

ELIGIBILITY CONTENTIONS APPENDIX D

U.S. Patent No. 7,689,001

The following charts contain the Amazon defendants' Subject-Matter Ineligibility Contentions demonstrating that claims 1-12 of U.S. Patent No. 7,689,001 (the "'001 patent") are patent-ineligible under 35 U.S.C. § 101 pursuant to the Court's Standing Order Regarding Subject Matter Eligibility Contentions. Because the Court has yet to issue a claim construction in this case and—to the extent that KAIFI contends that there are factual disputes that relate to eligibility of the asserted claims of the '001 patent—fact and expert discovery is ongoing, these contentions are preliminary only and Amazon reserves the right to supplement or modify these contentions in accordance with the Court's Local Rules and the Docket Control Order in this case. Additionally, and in further consideration of the preliminary stage of the case, the Amazon defendants note that the pinpoint citations referenced in these charts are not exhaustive, and the Amazon defendants reserve the right to rely on additional legal case authority. Further, the citations to intrinsic and extrinsic evidence are exemplary only, and the Amazon defendants reserve the right to rely on other portions of intrinsic and extrinsic evidence not expressly cited herein, including but not limited to evidence from the prior art and evidence from the specification, claims and prosecution history of the asserted patents.

Further, these charts incorporate KAIFI's apparent interpretation of the elements within the asserted claims, as reflected in KAIFI's infringement contentions to date. The Amazon defendants do not concede that such interpretation is correct, and reserves their rights to supplement these contentions accordingly.

The Amazon defendants expressly incorporate by reference their Invalidity Contentions, including both (1) the charts, which provide further evidence that the claims and claim elements were well known, conventional, and routine; and (2) the cover document, which provides additional information regarding the state of the art and which identifies publication information for the documents discussed herein.

Amazon reserves its right to supplement these contentions based on further discovery, including any supplemental infringement contentions or any interrogatory response provided by KAIFI purporting to rebut these ineligibility contentions. Amazon further reserves its right to supplement or amend these contentions based on any claim constructions provided by the Court.

Pursuant to the Court’s Standing Order Regarding Subject Matter Eligibility Contentions, Amazon provides the following chart identifying each exception to eligibility (e.g., abstract idea, law of nature, and natural phenomenon) to which each Challenged Claim is directed and the factual and legal basis therefor. Amazon contends that Claim 1 of the ’001 Patent is representative of Challenged Claim 2, 5, 7, 8, 10, and 11 of the ’001 Patent, but Amazon separately sets forth herein the exception to eligibility for each of claims 1-3, 5, 7-8, 10-11.

Patent Claim	Exception to Eligibility, and Basis Therefor
1. A method for recognizing a location by a mobile terminal having a built-in camera, the method comprising: a) photographing a location recognition tag storing location recognition information; b) measuring a distance to the location recognition tag; c) analyzing an image of the photographed location recognition tag, and obtaining location information corresponding to the location recognition tag; d) obtaining direction information of the photographed location recognition tag; and 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).	All of the Challenged Claims are directed to the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. They cover the system equivalent of how a person locates themselves using eyesight and signs, how seafarers could locate their position in the ocean using star patterns and a compass, map, and sextant, or how people estimated position based on landmarks of a known distance and size. It recites “broad and familiar concept[s] [in the realm of organizing human activity] that [are] untethered to any specific or concrete way of implementing it.” <i>Affinity Labs of Texas, LLC v. DIRECTV, LLC</i>, 838 F.3d 1253, 1258 (Fed. Cir. 2016). This is explained by Foxlin 03: The concept of a “self-tracker” has a long and distinguished history, introduced to the CG world by Gary Bishop’s 1984 dissertation [3], but practiced even earlier by ancient mariners who navigated the seas using a sextant to measure the bearing angles to celestial landmarks. Most Foxlin 03 at 1. 35 U.S.C. § 101 lists four broad categories of patent-eligible subject matter, but is subject to “an important implicit exception” that “[l]aws of nature, natural phenomena, and abstract ideas,” which form the “basic tools of scientific and technological work,” are not eligible for patent protection. <i>Alice Corp. Pty. Ltd. v. CLS Bank Int’l</i>, 573 U.S. 208, 216 (2014) (internal quotation marks omitted). “The ‘abstract ideas’ category embodies ‘the longstanding rule that

	an idea of itself is not patentable.” <i>Id.</i> at 209 (quoting <i>Gottschalk v. Benson</i>, 409 U.S. 63, 67 (1972) (quoting <i>Rubber-Tip Pencil Co. v. Howard</i>, 87 U.S. 498 (1874))). <i>Alice</i> set forth a two-step inquiry. “First, we determine whether the claims at issue are directed to one of those patent-ineligible concepts.” <i>Id.</i> at 217. In making this inquiry, the claims “must be considered as a whole.” <i>Alice</i>, 573 U.S. at 218 n.3 (quoting <i>Diamond v. Diehr</i>, 450 U.S. 175, 188 (1981)). If the claims recite an abstract idea, the second step requires a “search for an ‘inventive concept’— an element or combination of elements that is ‘sufficient to ensure that the patent in practice amounts to significantly more than a patent upon the [ineligible concept] itself.’” <i>Id.</i> at 218 (quoting <i>Mayo Collaborative Servs. v. Prometheus Labs., Inc.</i>, 566 U.S. 66, 73 (2016)). “A claim that recites an abstract idea must include ‘additional features’ to ensure ‘that the claim is more than a drafting effort designed to monopolize the abstract idea.’” <i>Id.</i> at 221 (quoting <i>Mayo</i>, 566 U.S. at 78) (alterations omitted). The recited “additional features must be more than well-understood, routine, conventional activity.” <i>Ultramercial, Inc. v. Hulu, LLC</i>, 772 F.3d 1335, 1339 (Fed. Cir. 2013) (internal quotations omitted). Using images, distance estimates, and known landmarks to estimate position an abstract idea that is used to guide and organize human behavior as they travel from one location to another. <i>See, e.g., IpLearn, LLC v. K12 Inc.</i>, 76 F. Supp. 3d 525, 533 (D. Del. 2014) (finding abstract claims “addressed to fundamental human behavior related to instruction” performed by computer structures); <i>FullView, Inc. v. Polycom, Inc.</i>, 485 F. Supp. 3d 1156, 1167 (N.D. Cal. 2020) (agreeing with the district court that “once the abstract idea is removed from the claim, all that is left here is the ‘conventional technology’ of a digital camera, such as image sensors, lenses, circuitry, memory and a processor being used in conventional ways.”). To the extent this abstract idea is considered to be two ideas—(1) creating an image, and (2) analyzing the image to determine location—the combination of these abstract ideas does not render Claim 1 any less abstract, <i>see Sensormatic Elecs., LLC v. Wyze Labs, Inc.</i>, 484 F. Supp. 3d 161, 165 (D. Del. 2020), <i>aff’d</i>, No. 2020-2320, 2021 WL 2944838 (Fed. Cir. July 14, 2021) (“Courts often invalidate patents that are directed to a combination of abstract ideas.”) (citing cases); <i>Broadband iTV, Inc. v. Amazon.com, Inc.</i>, No. 6:20-CV-00921-ADA, 2022 WL 4703425, at *14 (“Combing two abstract ideas . . . is not inventive.”);
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RecogniCorp. LLC v. Nintendo Co., 855 F.3d 1322, 1327 (Fed. Cir. 2017) (“Adding one abstract idea . . . to another abstract idea . . . does not render the claim non-abstract.”); *Consumer 2.0, Inc. v. Tenant Turner, Inc.*, 343 F. Supp. 3d 581, 590-91 (E.D. Va. 2018), *aff’d* 796 F. App’x 752 (Fed. Cir. 2020) (“[T]he mere combination of these abstract processes is insufficient to bring the patent-at-issue out of the realm of the abstract.”) (citing cases).

Claim 1 of the ’001 Patent does not contain an inventive concept such that it does more than claim the combination of these ineligible ideas. Instead, it recites only broad mental steps and mathematical algorithms, “a location recognition tag storing location recognition information” (i.e., a sign); “analyzing an image of the photographs location recognition tag” (i.e., reading the sign); “obtaining direction information (i.e., determining what direction the sign is relative to the person reading it); and “calculating a mobile terminal location by using the distance information . . . the location information . . . and the direction information” (which is nothing more than the mental process people use every day to get from point A to point B). *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1354 (Fed. Cir. 2016) (“we have treated analyzing information by steps people go through in their minds, or by mathematical algorithms, without more, as essentially mental processes within the abstract-idea category. . . . And we have recognized that merely presenting the results of abstract processes of collecting and analyzing information, without more (such as identifying a particular tool for presentation), is abstract as an ancillary part of such collection and analysis.” (citations omitted))

Just as in *Electric Power*, the claims of the ’001 patent “are clearly focused on the combination of those abstract-idea processes. The advance they purport to make is a process of gathering and analyzing information of a specified content, then displaying the results, and not any particular assertedly inventive technology for performing those functions. They are therefore directed to an abstract idea.” *Id.*

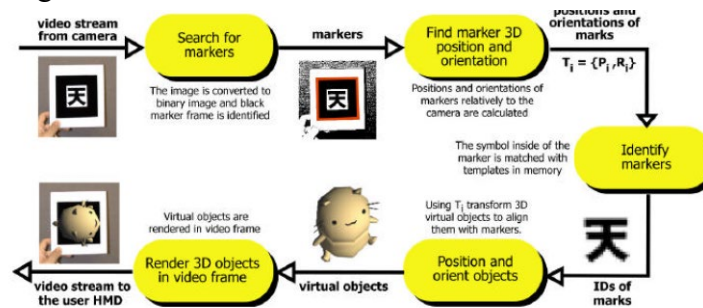
Claim 1 does not contain an inventive concept such that it does more than the ineligible idea(s). Instead, Claim 1 of the ’001 Patent seeks to apply the abstract ideas using generic electronic devices, structures, or concepts such as “photographing,” “analyzing,” “obtaining,” or “calculating,” presumably (but not necessarily) on a computer. But “[i]nstructing one to ‘apply’ an abstract idea and reciting no more than generic computer elements performing

	generic computer tasks does not make an abstract idea patent-eligible.” <i>Intellectual Ventures I LLC v. Capital One Bank (USA)</i>, 792 F.3d 1363, 1368 (Fed. Cir. 2015) (citing <i>Alice</i>, 134 S. Ct. at 2359-60). The only technological device mentioned in claim 1 is a “built-in-camera” having an autofocus feature (claim 3). The ’001 Patent specification makes clear that this element is a generic, off-the-rack structure well-known in the art: The above distance measuring method is used in mobile terminals having a camera function (e.g., a camera, a PDA, a PCS, a cellular phone, and a notebook computer), and is essentially used in a camera performing an active focusing operation. ’001 Patent at 4:25-29. The camera of Claim 1 simply takes a picture of a “location recognition tag.” Although the ’001 patent does not acknowledge it, location recognition tags were very well known in the art at the time of the alleged invention. Among others, the SignPost, ARToolKit, Maeda, ARQuake, and Lin prior art describe photographing such location recognition tags:
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Figure 1. The self-contained handheld AR system can track optical markers in real time.

Wagner at 1.



ARToolKit at 8.

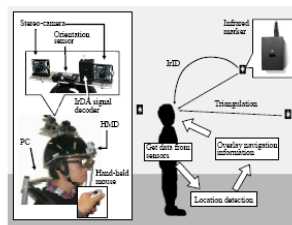


Figure 1. Overview of proposed tracking system

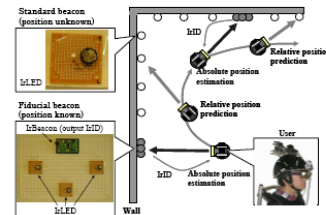


Figure 2. Absolute position estimation and relative position prediction

Maeda at 3.



Figure 3: Fiducial marker on a building

Thomas (2000) at 8.

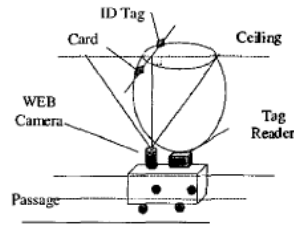


Fig. 2. Diagram of localization system.

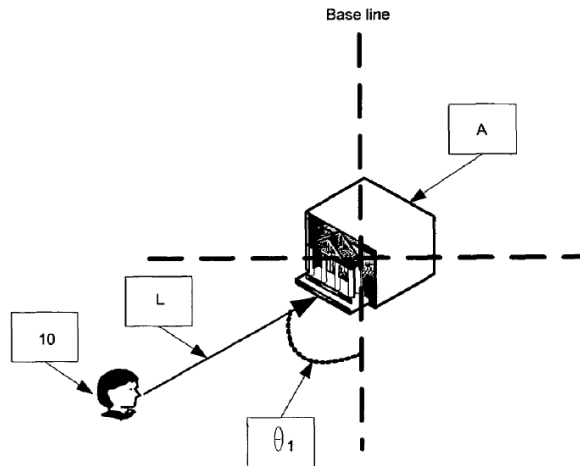
Lin at 2.

The ability to determine distance, orientation, and user location from the such location markers was also well known to be an abstract concept, as even the '001 patent acknowledges:

FIG. 1 shows a diagram describing a method of recognizing a location by a person using eyesight.

As shown in FIG. 1, when a person (10) recognizes a location reference object A using eyesight, he approximately determines his current location based on spatial location information stored in his brain through his experiences and on study of the location reference object A.

In addition, he estimates a distance L to the location reference object A according to his sense of perspective, and determines the angle θ_1 of his observing position relative to a baseline of the location reference object A. Specifically, more accurate location recognition may be achieved as the number of location reference objects A around the person is increased.



'001 patent at 3:44-58, Fig. 1. Thus, as even the '001 patent acknowledges, the subject matter of this Claim 1 is tantamount to subject-matter that can be performed by a human actor. For example, a human actor could observe a process that is being performed by an operator and shine light-based visual cues to the operator to help guide the operator through the process, with the process being recorded and displayed remotely. As just one specific example, a supervisor teaching a worker how to assemble a machine could point a flashlight sequentially at the components needed and at the locations where they should be attached, while filming the process of the worker assembling the machine for remote viewing. Patents that involve “the use of computers to conserve human resources by automating work otherwise performed through human labor” may be directed at abstract ideas. *Enco Sys., Inc. v. DaVincia, LLC*, 845 F. App'x 953, 957 (Fed. Cir. 2021) (quotation omitted); *see also, e.g., Ubisoft Entertainment, S.A. v. Yousician Oy*, 401 F.Supp.3d 644, 649 (finding claims to be directed toward abstract idea of teaching guitar by evaluating a user’s performance and generating appropriate exercises to improve that performance and noting that “[a] typical music teacher performs these steps when teaching a musical instrument.”), *aff’d*, 814 Fed. App'x 558, 591-592 (“The mini-game generation step is thus no different from the ordinary mental processes of a guitar instructor teaching a student how to play the guitar.”).

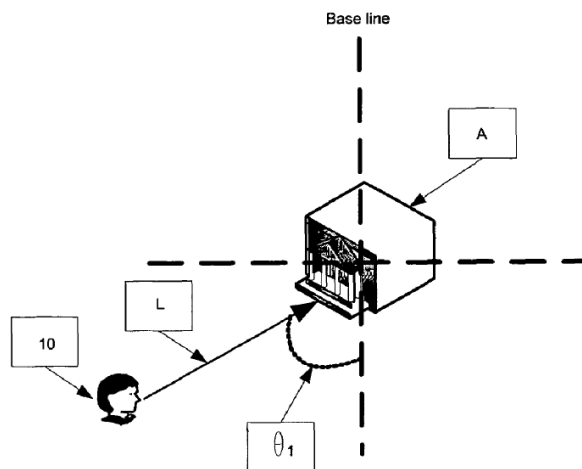
The “photographing,” “measuring a distance,” “analyzing an image,” and “calculating . . . using distance information . . . location information . . . and direction information” limitations are likely performing routine and generic processing capabilities of devices like cameras and processors generally. *See Affinity Labs*, 838 F.3d at 1262 (characterizing “transmitting and receiving signals” as “routine functions.”). The description of each of these components is functional. *See id.* at 1258 (finding abstract a patent claim that included a cellular telephone, a graphical user interface, and a downloadable application, because “the claimed invention [was] entirely functional in nature”). “There is nothing in claim 1 that is directed to *how* to implement the [idea]. Rather, the claim is drawn to the idea itself.” *Id.* Put another way, “the recited physical components ‘merely provide a generic environment in which to carry out the abstract idea . . .’” *Id.* at 1260 (citing *In re TLI Comms. LLC Patent Litigation*, 823 F.3d 607, 611 (Fed. Cir. 2016)). Because the limitations of Claim 1 of the ’001 Patent require nothing other than “off-the-shelf, conventional computer, network, and display technology for gathering, sending, and presenting the desired information,” the claims are directed to abstract ideas. *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1355 (Fed. Cir. 2016). The claims recite broad and result-based functional language that is performed by these generic structures.

The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon’s Invalidity Contentions, provided concurrently herewith, at each “List B” associated with a claim limitation included in this claim of the ’001 Patent, and as charted in the corresponding claim charts submitted with Amazon’s Invalidity Contentions.

Moreover, this claim would preempt the broad subject matter of determining where a person is located using vision, distance estimates, and known landmarks or signs. This further suggests that the claims are directed to an abstract idea and patent-ineligible subject matter. *See, e.g., Bancorp Servs., LLC v. Sun Life Assur. Co. of Canada (U.S.)*, 687 F.3d 1266, 1280

	(Fed. Cir. 2012) (finding that claimed abstract idea would improperly preempt broad subject matter). Thus, either “individually” or “as an ordered combination,” the elements of this claim do not add enough to “transform the nature of the claim’ into a patent-eligible application.” <i>Alice</i>, 134 S. Ct. at 2355 (quoting <i>Mayo</i>, 132 S. Ct. at 1297-98).
2. 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, and the offset information is obtained by analyzing a photographing angle of the photographed location recognition tag.	Like Claim 1, this claim is directed to the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. <i>See supra</i> Claim 1. Claim 2 adds the additional abstract idea of (3) analyzing a photographing angle to determine an “offset,” which the ’001 patent describes as “an angle and a direction formed between the location reference object A and a user observing the location reference object A with respect to a base line.” ’001 patent at 4:31-35. Additionally, “offset information” is described as “(including the offset angle and the offset direction) of photographed location identifier images.” Such “offset information” “is determined according to a position of a user observing the location reference object A, and a photographing direction of the camera terminal is determined by using the offset information.” This so-called “offset information” is nothing more than the mental process that a person follows when trying to determine their position, as the ’001 patent acknowledges: FIG. 1 shows a diagram describing a method of recognizing a location by a person using eyesight. As shown in FIG. 1, when a person (10) recognizes a location reference object A using eyesight, he approximately determines his current location based on spatial location information stored in his brain through his experiences and on study of the location reference object A. In addition, he estimates a distance L to the location reference object A according to his sense of perspective, and determines the angle θ_1 of his observing position relative to a baseline of the location reference object A. Specifically, more accurate location

recognition may be achieved as the number of location reference objects A around the person is increased.



'001 patent at 3:44-58, Fig. 1.

The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon's Invalidity Contentions, provided concurrently herewith, at each "List B" associated with a claim limitation included in this claim of the '001 Patent, and as charted in the corresponding claim charts submitted with Amazon's Invalidity Contentions.

Because claim 2 does nothing more than attempt to claim a further mental process and/or preempt the use of that process by a computer, it does nothing more than reflect an abstract idea. Thus, either "individually" or "as an ordered combination," the elements of this claim do not add enough to "transform the nature of the claim" into a patent-eligible application." *Alice*, 134 S. Ct. at 2355 (quoting *Mayo*, 132 S. Ct. at 1297-98).

3. 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.	Like Claim 1, this claim is directed to the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. <i>See supra</i> Claims 1 & 2. Claim 3 adds the additional abstract idea of measuring distance using an automatic focusing operation. While this claim purports to add autofocusing to the steps of claim 1, “[t]hat restriction, however, does not alter the result. All that limitation does is to confine the abstract idea to a particular technological environment” <i>Affinity Labs of Texas, LLC v. DIRECTV, LLC</i>, 838 F.3d 1253, 1258-59 (Fed. Cir. 2016). But “merely limiting the field of use of the abstract idea to a particular existing technological environment does not render the claims any less abstract.” <i>Id.</i> at 1259 (collecting cases). Here, the additional limitation merely restricts the abstract idea to a system whose camera has an auto focusing functionality, which the ’001 patent admits is a standard camera functionality at the time of the alleged invention. The above distance measuring method is used in mobile terminals having a camera function (e.g., a camera, a PDA, a PCS, a cellular phone, and a notebook computer), and is essentially used in a camera performing an active focusing operation. ’001 Patent at 4:25-29. The autofocus operation of Claim 3 does nothing more that provide an input to the patent-ineligible method of claim 1 The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon’s Invalidity Contentions, provided concurrently herewith, at each “List B” associated with a claim limitation included in this claim of the ’001 Patent, and as charted in the corresponding claim charts submitted with Amazon’s Invalidity Contentions.

	Thus, either “individually” or “as an ordered combination,” the elements of this claim do not add enough to “transform the nature of the claim’ into a patent-eligible application.” <i>Alice</i>, 134 S. Ct. at 2355 (quoting <i>Mayo</i>, 132 S. Ct. at 1297-98).
5. 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 the location recognition tags are formed as one-dimensional or two-dimensional barcode types.	Like Claim 1, this claim is directed to the abstract idea the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. <i>See supra</i> Claims 1-2. While this claim purports to add to Claim 1 arranging the location tags such that “so that a desired precision for using the location recognition tags at a predetermined physical area may be achieved” that is itself an abstract idea that purports to preempt the entire area of using signs to aid a person in locating themselves, particularly since there is no limitation on what a “desired precision” could include. Similarly, the idea that the visual indicator is a barcode is not a significant limitation because that was the standard way of using a camera image to provide location information in similar systems in the prior art, including in the Wagner reference below and many of the ARToolKit references: Among others, the SignPost, ARToolKit, Maeda, ARQuake, and Lin prior art describe photographing such location recognition tags:



Figure 1. The self-contained handheld AR system can track optical markers in real time.

Wagner at 1.

The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon’s Invalidation Contentions, provided concurrently herewith, at each “List B” associated with a claim limitation included in this claim of the ’001 Patent, and as charted in the corresponding claim charts submitted with Amazon’s Invalidation Contentions.

Thus, either “individually” or “as an ordered combination,” the elements of this claim do not add enough to “transform the nature of the claim” into a patent-eligible application.” *Alice*, 134 S. Ct. at 2355 (quoting *Mayo*, 132 S. Ct. at 1297-98).

7. 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.	Like Claim 1, this claim is directed to the abstract idea the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. <i>See supra</i> Claims 1-3, 5. This claim purports to add the idea that the sign or marker includes either (a) its own location data; or (b) information from which its location data may be obtained. This claim adds nothing patent-eligible to the claim and merely seeks to capture the universe of possible location markers that are used with the system of claim 1. Moreover, a limitation regarding the types of information that can be collected is itself an abstract idea. <i>Elec. Power Grp., LLC v. Alstom S.A.</i>, 830 F.3d 1350, 1353 (Fed. Cir. 2016) (“collecting information, including when limited to particular content (which does not change its character as information), as within the realm of abstract ideas.”) The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon’s Invalidity Contentions, provided concurrently herewith, at each “List B” associated with a claim limitation included in this claim of the ’001 Patent, and as charted in the corresponding claim charts submitted with Amazon’s Invalidity Contentions. Thus, either “individually” or “as an ordered combination,” the elements of this claim do not add enough to “‘transform the nature of the claim’ into a patent-eligible application.” <i>Alice</i>, 134 S. Ct. at 2355 (quoting <i>Mayo</i>, 132 S. Ct. at 1297-98).
8. A location recognition device for recognizing a location by using a built-in camera, the location recognition device comprising: an image photographing unit for photographing a plurality of location recognition tags that are arranged in a predetermined	Like Claim 1, this claim is directed to the abstract idea the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. <i>See supra</i> Claims 1-3, 5, 7. The same concepts of photographing, identifying location information from a message tag, and using distance and orientation information to determine position cannot combine into a patent-eligible form because they are nothing more than abstract ideas that are (1) mental processes implemented on a computer; (2) collecting and analyzing data; and (3) attempt to preempt the entire field of using a photographed location sign or marker to

physical area and respectively store location recognition information, and for performing a digital image process; a distance measuring unit for measuring a distance to the location recognition tag; 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 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.	determine ones location (which was well-known long before the '001 patent's priority date). Thus, Claim 8 lacks patent eligibility for the same reasons described as to claim 1. Claim 8 is written in means-plus-function form, and thus is likely to be subject to 35 U.S.C. 112 ¶ 6. The corresponding structure from the specification does not render claim 8 into a non-abstract idea. The phrase “a distance measuring unit for measuring a distance to the location recognition tag” contains functional language that is subject to 35 U.S.C. § 112, ¶ 6. The claimed function is “measuring a distance to the location recognition tag.” The corresponding structure to the “distance measuring unit” is found in the '001 Patent specification at 4:17–24 and includes standard hardware that “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.” The '001 patent also asserts that this functionality is “essentially used in a camera performing an active focusing operation.” '001 Patent at 4:25–29; <i>see also</i> '001 Patent at 7:26–28, 8:18–20. The '001 Patent's general-purpose computer may play a role in such calculations. '001 patent at 3:59–65. The phrase “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” is subject to 35 U.S.C. § 112, ¶6, and requires that the “image analyzing unit” perform two separate functions: (1) “analyzing an image of the location recognition tag . . . and obtaining corresponding location . . . information of the location recognition tag”; and (2) “analyzing an image of the location recognition tag . . . and obtaining corresponding direction information of the location recognition tag.” The “image analyzing unit” itself is part of 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.” '001 patent at 3:55–61. Accordingly the corresponding structure for the three “image analyzing unit” functions must include the algorithm(s) disclosed in the specification, in addition to the
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	disclosure of a general purpose computer, which Maeda has. Maeda at 3 (explaining that the mobile system is “connected to a laptop computer in a backpack.”) For the first function, “analyzing an image of the location recognition tag . . . and obtaining corresponding location . . . information of the location recognition tag,” a corresponding algorithm is found in the ’001 patent at 7:29–31, which describes how “the image analyzing unit 120 interprets the location information” in the tag. <i>First</i>, the image analyzing unit determines the information being conveyed by the tag. In the ’001 patent, the system “read[s] the two-dimensional barcode of the location recognition tag 30 photographed by the image photographing unit 110.” <i>Id.</i> at 7:31–33. Although the specific bar code reading algorithm is not disclosed, Amazon reads this as requiring the use of a standard bar code reading algorithm that existed at the time of the claimed invention or its equivalents. <i>Second</i>, the ’001 patent discloses using the tag information to determine the location of the tag. For example, the ’001 patent “provides the interpreted location information to the tag location information storage unit 130.” <i>Id.</i> at 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. <i>See also</i> ’001 patent at 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 <u>not</u> by the image analyzing unit. <i>Third</i>, 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.” Alternatively, if the location recognition tag “includes the absolute location coordinate,” <i>id.</i> at 7:39, then the second and third steps are not performed. For the second function, “analyzing an image of the location recognition tag . . . and obtaining corresponding direction information of the location recognition tag,” a corresponding algorithm is found in the ’001 patent at 7:4–9: “the image analyzing unit 120 performs an edge detection process for the digital image data output from the image photographing unit 110, recognizes the contour line of the location recognition tag 30 and a slope of the analyzed contour line, and compares the slope to a base line, so as to recognize an offset state.” The “location recognizing unit” itself is part of a general purpose computer such as “mobile terminals having operating functions (e.g., a personal communication system (PCS), a
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personal digital assistance (PDA), and a cellular phone) or a notebook computer.” ’001 patent at 3:55–61. Accordingly the corresponding structure for the “recognizing a user location” function is the algorithm(s) disclosed in the specification.

There are two corresponding algorithms in the ’001 patent. In the first algorithm, 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” *id.* at 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.” *Id.* at 6:12–15.

In the second disclosed algorithm, “the location information of three or more location recognition tags 30 is provided from the image analyzing unit 120, and distance information on each distance to the three or more location recognition tags 30 is provided from the distance measuring unit 140.” *Id.* at 6:16–20. The location recognizing unit then performs a “triangulation measuring algorithm” in which “one or more triangulation points is set, each apex (i.e., each triangulation point) is observed, and a relationship between each angle and each side is calculated. Subsequently, the ratio of respective sides is compared to a distance ratio between the location recognition tags 31, 32, and 33 to calculate an accurate current location. Such a triangulation is based on a characteristic for obtaining a relative location by using some base lines, since the number of triangulation points correspond to the real scale at an observing position when there are some base lines.” *Id.* at 6:25–35.

The ’001 patent also describes an alternative embodiment in which the location recognizing unit 150 does not itself recognize the user location, but instead “transmits [distance, photographing, and tag recognition information] to the location information management server 200.” *Id.* at 8:46–51. This embodiment does not fall within the scope of claim 8, which requires the location recognizing unit to recognize a user location, and not some other component.

Theses corresponding structures and algorithms are either (A) a computer implementation of the mental processes described as to Figure 1 of the ’001 patent; (B) a mathematical process; or (C) both. Either way, the corresponding structure/algorithms do not include a patent-eligible technical concept. In particular, looking at a location marker and extracting information from it is simply collecting and analyzing data, which is not patent eligible. *Elec. Power Grp., LLC v. Alstom S.A.*, 830 F.3d 1350, 1353 (Fed. Cir. 2016) (“collecting

	information, including when limited to particular content (which does not change its character as information), as within the realm of abstract ideas.”). The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon’s Invalidity Contentions, provided concurrently herewith, at each “List B” associated with a claim limitation included in this claim of the ’001 Patent, and as charted in the corresponding claim charts submitted with Amazon’s Invalidity Contentions. Thus, either “individually” or “as an ordered combination,” the elements of this claim do not add enough to “transform the nature of the claim’ into a patent-eligible application.” <i>Alice</i>, 134 S. Ct. at 2355 (quoting <i>Mayo</i>, 132 S. Ct. at 1297-98).
10. 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.	Like Claim 1, this claim is directed to the abstract idea the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. <i>See supra</i> Claims 1-3, 5, 7-8. Claim 10 purports to add the functionality of storing location information in one of two forms—actual coordinates or logical coordinates. These concepts are nothing more than “collecting information” which the Federal Circuit has held “as within the realm of abstract ideas.” <i>Elec. Power Grp., LLC v. Alstom S.A.</i>, 830 F.3d 1350, 1353 (Fed. Cir. 2016). The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon’s Invalidity Contentions, provided concurrently herewith, at each “List B” associated with a claim limitation included in this claim of the ’001 Patent, and as charted in the corresponding claim charts submitted with Amazon’s Invalidity Contentions. Thus, either “individually” or “as an ordered combination,” the elements of this claim do not add enough to “transform the nature of the claim’ into a patent-eligible application.” <i>Alice</i>, 134 S. Ct. at 2355 (quoting <i>Mayo</i>, 132 S. Ct. at 1297-98).

11. 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.	Like Claim 1, this claim is directed to the abstract idea the abstract idea of determining where a person is located using vision, distance estimates, and known landmarks or signs. <i>See supra</i> Claims 1-3, 5, 7-8, 10. Claim 11 purports to add the functionality of storing location information at a separate location. These concepts are nothing more than “collecting information” which the Federal Circuit has held “as within the realm of abstract ideas.” <i>Elec. Power Grp., LLC v. Alstom S.A.</i>, 830 F.3d 1350, 1353 (Fed. Cir. 2016). The functions and generic structures recited in this claim were all well-known, routine, and conventional in the art, as shown in greater detail in the chart below and as further shown in each of the references listed in Amazon’s Invalidity Contentions, provided concurrently herewith, at each “List B” associated with a claim limitation included in this claim of the ’001 Patent, and as charted in the corresponding claim charts submitted with Amazon’s Invalidity Contentions. Thus, either “individually” or “as an ordered combination,” the elements of this claim do not add enough to “transform the nature of the claim’ into a patent-eligible application.” <i>Alice</i>, 134 S. Ct. at 2355 (quoting <i>Mayo</i>, 132 S. Ct. at 1297-98).
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Pursuant to the Court’s Standing Order Regarding Subject Matter Eligibility Contentions, Amazon provides the following chart identifying a description of the industry at the relevant time in which the Challenged Claims are alleged to be well understood, routine, and conventional, and the factual and legal basis therefore; and a description of how each element of each Challenged Claim, both individually and in combination with other elements of that claim, was well understood, routine, and conventional, in the relevant industry at the relevant time, and the legal and factual basis therefor.

Description of Industry, at Relevant Time, in Which the Claim is Well-Understood, Routine, and Conventional, and Basis Therefor

The Challenged Claims of the ’001 Patent cover the system equivalent of determining where a person is located using vision, distance estimates, and known landmarks or signs. They cover the system equivalent of how a person locates themselves using eyesight and signs, how seafarers could locate their position in the ocean using star patterns and a compass, map, and sextant, or how people estimated position based on landmarks of a known distance and size. They recite “broad and familiar concept[s] [in the realm of organizing human activity] that [are] untethered to any specific or concrete way of implementing it.” *Affinity Labs of Texas, LLC v. DIRECTV, LLC*, 838 F.3d 1253, 1258 (Fed. Cir. 2016).

Humans have been using vision, markers, and measurements to locate themselves for thousands of years. As Wikipedia explains:

Celestial navigation, also known as astronavigation, is the practice of position fixing using stars and other celestial bodies that enables a navigator to accurately determine their actual current physical position in space or on the surface of the Earth without relying solely on estimated positional calculations, commonly known as dead reckoning. Celestial navigation uses "sights," or timed angular measurements, taken typically between a celestial body (e.g., the Sun, the Moon, a planet, or a star) and the visible horizon. Celestial navigation can also take advantage of measurements between celestial bodies without reference to the Earth's horizon, such as when the Moon and other selected bodies are used in the practice called "lunars" or the lunar distance method, used for determining precise time when time is unknown.

See https://en.wikipedia.org/wiki/History_of_navigation. However, KAIFI is trying to patent this method—using markers (instead of star patterns) and a camera (instead of human eyes) to determine one’s location.

KAIFI was not the first party to implement such a method using modern electronic computers and cameras. In the decade before the ’001 patent priority, many researchers were involved in creating similar systems. Those systems are described in Amazon’s invalidity contentions and charts, which are incorporated by reference.

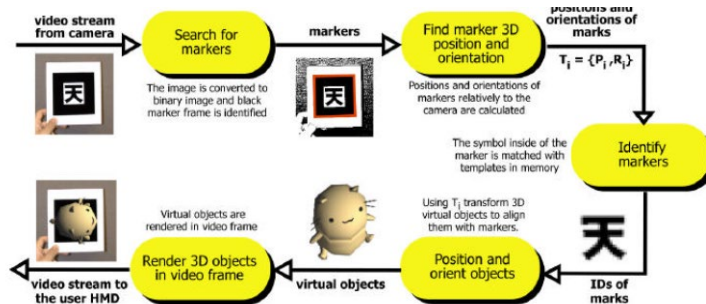
For example, it was well known at the time of the claimed invention to take photographs of location markers for use in locating a person's position.

Among others, the SignPost, ARToolKit, Maeda, ARQuake, and Lin prior art describe photographing such location recognition tags:



Figure 1. The self-contained handheld AR system can track optical markers in real time.

Wagner at 1.



ARToolKit at 8.

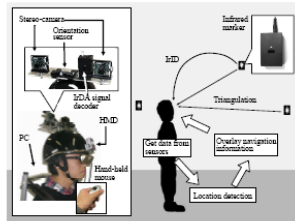


Figure 1. Overview of proposed tracking system

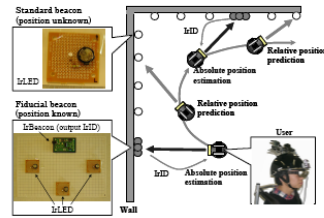


Figure 2. Absolute position estimation and relative position prediction

Maeda at 3.



Figure 3: Fiducial marker on a building

Thomas (2000) at 8.

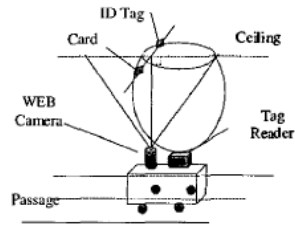


Fig. 2. Diagram of localization system.

Lin at 2.

These researchers had developed sophisticated mathematical models for using pictures to determine a person's location based on the person's distance from and orientation to a particular marker (which is often called the "camera pose." One notable example of such a location-finding model is found in the Kato reference:

Size-known square markers are used as a base of the coordinates frame in which Virtual Monitors are represented (Figure 5). The transformation matrices from these marker coordinates to the camera coordinates (**T_{cm}**) represented in eq.1 are estimated by image analysis.

$$\begin{bmatrix} X_c \\ Y_c \\ Z_c \\ 1 \end{bmatrix} = \begin{bmatrix} V_{11} & V_{12} & V_{13} & W_1 \\ V_{21} & V_{22} & V_{23} & W_2 \\ V_{31} & V_{32} & V_{33} & W_3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} V_{3 \times 3} & W_{3 \times 1} \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} = T_{cm} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} \quad (\text{eq. 1})$$

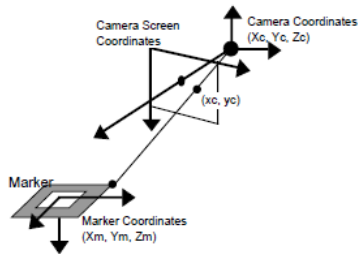


Figure 5. The relationship between marker coordinates and the camera coordinates is estimated by image analysis.

Kato at 4 (this is just an excerpt; the discussion of this mathematical model goes on for multiple pages). Kato incorporated this understanding into a system called ARToolKit (the Augmented Reality Toolkit). This toolkit was widely used by researchers in the field in 2005 and remains available to this day.

By the priority date of the '001 patent, Kato's ARToolKit and similar techniques had been used by many researchers to develop systems that used a camera and a computer to determine where an individual was located. This includes the references and systems described in Defendants' invalidity contentions. For example, the Wagner describes the Signpost application, which uses a computer and a camera to determine a user's position:



Figure 7. Signpost in stand-alone mode. Note the registered 3D overlays in the video image



Figure 8. Signpost showing the overview map (current user position marked with small cross)

To test our PDA-based augmented reality system with an actual application within the *Studierstube* framework, we choose to implement a client for the Signpost [13] project. The application guides a user through an unknown building by showing a variety of navigation hints, including a wireframe visualization of the building structure superimposed on the video image, labeling of relevant elements and highlighting of the next exit to take. In addition, an arrow indicates the direction (Figure 7), and a 2D overview map is available (see Figure 8).

Relying on the PDA's touch screen capabilities allowed us to create a graphical user interface (GUI), as in Figure 8, which we found easy and intuitive. The GUI primarily consists of a menu through which several settings, such as selecting the start and end points as well showing the current position on an overview map, are available.

Wagner at 7.

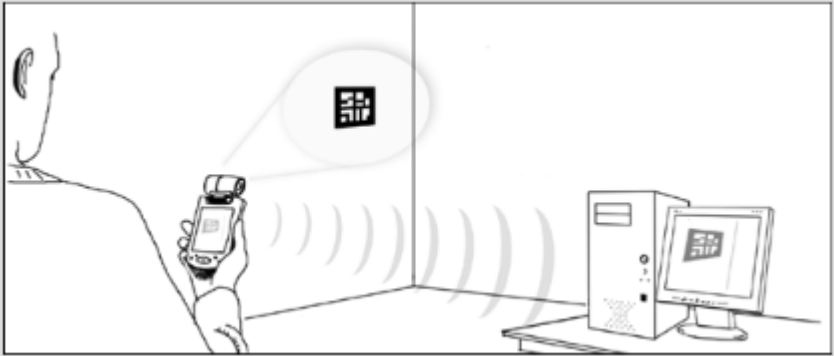
Similarly, Foxlin created a device called “VIS-Tracker” which uses markers and a camera to determine a user’s position.



Figure 8: Using VIS-Tracker in lobby test area.

Foxlin VIS-Tracker at 76. Similar systems appear throughout Defendants’ invalidity contentions.

Patent Claim	Reasons Why Each Claim Element Was Well Understood, Routine, and Conventional
1[pre]. A method for recognizing a location by a mobile terminal having a built-in camera, the method comprising:	This element was well understood, routine, and conventional for all the reasons shown in Defendants’ Invalidity Contentions corresponding to this claim. In particular the claim charts corresponding to “List B” for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following is a particular example of how this element was well understood, routine, and conventional. The Signpost web page shows a cartoon of a person taking a picture of a location tag using a built-in camera, indicating that the technique was not just conventional, but established enough to have been portrayed via-hand-drawn graphic.

	9/18/24, 3:01 PM Handheld Augmented Reality  Figure 3: SignPost setup. Signpost Web Page at 2.
[1a] a) photographing a location recognition tag storing location recognition information;	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. The Signpost web page shows a cartoon of a person taking a picture of a location tag using a built-in camera, indicating that the technique was not just conventional, but established enough to have been portrayed via-hand-drawn graphic.

9/18/24, 3:01 PM

Handheld Augmented Reality



Figure 3: SignPost setup.

Signpost Web Page at 2.

In a related example, the fact that location tags stored location information was illustrated clearly in Reitmayr.

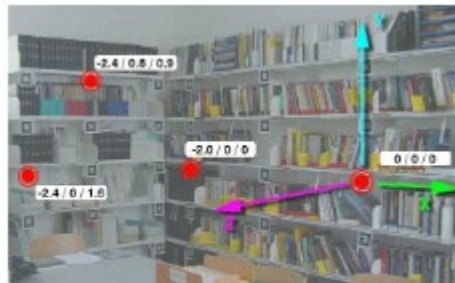


Figure 13: Markers are mounted to the book shelves and registered.

Reitmayr at 8.

Similarly, Rekimoto explains that tags having “code” (i.e., barcode information) were measured for position, orientation, and ID (i.e., location information).

	Measures the code position and orientation as well as an ID Another advantage of using a camera as a visual tag reader is that the 3D position and orientation of a tag relative to the camera can be estimated – and, consequently, the camera position and orientation relative to the tag [16]. Rekimoto 00 at 2. Finally, perhaps the most conventional illustration of this functionality was the existence of ARToolKit, which was widely used throughout industry and academics for identifying the position and orientation of a location recognition tag.
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4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched against some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

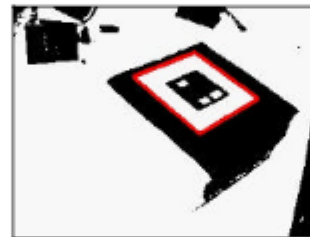
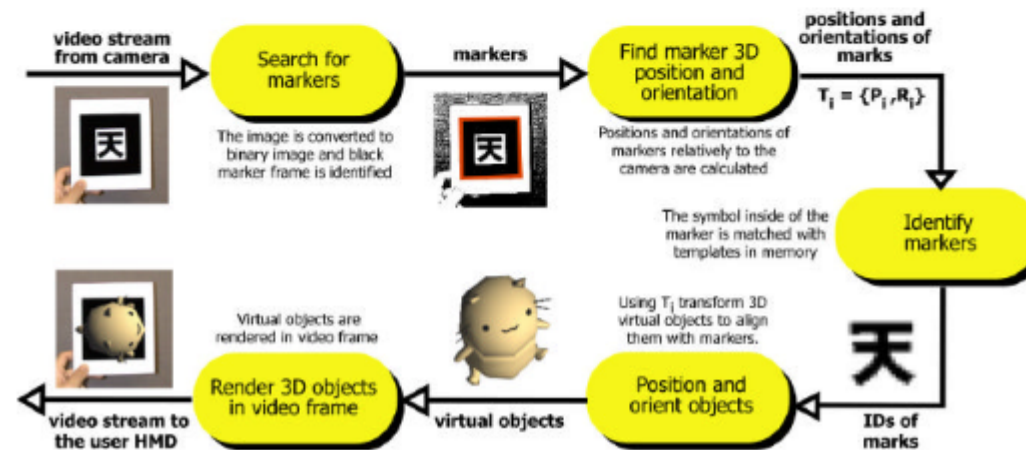


Fig 4: Thresholded Video



Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



	2000 ARToolKit User Documentation at 8.
[1b] b) measuring a distance to the location recognition tag;	This element was well understood, routine, and conventional for all the reasons shown in Defendants’ invalidity contentions corresponding to this claim. In particular the claim charts corresponding to “List B” for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. The ARToolKit functionality used a square shape outside of a barcode to measure the distance to the tag itself. This was a very well-known technique as ARToolKit was widely used at the time of the claimed invention.

4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched against some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

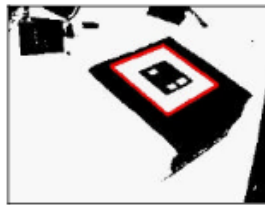
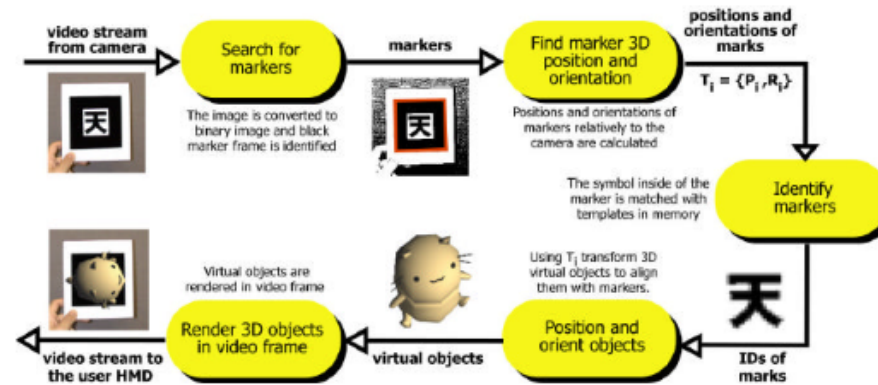


Fig 4: Thresholded Video



Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

	Additionally, tracking systems were known to use a wide variety of distance measurements to aid in determining where a person or object was located: 2.1 The sensor/target abstraction There are a huge variety of sensors used in tracking and navigation applications, each with different performance, operating environments, range, size, cost, update rate, penetration capabilities, and so on. From the sensor fusion algorithm's point of view, however, most sensors belong to one of a few basic categories according to the type of measurement observable they produce: <u>Dead-reckoning continuous observables</u> • Angular rate (e.g. gyros) • Linear acceleration (e.g. accelerometers) • Relative displacement (wheel encoder, optical flow) <u>Map-point-referenced discrete update observables</u> • Range (e.g. ultrasonic, Lidar, radar, raw GPS) • 1-D Bearing (laser scan, linear CCD, phased array) • 2-D Bearing (imaging sensor, quadcell, pan/tilt servo) • Range rate (Doppler radar, phase-coherent acoustic) • Range difference (e.g. TDOA acoustic or radar) • Dipole field component (e.g. active source magnetic tracker, electric field tracker) <u>Earth-referenced discrete update observables</u> • Cartesian position (e.g. cooked GPS, altimeter) • Heading (e.g. magnetic compass, gyrocompass) • Speed (optical flow, airspeed, waterspeed sensors) • Direction (e.g. optical flow) • Homogeneous field (magnetometers, gravitometers) Foxlin 02 at 2.
[1c] c) analyzing an image of the photographed location recognition tag, and obtaining location information corresponding to the location recognition tag;	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional.

As noted above, the ARToolKit functionality was designed to read a barcode inside of a location tag and obtain the position of the code relative to a camera. This functionality was used across many of the prior art references in Defendants' invalidity contentions.

4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched again some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

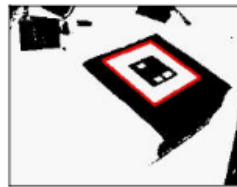
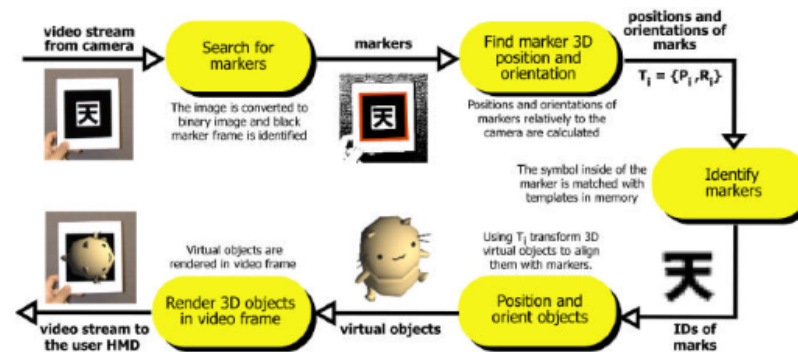


Fig 4: Thresholded Video



Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

4. Position and pose estimation of markers

4.1. Estimation of the Transformation Matrix

Size-known square markers are used as a base of the coordinates frame in which Virtual Monitors are represented (Figure 5). The transformation matrices from these marker coordinates to the camera coordinates (T_{cm}) represented in eq.1 are estimated by image analysis.

$$\begin{bmatrix} X_c \\ Y_c \\ Z_c \\ 1 \end{bmatrix} = \begin{bmatrix} V_{c1} & V_{c2} & V_{c3} & W_c \\ V_{c4} & V_{c5} & V_{c6} & W_c \\ V_{c7} & V_{c8} & V_{c9} & W_c \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} \quad (\text{eq. 1})$$

$$= \begin{bmatrix} V_{c1} & W_{c1} \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} = T_{cm} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix}$$

Kato at 4.

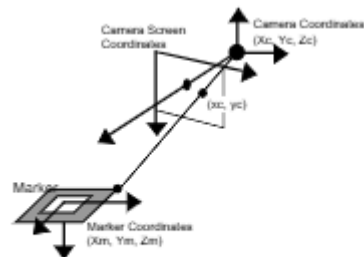


Figure 5. The relationship between marker coordinates and the camera coordinates is estimated by image analysis.

Kato at 4.

[1d] d) obtaining direction information of the photographed location recognition tag; and

This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and

	conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. The conventional ARToolKit functionality also obtained direction information regarding the location recognition tag, by using mathematical transforms on the square outside of the barcode.
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4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched against some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

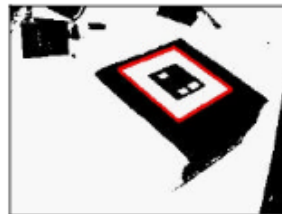


Fig 4: Thresholded Video

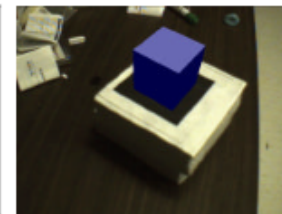
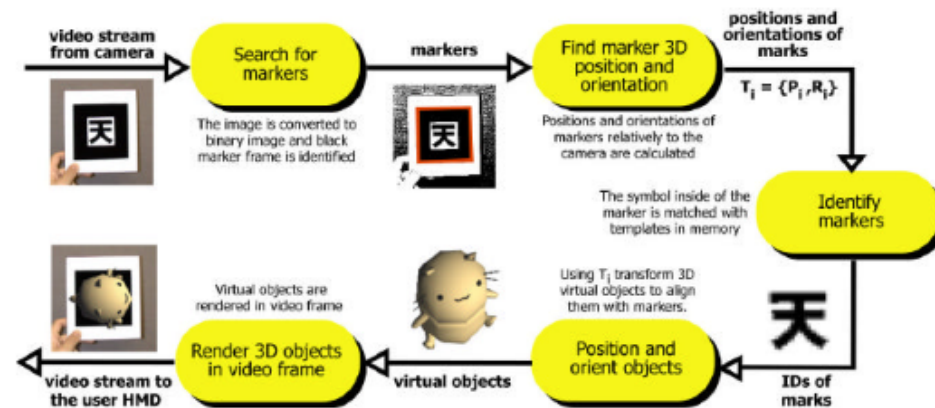


Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

4. Position and pose estimation of markers

4.1. Estimation of the Transformation Matrix

Size-known square markers are used as a base of the coordinates frame in which Virtual Monitors are represented (Figure 5). The transformation matrices from these marker coordinates to the camera coordinates (T_{cm}) represented in eq.1 are estimated by image analysis.

$$\begin{bmatrix} X_c \\ Y_c \\ Z_c \\ 1 \end{bmatrix} = \begin{bmatrix} V_{11} & V_{12} & V_{13} & W_1 \\ V_{21} & V_{22} & V_{23} & W_2 \\ V_{31} & V_{32} & V_{33} & W_3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} \quad (\text{eq. 1})$$

$$= \begin{bmatrix} V_{11} & W_1 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} = T_{cm} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix}$$

Kato at 4.

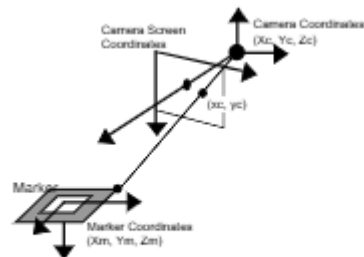


Figure 5. The relationship between marker coordinates and the camera coordinates is estimated by image analysis.

Kato at 4.

[1e] e) calculating a mobile terminal location by using the distance information measured in

This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and

b), the location information obtained in c), and the direction information obtained in d).	conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. The conventional ARToolKit functionality also obtained location information by combining the distance and direction information determined from the square outside of the barcode with the any location information inside of the barcode itself.
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4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched against some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

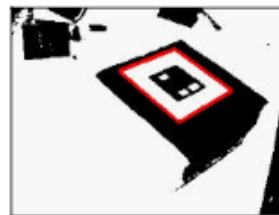


Fig 4: Thresholded Video

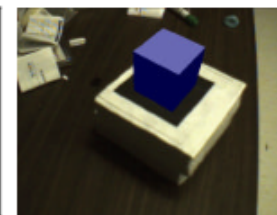
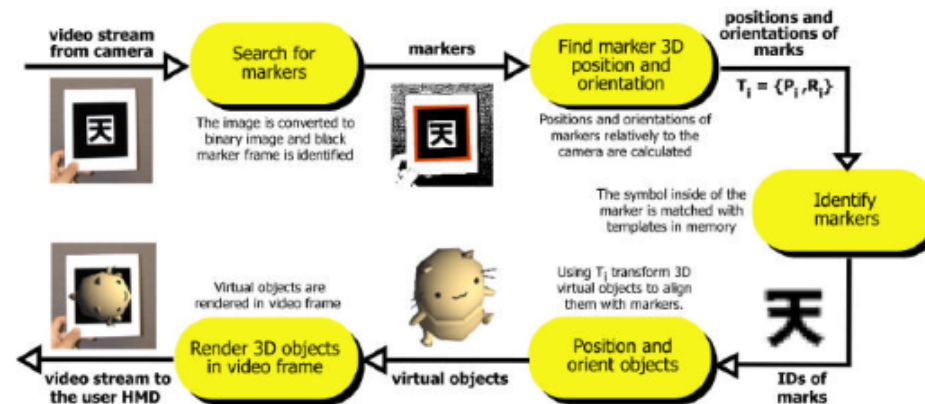


Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

The mathematical techniques for determining where the camera was located were well-known and conventional by the time of the claimed invention, as illustrated by Kato and the other references that provide similar matrix transforms for identifying where a tag is located (e.g., Maeda, Reikimoto, Kalkusch etc.) One especially notable example is Kato, who was one of the original implementors of this functionality for ARToolKit.

4. Position and pose estimation of markers

4.1. Estimation of the Transformation Matrix

Size-known square markers are used as a base of the coordinates frame in which Virtual Monitors are represented (Figure 5). The transformation matrices from these marker coordinates to the camera coordinates (T_{cm}) represented in eq.1 are estimated by image analysis.

$$\begin{bmatrix} X_c \\ Y_c \\ Z_c \\ 1 \end{bmatrix} = \begin{bmatrix} V_{11} & V_{12} & V_{13} & W_1 \\ V_{21} & V_{22} & V_{23} & W_2 \\ V_{31} & V_{32} & V_{33} & W_3 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} \quad (\text{eq. 1})$$

$$= \begin{bmatrix} V_{2,1} & W_{2,1} \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} = T_{cm} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix}$$

Kato at 4.

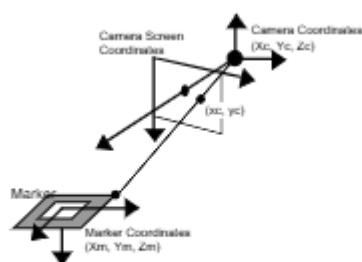
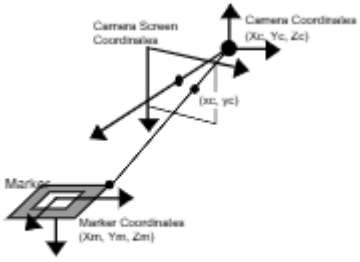


Figure 5. The relationship between marker coordinates and the camera coordinates is estimated by image analysis.

Kato at 4.

2. 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, and the offset information is obtained by analyzing a photographing angle of the photographed location recognition tag.	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. The standard Kato/ARToolKit method for determining tag position based on an image used the offset functionality and photographing angle information described in claim 2.  Figure 5. The relationship between marker coordinates and the camera coordinates is estimated by image analysis. Kato at 4. By the time of the claimed invention, the ARToolKit method was the industry standard way of identifying tag location based on a photograph.

4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched against some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

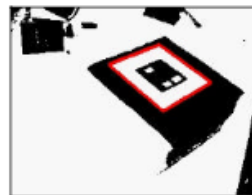
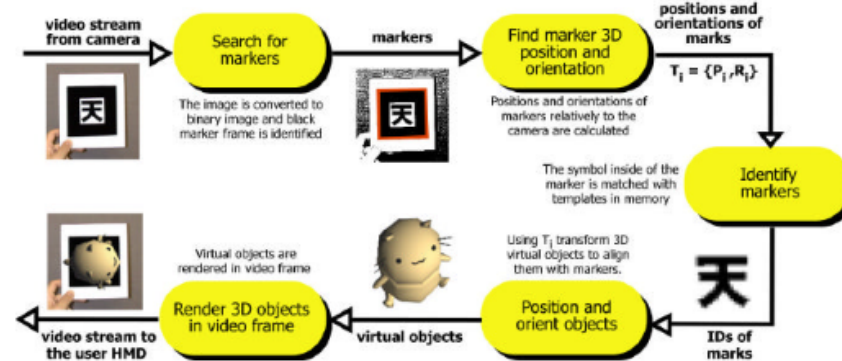


Fig 4: Thresholded Video



Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

The mathematics are simpler. Three range measurements pin down the position. Six bearing angles (normally measured two at a time) are required to solve for position and orientation.

Foxlin 98 at 2.

	4. Position and pose estimation of markers 4.1. Estimation of the Transformation Matrix Size-known square markers are used as a base of the coordinates frame in which Virtual Monitors are represented (Figure 5). The transformation matrices from these marker coordinates to the camera coordinates (T_{cm}) represented in eq.1 are estimated by image analysis. $\begin{bmatrix} X_c \\ Y_c \\ Z_c \\ 1 \end{bmatrix} = \begin{bmatrix} V_{11} & V_{12} & V_{13} & W_x \\ V_{21} & V_{22} & V_{23} & W_y \\ V_{31} & V_{32} & V_{33} & W_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix}$ $= \begin{bmatrix} V_{11} & W_{11} \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} = T_{cm} \begin{bmatrix} X_m \\ Y_m \\ Z_m \\ 1 \end{bmatrix} \quad (\text{eq. 1})$ Kato at 4.
3. 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.	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. It was known in the art that auto focusing in cameras is used to measure the distance between a camera and an object: "In recent years, various automatic focusing systems for cameras have been developed for automatically measuring distance between the cameras and objects to be focused upon and operating focusing lens at positions corresponding to the measured distance for focusing at the object. Such automatic focusing systems are

	useful in various cameras, such as electronic still cameras and so forth, for eliminating the need for operators of the cameras to focus them.” Kuno, 1:18-26. “As is well known, basically two different types of automatic focusing systems have been developed. One of the systems is known as an ‘active type automatic focusing system’ which transmits an infrared light beam or ultra sonic wave toward the object to be focused upon and receives the reflected beam or wave for measuring the distance from the camera to the object by measuring elapsed time from transmission to receipt.” Kuno, 1:27-35. 2.4. Calibration The camera’s internal parameters for focal length and lens distortion must be determined. Our method for focal length determination (Fig. 4) uses a planar target with a known grid pattern. Multiple images are taken at measured offsets D along the viewing direction. From each pair of images we compute the focal length f using the equations and geometry in figure 4 and average the results. Grid-point pairs closest to the center of the image are used since they are least affected by lens distortion. Neumann 96 at 4.
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ARToolKit Step	Function
1. Initialize the application	<i>init</i>
2. Grab a video input frame.	<i>arVideoGetImage</i>
3. Detect the markers	<i>arDetectMarker</i>
4. Calculate camera transformation	<i>arGetTransMat</i>
5. Draw the virtual objects	<i>draw</i>
6. Close the video path down.	<i>cleanup</i>

Table 1.0 Function calls and code that corresponds to the ARToolKit applications steps.

`init( )`

The `init` routine is called from the main routine and is used to open the video path and read in the initial ARToolKit application parameters. The key parameters for an ARToolKit application are:

- the patterns that will be used for the pattern template matching and the virtual objects these patterns correspond to.
- the camera characteristics of the video camera being used.

These are both read in from file names that can either be specified on the command line or by using default hard-coded file names. In the `init` routine the default camera parameter file name is `Data/camera_para.dat`, while the default object file name is `Data/object_data`. The file containing the pattern names and virtual objects is read in with the function call:

```
/* load in the object data - trained markers and associated bitmap files */
if( (object=read_objectdata(odataname,&objectnum)) == NULL ) exit(0);
```

2000 ARToolKit User Documentation at 10.

5. 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 the location recognition tags are formed as one-dimensional or two-dimensional barcode types.

This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional.

It was well known that using additional tags (or "fiducials") would lead to a more accurate estimate of a person's location. This example from Foxlin 03 shows a relatively high density of location tags being used.

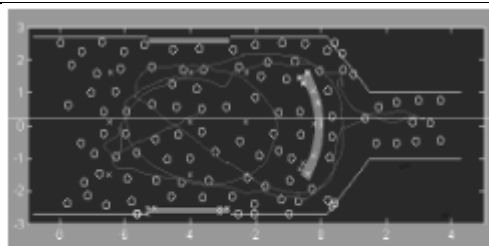
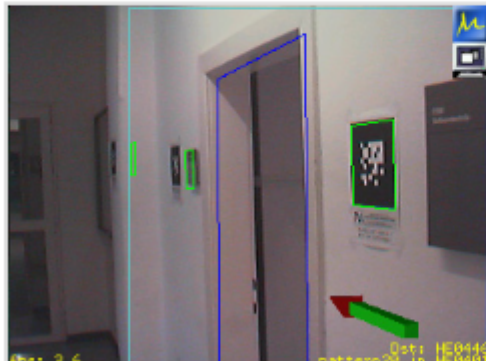
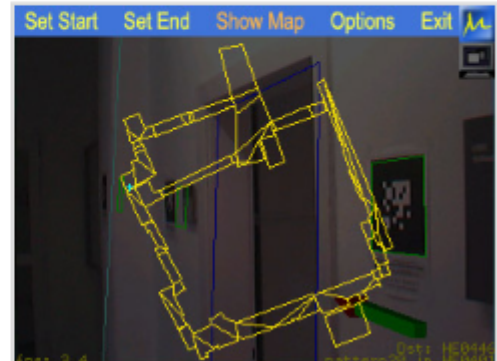


Figure 7: Floor plan showing dimensions of lobby and adjoining tracked corridor in meters. Circles represent fiducials and crosses are certain architectural corner points we surveyed for future testing. The faint wiggly line is the path of the walk-through described below.

Foxlin 03 at 5.

The use of barcodes as location tags was also well-established and standard by the time of the claimed invention. For example, the SignPost project (and many of the other references in Defendants' invalidity contentions) used 2-d bar codes for their location tags:

	Introduction To test our PDA-based augmented reality system with an actual application within the Studierstube framework, we choose to implement a client for the Signpost project. The application guides a user through an unknown building by showing a variety of navigation hints, including a wireframe visualization of the building structure superimposed on the video image. An arrow points in the direction to go (see Figure 1), and a 2D overview map is available too (see Figure 2).  Figure 1: SignPost showing the way.  Figure 2: SignPost Overview map. The green spot marks the current position. Signpost Web Page at 1.
7. 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.	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. Conventional systems at the time of the claimed invention associated tags with particular locations in a coordinate system, such as in the Reitmayr library example below.

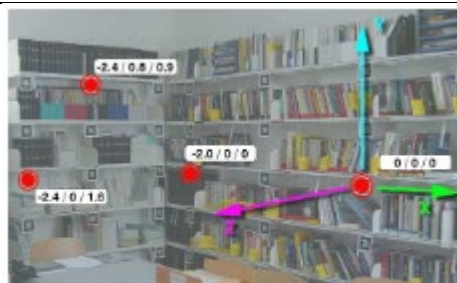


Figure 13: Markers are mounted to the book shelves and registered.

Reitmayr at 8.

The association of tags with coordinate systems was an essential part of the ARToolKit/Kato process for identifying tag and camera location, including as illustrated below.

4.1. Camera Model and Coordinates

The configuration of our system includes only a moving CCD video camera. There are three principal coordinate systems, as illustrated in Figure 4: the world coordinate system W , the camera-centered coordinate system C , and the 2D image coordinate system U .

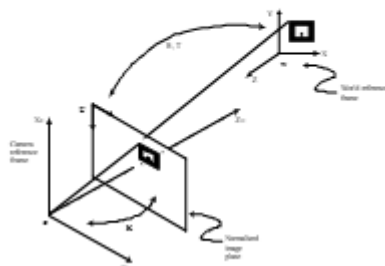
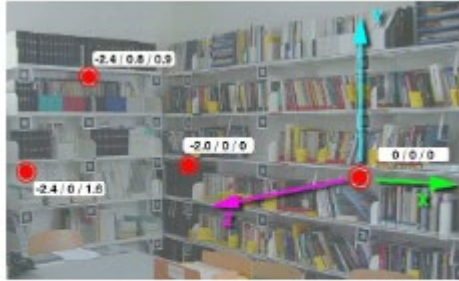


Figure 4. Camera model and the related coordinates systems

Ababsa at 3. Similar teachings appear in a number of prior art references including Kato, Kalkusch, Maeda, and others.

8[pre]. A location recognition device for recognizing a location by using a built-in camera, the location recognition device comprising:	This element was well understood, routine, and conventional for all the reasons shown in Defendants’ invalidity contentions corresponding to this claim. In particular the claim charts corresponding to “List B” for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. This element was well-known and conventional for the same reasons discussed in 1[pre].
[8a] 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;	This element was well understood, routine, and conventional for all the reasons shown in Defendants’ invalidity contentions corresponding to this claim. In particular the claim charts corresponding to “List B” for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. This element was well-known and conventional for the same reasons discussed in 1[a]. Additionally, conventional systems at the time of the claimed invention associated tags with particular locations in a coordinate system, such as in the Reitmayr library example below.  Figure 13: Markers are mounted to the book shelves and registered. Reitmayr at 8. Moreover, the tags went through a digital image process, such as disclosed as to ARToolKit

4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched against some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

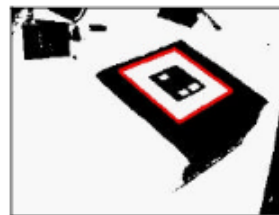


Fig 4: Thresholded Video

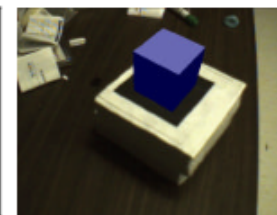
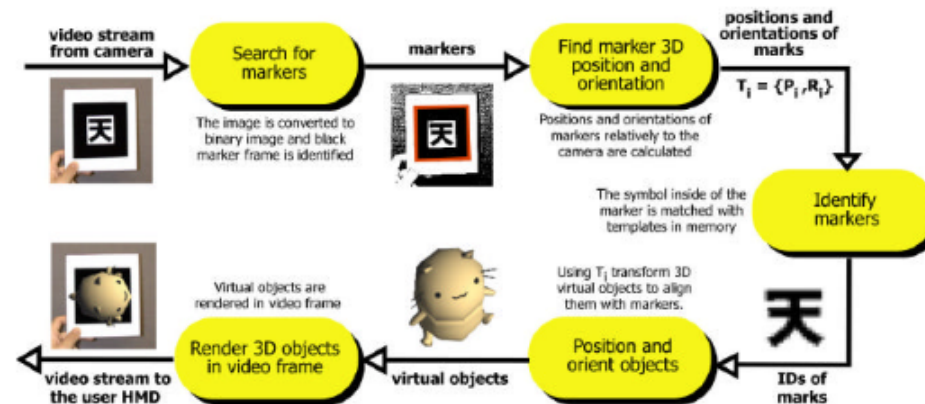


Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

[8b] a distance measuring unit for measuring a distance to the location recognition tag;	This element was well understood, routine, and conventional for all the reasons shown in Defendants’ invalidity contentions corresponding to this claim. In particular the claim charts corresponding to “List B” for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. This element was well-known and conventional for the same reasons discussed in 1[b]. Specifically, as discussed above, the distance from the camera to the tag is determined by performing a conventional mathematical matrix transform on the camera image. This transform process is discussed in detail in Kato (the basis for the conventional ARToolKit software) and in other prior art references including Maeda and Kalkusch.
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4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched again some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

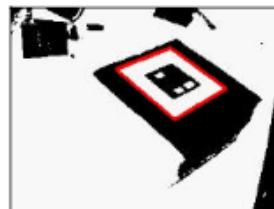
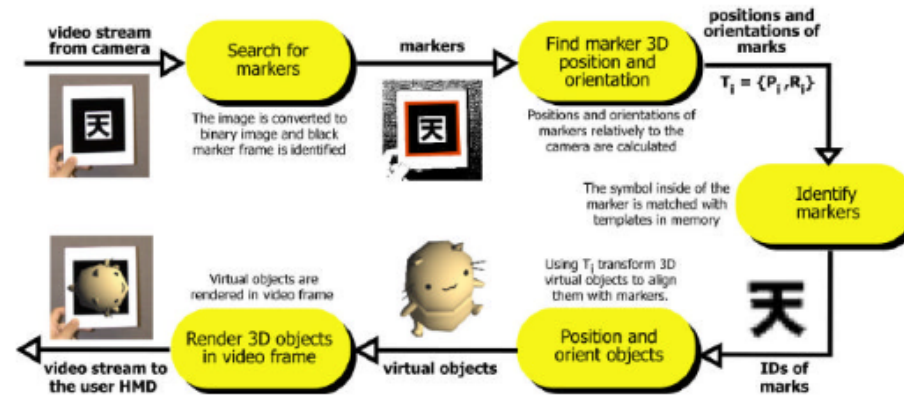


Fig 4: Thresholded Video



Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



Earlier conventional methods for determining distance included using the combination of a camera and a laser-range-finder, such as in Makynen.

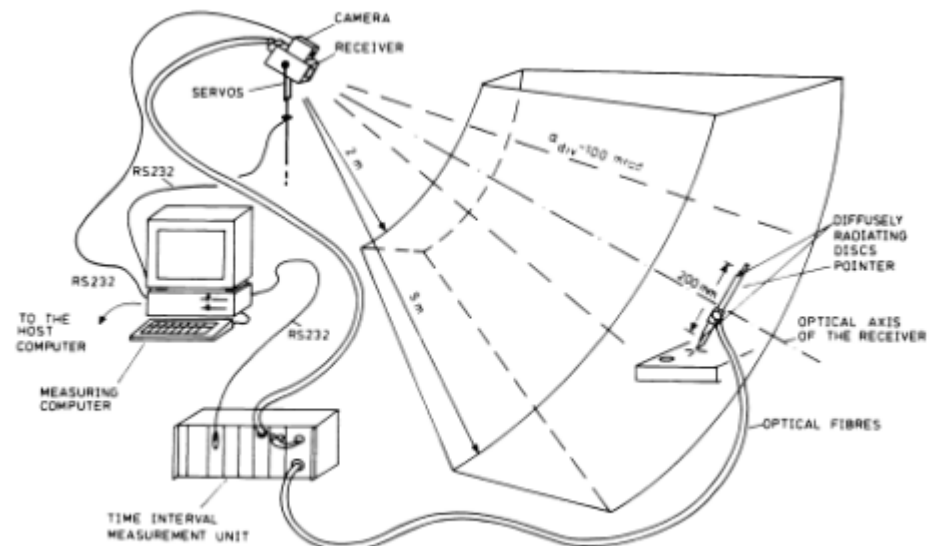


Fig. 1 Overview of the 3-D sensor system.

Makynen at 2.

	3 Construction of the Rangefinder 3.1 Basic Operation Laser rangefinders generally have their transmitter and receiver optics in the same measuring head, and thus the light pulse travels through the air to the object and back. In this application, however, the use of the conventional principle would have led to a complicated transceiver construction. This problem was avoided by using a new method including active targets and a single receiver with a wide field of view (FOV). The transmitted light pulses travel via optical fibers to the pointed arm and are radiated into a wide solid angle towards the receiver. The FOV of the receiver is large enough so that the light transmitted from both of the radiators can be detected simultaneously when the receiver is directed towards the center of the pointer arm. Simultaneous detection of more than one distance can be implemented in pulsed TOF ranging simply by time-gating, which is an obvious advantage with respect to other ranging techniques. Makynen at 3.
[8c] 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	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. This element was well-known and conventional for the same reasons discussed in 1[c] and 1[d]. Specifically, as discussed above, the direction from the camera to the tag is determined by performing a conventional mathematical matrix transform on the camera image. This transform process is discussed in detail in Kato (the basis for the conventional ARToolKit software) and in other prior art references including Maeda and Kalkusch.

4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched again some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3×4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video

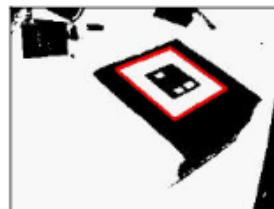
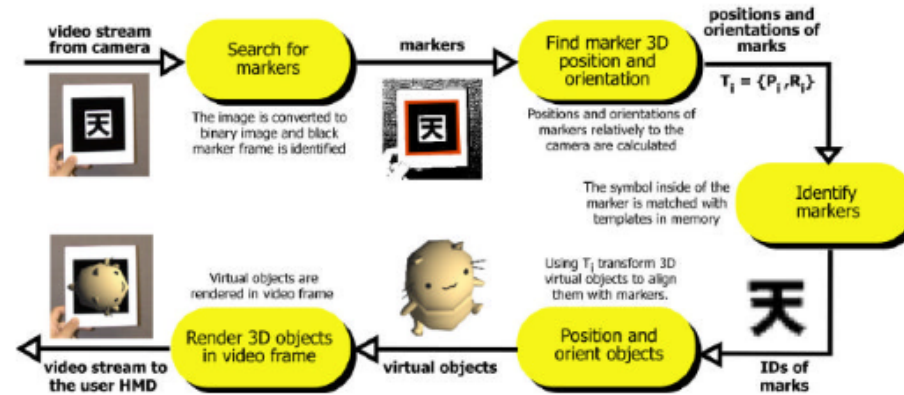


Fig 4: Thresholded Video



Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

[8d] 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.	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. This element was well-known and conventional for the same reasons discussed in 1[e]. Specifically, as discussed above, the direction from the camera to the tag is determined by performing a conventional mathematical matrix transform on the camera image. This transform process is discussed in detail in Kato (the basis for the conventional ARToolKit software) and in other prior art references including Maeda and Kalkusch.
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4 How ARToolKit Works

ARToolKit uses computer vision techniques to calculate the real camera viewpoint relative to a real world marker. There are several steps as shown in figures 3-5. First the live video image (figure 3) is turned into a binary (black or white) image based on a lighting threshold value (figure 4). This image is then searched for square regions. ARToolKit finds all the squares in the binary image, many of which are not the tracking markers. For each square, the pattern inside the square is captured and matched against some pre-trained pattern templates. If there is a match, then ARToolKit has found one of the AR tracking markers. ARToolKit then uses the known square size and pattern orientation to calculate the position of the real video camera relative to the physical marker. A 3x4 matrix is filled in with the video camera real world coordinates relative to the card. This matrix is then used to set the position of the virtual camera coordinates. Since the virtual and real camera coordinates are the same, the computer graphics that are drawn precisely overlay the real marker (figure 5). The OpenGL API is used for setting the virtual camera coordinates and drawing the virtual images.



Fig 3: Input Video



Fig 4: Thresholded Video

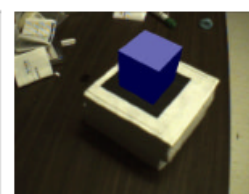
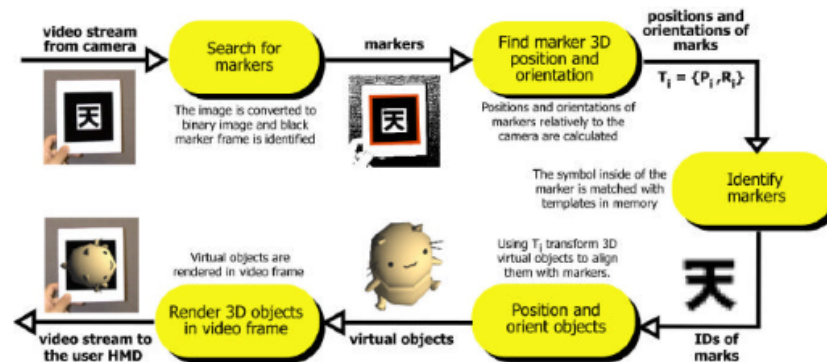


Fig 5: Virtual Overlay

The diagram below shows the image processing used in ARToolKit in more detail.



2000 ARToolKit User Documentation at 8.

10. The location recognition device of claim 8, further comprising a tag location information storage unit

This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and

for storing location coordinate information of a location of the location recognition tag, and logic location coordinate information corresponding to the location coordinate information.

conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional.

This element was well-known and conventional for the same reasons discussed for claim 5. Examples of coordinate information being stored include Reitmayr and Absasa.

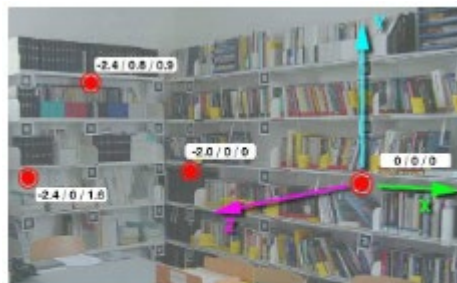
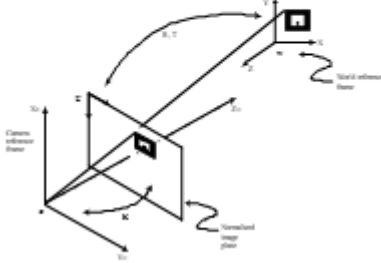


Figure 13: Markers are mounted to the book shelves and registered.

Reitmayr at 8.

	4.1. Camera Model and Coordinates The configuration of our system includes only a moving CCD video camera. There are three principal coordinate systems, as illustrated in Figure 4: the world coordinate system W, the camera-centered coordinate system C, and the 2D image coordinate system U.  Figure 4. Camera model and the related coordinates systems Ababsa at 3.
11. 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.	This element was well understood, routine, and conventional for all the reasons shown in Defendants' invalidity contentions corresponding to this claim. In particular the claim charts corresponding to "List B" for this element show that it was well understood, routine, and conventional at the time of the claimed invention. Those contentions and the charts for the List B references are hereby incorporated by reference. In addition, the following are particular examples of how this element was well understood, routine, and conventional. For example, the Signpost Web Page shows information about a location tag being transmitted to a computer.

9/18/24, 3:01 PM

Handheld Augmented Reality



Figure 3: SignPost setup.

Signpost Web Page at 2.

Similarly, Wagner (which was a signpost implementation) described server-assisted tracking:

3.5. Server-assisted optical tracking ARToolKit is intrinsically CPU intensive which generally is a serious problem for a low-power platform such as the PocketPC and can not be completely solved by applying optimizations. We implemented a tracking server that runs on a workstation (a 2.4GHz PC). The mobile client uses WLAN to send frame analysis requests to the server.

A 320x240x24bit RGB image has a size of 225Kb which too large for a fast service request. However, for tracking-only purposes, a full color video is not necessary. After applying a black/white thresholding followed by a 1-bit RLE compression the image size is reduced to 2-4 Kbytes, which easily fits the available WLAN bandwidth (theoretically up to 300 fps can be transmitted over 802.11b). Performing this simple compression has negligible overhead on the PDA (see the results section for detailed performance analysis). We transmit the compressed video using a low latency UDP based protocol, because the frequent updates make reliable transmission unnecessary. The server decompresses the image and passes it on to ARToolKit for analysis. The resulting transformation matrix and the index of the best recognized marker are sent back to the client. Wagner alone and Wagner/Kalkusch together expressly or inherently disclose or render obvious “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.” Wagner at 5. In any event, processing information on a server rather than a local device was a very well-known technique at the time of the claimed invention.
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