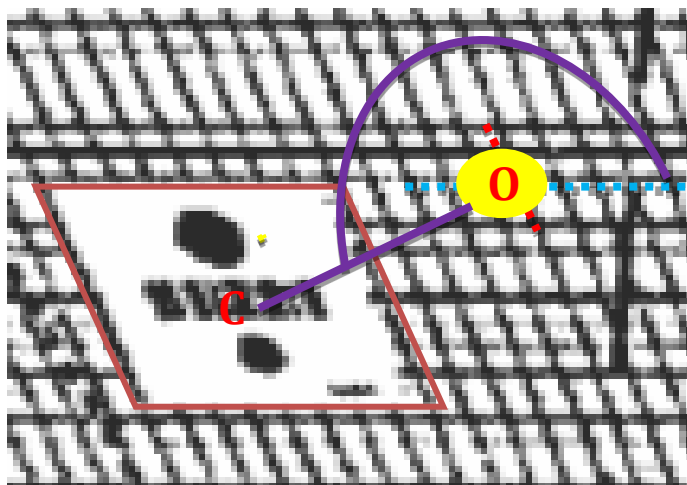


Figure 6

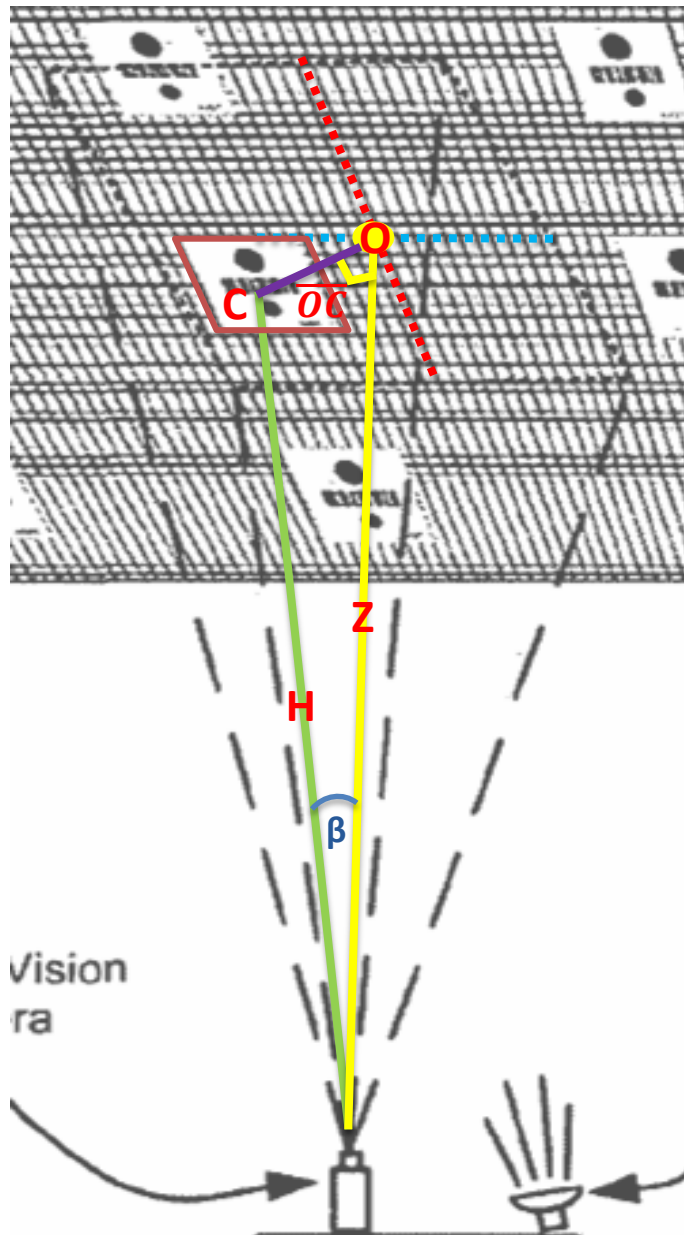
Ex.1005, Fig. 6 (annotated); Ex.1006, Fig. 11; Ex.1003, ¶¶258-259

“Once these two values [i.e. angle XOC and the length of line segment OC] have been established, it is possible to calculate a more accurate X, Y camera position using plane geometry.” Ex.1005, 12:24-31; Ex.1006, 10; Ex.1003, ¶259. To calculate the Z camera position, it would have been obvious to a POSITA to use angle XOC and the length of line segment OC, to calculate this value for the position marker. Ex.1003, ¶¶260-264. In particular, angle XOC and the length of line segment OC define one side of a right-triangle formed by Center of Position Marker (Point C), Center of Field of View (Point O), and the camera, as shown

below:



Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶260-261

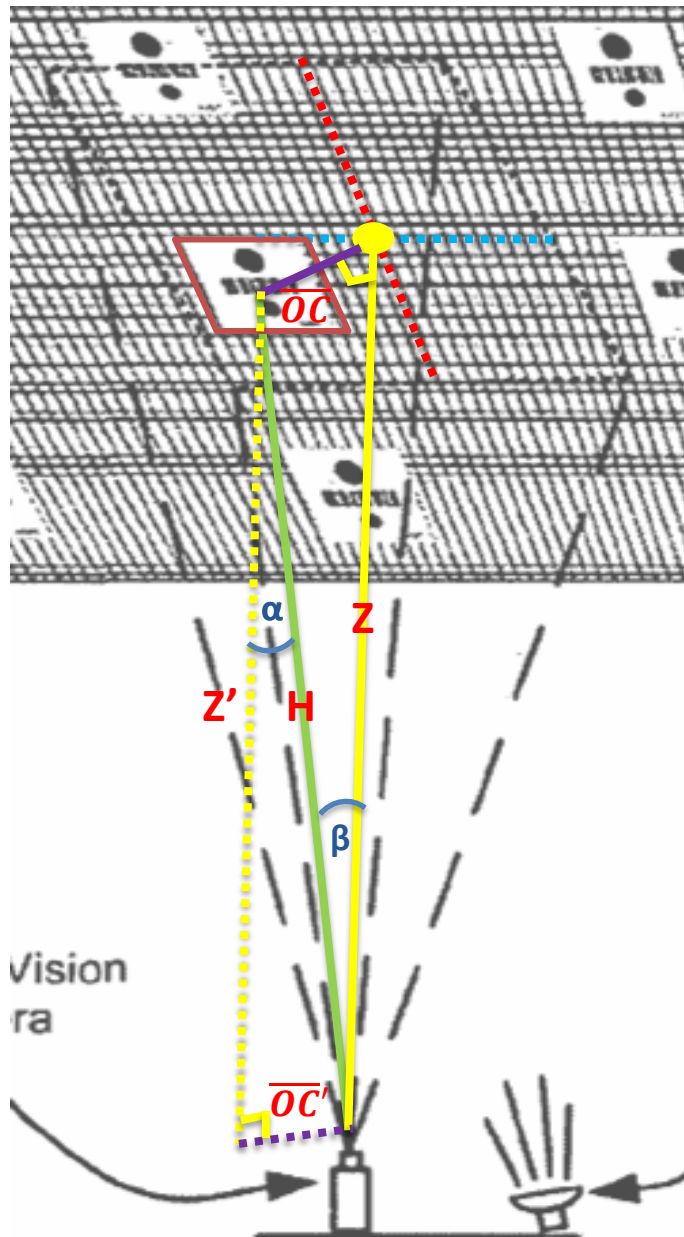


Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶260-261

Because the distance between the camera and the location tag is known as discussed in [8.2] (line H), and because the length and orientation of line segment OC is known as discussed in [8.3], it would have been obvious to a POSITA to use

basic math to calculate the length of line segment Z to calculate the Z coordinate of the camera. Ex.1003, ¶260-264. In particular, the angle beta (β) would be calculated using the well-known relationship, $\sin \beta = \overline{OC} / H$. Ex.1003, ¶¶260-264. The angle beta would then be used to calculate the length of the Z coordinate (line Z), as discussed in [8.4] below. Ex.1003, ¶¶260-264.

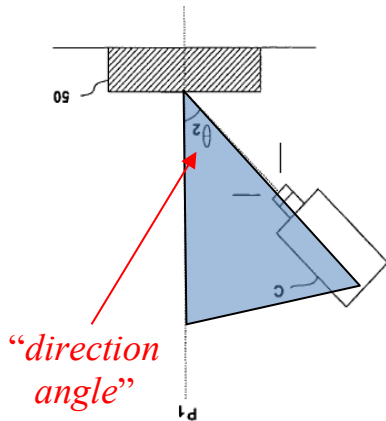
Second, it would have also been obvious to a POSITA that calculating the value of angle beta by using angle XOC and the length of line segment that define one side of the right-triangle $Z\overline{O}CH$, renders obvious “generating direction angle information by using the offset information.” Ex.1003, ¶¶260-277. In particular, angle beta is equivalent to angle alpha annotated in the congruent triangle formed by the line segments Z’ (dotted yellow), OC’ (dotted purple), and H below (solid green):



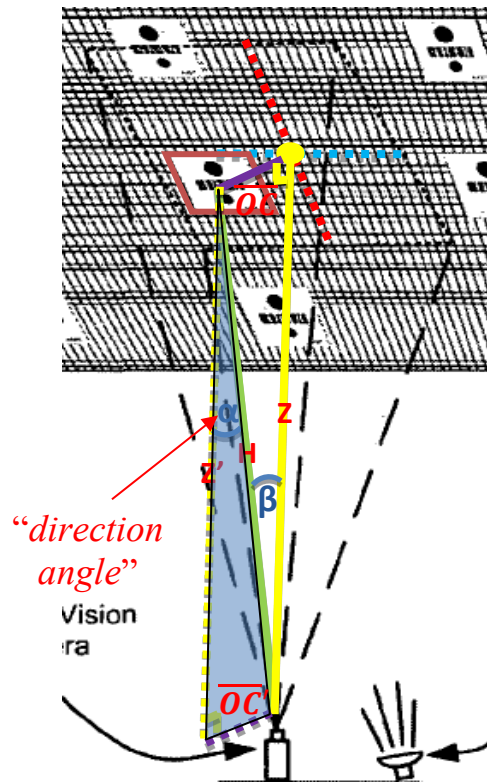
Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶270-271

Further, angle alpha is much like the example of a “*direction angle*” in the ’001 patent where the user location is calculated “by applying the distance information following the direction angle,” as illustrated in Figure 6B of the ’001

patent as angle θ_2 (Ex.1003, ¶¶260-276):



Ex.1001, Fig. 6B (annotated,
rotated); Ex.1003, ¶¶276-277



Ex.1005, Fig. 1
(annotated);
Ex.1006, Fig. 1;
Ex.1003, ¶¶276-277

Just like the distance between the camera C and location recognition tag 50 is “appl[ied]...following the direction angle” θ_2 “to the coordinate information of the first location recognition tag” in the '001 patent, Ex.1001, 6:11-15, the distance Z between the camera the position would be applied following direction angle alpha (which is equivalent to angle beta) to calculate the location of the camera. Ex.1003, ¶¶258-277.

Thus, Emanuel’s disclosure of calculating the value of angle beta, by using angle XOC and the length of line segment that define one side of the right-triangle $\overline{ZOCH}$, renders obvious this limitation. Ex.1003, ¶¶242-278.

[8.4] *a location recognizing unit for recognizing a user location by using distance information measured by the distance measuring unit, and the location information and the direction information obtained by the image analyzing unit.*

In the event this limitation is construed as a means-plus-function limitation, Petitioner adopts the following:

Function: “*recognizing a user location by using distance information measured by the distance measuring unit, and the location information and the direction information obtained by the image analyzing unit*”

Corresponding structure for “a location recognizing unit”: Computer-implemented algorithm.

Computer corresponding to the function: The computer element in the ’001 patent for the “location recognizing unit” is the same as the computer element in [8.3]. Ex.1003, ¶282.

Algorithm corresponding to the function: The “*location recognizing unit*” (1) “receives the absolute location coordinate, the photographing angle, and the information on the distance to the location recognition tag 30” Ex.1001, 7:54-56 and (2) “calculates the current user location by applying the distance information following the direction angle to the coordinate information of the first location

recognition tag 30.” Ex.1001, 6:12-15.

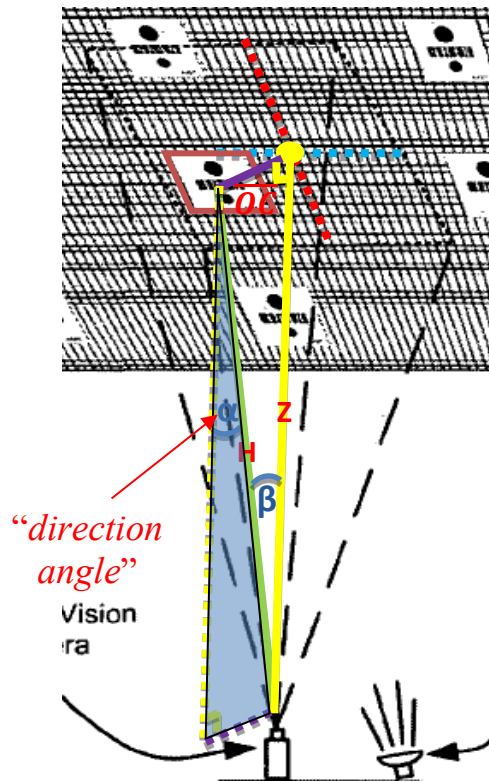
Computer corresponding to the function in the prior art: Emanuel teaches the computer element through Emanuel’s “machine vision system computational device 5.” Ex.1005, 10:1-6.

Algorithm corresponding to the function in the prior art: Emanuel discloses receiving a location coordinate, photographing angle, and information on the distance to the position marker (“*location recognition tag*”). Ex.1003, ¶285.

For the first step of the function, as discussed in [1.3] Emanuel discloses obtaining X, Y, and Z coordinates of the position markers by decoding “the position markers encoded information.” Ex.1005, 10:20-24; Ex.1006, 8. As discussed in [7.0], the encoded information may be absolute location coordinate or logic location coordinate information. Ex.1005, 10:48-49, 53-55; Ex.1006, 3-4, 6-8, 12-13. As discussed in [2.1] Emmanuel discloses obtaining a photographing angle, which is the angle XOC. Ex.1003, ¶286. As discussed in [1.2], Emanuel describes determining “the distance from the camera 4 to the position marker.” Ex.1005, 12:64-65; Ex.1006, 10.

For the second step of the function, Emanuel discloses applying the distance information following the direction angle to the coordinate information of the location recognition tag. As discussed in [8.2], the distance between the camera and the location tag is represented by line H, and as discussed in [8.3] the direction

angle to the location recognition tag is angle alpha (which is equivalent to angle beta):



Ex.1005, Fig. 1 (annotated); Ex.1006, Fig. 1; Ex.1003, ¶¶289-290

Because both the distance between the camera and the location tag is known as discussed in [8.2] (line H), and because the length and orientation of line segment OC is known as discussed in [8.3], it would have been obvious to a POSITA to use basic math to calculate the length of line segment Z. Ex.1003, ¶¶288-294. In particular, the length of line Z would be calculated using the well-known relationship, $\cos \beta = Z / H$. Ex.1003, ¶¶288-292. Further, because angle beta is equivalent to angle alpha, then length of line Z would also be calculated as

$\cos \alpha = Z / H$. Ex.1003, ¶¶288-292. Therefore, a POSITA would have found that calculating the length of line Z using the mathematical relationship between angle beta (which is equivalent to angle alpha) (“the direction angle”) and line H (“*the distance information*”), renders obvious “applying the distance information following the direction angle to the coordinate information of the location recognition tag.” Ex.1003, ¶291.

Finally, as discussed in [1.5], Emanuel teaches that with the Z coordinate of the position marker already known, “the Z coordinate of the object may be readily calculated,” along with the X and Y coordinates of the object (“calculate user location”). Ex.1005, 12:66-67; Ex,1006, 10; Ex.1003, ¶292.

Accordingly, Emanuel’s disclosure of a machine vision system that obtains the X, Y, and Z coordinates of the positions markers, obtains a photographing angle, determines a distance from the camera to the position marker, applies the distance information following the direction angle to the coordinate information of the location recognition tag, and calculates the location of the camera, renders obvious this limitation. Ex.1003, ¶¶279-292.

2. Claim 9

See [9.0] from Ground 1.

3. Claim 10

See [10.0] from Ground 1.

I. Ground 6: Claim 11 is obvious under 35 U.S.C. §103 over Emanuel, Ihara, and Sheynblat (to the extent claim 8 is interpreted as having means-plus-functions limitations).

4. Claim 11

See [11.0] in Ground 4.

J. Ground 7: Claim 12 is obvious under 35 U.S.C. §103 over Emanuel, Ihara, and deVos (to the extent claim 8 is interpreted as having means-plus-functions limitations).

5. Claim 12

See [12.0] in Ground 3.

X. DISCRETIONARY DENIAL WOULD BE INAPPROPRIATE

A. No basis for *Fintiv* denial

The *Fintiv* factors favor institution. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 (Mar. 20, 2020) (precedential).

Factor 1: No motion to stay has been filed, and thus this factor is neutral.

Factor 2: The Board will likely issue a Final Written Decision in July/August of 2026, and the district court trial date is currently set for March 16, 2026. Ex.1022. The estimated trial date based on time-to-trial statistics is June 2026. Ex.1024, 5 (23 months). This factor is neutral because the trial date is speculative and subject to change. *See* Ex.1023 (Interim Procedure for Discretionary Denials) (“scheduled trial dates are unreliable and often change”). For example, Judge Gilstrap has *eleven* trials set for March 16, 2026. Ex.1021.

Further, a Motion to Dismiss for Lack of Venue is currently pending before the Court.

Factor 3: The co-pending litigation is in its early stages, and the investment in it has been minimal. The claim construction hearing is not until September 16, 2025, fact discovery is not set to close until October 17, 2025, and expert discovery is not set to close until December 4, 2025. Ex.1022, 1-2. Moreover, Petitioner only learned which claims were being asserted on November 14, 2024, and has worked expeditiously to file this petition within three months. Ex.1019 (infringement contentions cover pleading). This factor favors institution.

Factor 4: Final invalidity theories will not be submitted until March 11, 2026, so the extent of overlap is currently speculative. If Patent Owner raises a *Fintiv* challenge in its preliminary response, Petitioner will evaluate whether a stipulation is appropriate based on the state of the district court proceeding at that time. This factor is neutral.

Factor 5: Petitioner is a defendant in the co-pending litigation, and thus this factor is neutral.

Factor 6: This Petition presents compelling evidence of unpatentability, and thus denial is inappropriate. Ex.1023, 3-5. The Petition—supported by Dr. Papanikolopoulos’s expert testimony—plainly shows that the ’001 patent claims no more than what was already known or obvious.

In sum, every *Fintiv* factor is either neutral or weighs against denial.

B. No basis for §325(d) denial

Denial under §325(d) is not warranted because the challenges presented in this petition are neither cumulative nor redundant to the prosecution of the '001 patent. The Examiner did not consider any of the references applied in the above grounds.

XI. CONCLUSION

The Challenged Claims are unpatentable.

Respectfully submitted,

Dated: February 27, 2025
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XII. MANDATORY NOTICES

A. Real Party-in-Interest

Pursuant to 37 C.F.R. § 42.8(b)(1), Petitioner certifies that the real parties-in-interest are Amazon.com, Inc., Amazon.com Services LLC, and Amazon Web Services, Inc.

B. Related Matters

Pursuant to 37 C.F.R. § 42.8(b)(2), to the best knowledge of the Petitioner, the '001 patent is or was involved in the following case:

Case Heading	Number	Venue	Filed
<i>KAIFI LLC v. Amazon.com, Inc. et al</i>	2:24-cv-00542	EDTX	Jul. 17, 2024

C. Lead and Back-up Counsel and Service Information

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Please address all correspondence in this proceeding to lead and back-up counsel. Petitioner consents to service in this proceeding by email at the addresses above.

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24(d), Petitioner hereby certifies, in accordance with and reliance on the word count provided by the word-processing system used to prepare this Petition, that the number of words in this paper is 13,813. Pursuant to 37 C.F.R. § 42.24(d), this word count excludes the table of contents, table of authorities, mandatory notices under § 42.8, certificate of service, certificate of word count, appendix of exhibits, and any claim listing.

Dated: February 27, 2025

/Scott T. Jarratt/
Scott T. Jarratt
Lead Counsel for Petitioner
Registration No. 70,297

CERTIFICATE OF SERVICE

The undersigned certifies that, in accordance with 37 C.F.R. § 42.6(e) and 37 C.F.R. § 42.105, service was made on Patent Owner as detailed below.

Date of service February 27, 2025

Manner of service FEDERAL EXPRESS

Documents served Petition for *Inter Partes* Review Under 35 U.S.C. § 312 and 37 C.F.R. § 42.104 of U.S. 7,689,001; Petitioner's Power of Attorney; Petitioner's Exhibit List; Exhibits Ex.1001 – Ex.1030

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