

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Amazon.com, Inc. and Amazon.com Services LLC,
Petitioner

vs.

LightGuide, Inc.,
Patent Owner

IPR2023-01423
U.S. Patent No. 10,528,036

PETITION FOR *INTER PARTES* REVIEW

Mail Stop Patent Board
Patent Trial and Appeal Board
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

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<i>Samsung Electronics America v. Prisia Engineering</i> , 948 F.3d 1342 (Fed. Cir. 2020)	7
<i>Supercell Oy v. Rothschild Digital Media Innovations, LLC</i> , No. C15-1119JLR, 2016 WL 9226493 (W.D. Wash. July 28, 2016)	74

PETITIONER’S EXHIBIT LIST

Petitioner Ex. No.	Description
1001	U.S. Patent No. 10,528,036 (cited as ’036 patent)
1002	Prosecution history to ’036 patent
1003	Declaration of William Singhose (technical expert) re: ’036 patent (cited as “Singhose”)
1004	<i>Curriculum Vitae</i> of Dr. William Singhose
1005	Rick Kjeldsen et al., <i>Interacting with Steerable Projected Displays</i> (in Proc. of 5 th Int’l Conf. on Automatic Face and Gesture Recognition (May 20-21, 2002)) (downloaded from https://web.archive.org/web/20050410205612/http://www.research.ibm.com/ed/publications/fg02.pdf) (cited as “Kjeldsen”)
1006	Claudio Pinhanez et al., <i>Ubiquitous Interactive Graphics</i> (dated May 17, 2002, downloaded from https://web.archive.org/web/20060208095408/http://www.research.ibm.com/ed/publications/rc22495.pdf) (cited as Pinhanez-I)
1007	Declaration of Nathaniel E. Frank-White of the Internet Archive
1008	Declaration of James Mullins (library practices and public availability expert) re: availability of prior art.
1009	Declaration of Rick Kjeldsen
1010	U.S. Patent No. 6,833,863
1011	RESERVED
1012	Docket Control Order Granting Joint Motion for Entry of Proposed Docket Control Order, D.I. 62 in <i>LightGuide, Inc. v. Amazon.com, Inc., et al.</i> , Case No. 2:22-CV-00433-RWS-RSP (E.D. Texas)

1013	Case Docket for <i>Amazon.com, Inc., et al. v. LightGuide, Inc.</i> , Case No. 2:23-cv-00053-JHC (W.D. Wa.)
1014	Claudio Pinhanez et al., <i>Applications of Steerable Projector-Camera Systems</i> (in Proc. Of ICCV Workshop on Projector-Camera Systems (PROCAMS'03)) (cited as Pinhanez-II)
1015	Claudio Pinhanez and Gopal Pingali, <i>Projector-camera Systems for Telepresence</i> (in Proc. of the 2004 ACM SIGMM Workshop on Effective Telepresence) (cited as Pinhanez-III)
1016	Tamotsu Machino et al., <i>Robot-Augmented Communication: A Remote-collaboration System based on a Shared Field of View in Real Space</i> (in Proc. of 2005 IEEE Int'l Conference on Robotics & Automation) (cited as Machino-I)
1017	Tamotsu Machino et al., <i>Remote-Collaboration System using Mobile Robot with Camera and Projector</i> (in Proc. of the 2006 IEEE Int'l Conf. on Robotics and Automation) (cited as Machino-II)
1018	Tetsuo Iyoda et al., <i>LightCollabo: Distant Collaboration Support System for Manufacturers</i> (in Proc. of 14th Int'l Multimedia Modeling Conference (2008)) (cited as Iyoda)

I. INTRODUCTION

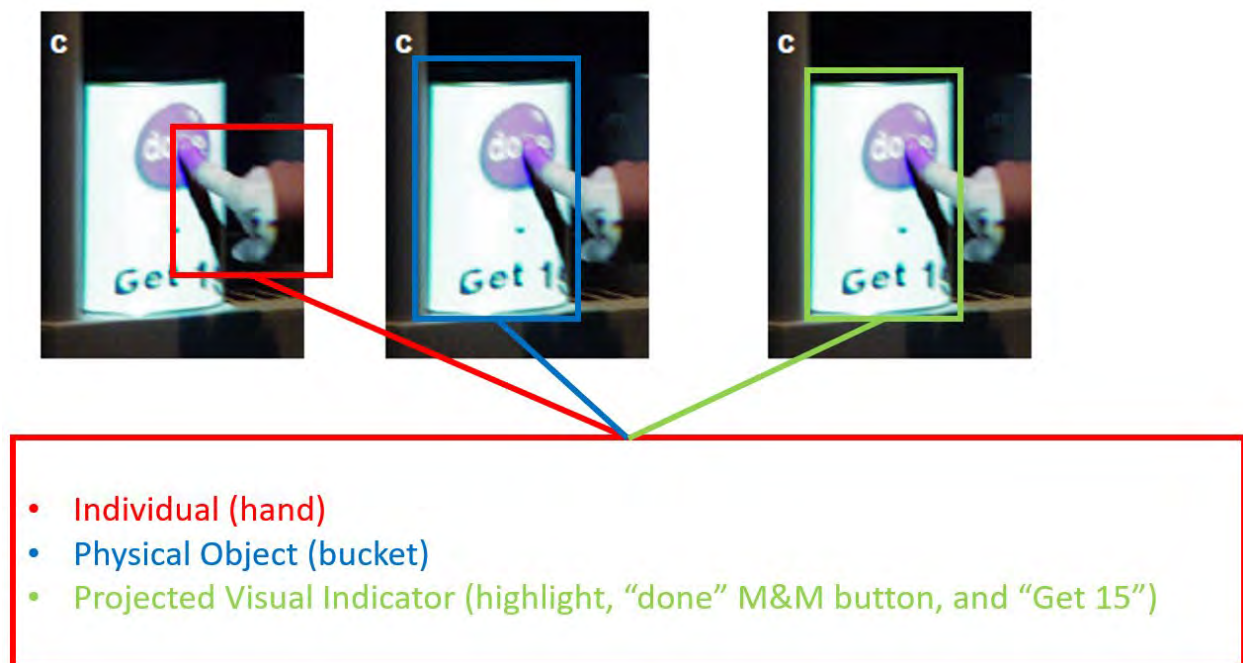
Petitioners Amazon.com, Inc. and Amazon.com Services LLC (collectively, “Amazon” or “Petitioner”) request *inter partes* review and cancellation of Claims 1-12 (“the challenged claims”) of U.S. Patent No. 10,528,036 (Ex. 1001, “the ’036 patent”), assigned to LightGuide, Inc. (“LightGuide”).

The ’036 patent purports to describe advances to an earlier LightGuide patent, U.S. Patent No. 7,515,981, which describes using a sensor and a projector to guide the actions of individuals. ’036 patent at 5:43-47. The claims of the ’036 patent further combine the ’981 patent technology with a camera and a remote monitor.

During prosecution, the claims of the ’036 patent were initially rejected in view of a prior art reference that combined a projection system with a camera. Ex. 1002 (’036 prosecution history at 120). In response, LightGuide added new claims that required the camera “to capture an image of at least the individual, the physical object and [a] visual indicator.” *Id.* at 346-347 (application claims 4 and 10). The examiner indicated that such claims would be allowable, *id.* at 354, and similar language appears in the issued claims, which contains a wherein clause requiring that *imaging, by the camera, captures images of at least the individual being guided, the physical object and the projected visual indicator.* *Id.*; see also Ex. 1003 (Singhose Decl., hereinafter “Singhose”) ¶¶ 42-45.

However, the most relevant and material prior art was not reviewed by the examiner. This Petition is based on multiple prior art projector-camera references expressly teach or suggest the camera imaging limitation relied on by LightGuide for claim allowance. This Petition shows specifically why the '036 patent should not have been issued over this far more material prior art.

For example, the Kjeldsen reference (Ex. 1005) contains camera images of an individual being guided by a projection, such as the annotated figure below showing an image—“from system camera”—of an individual being guided to push a virtual button after collecting items from a bin:



Kjeldsen Fig. 2c (annotated). A video capture taken by Kjeldsen’s camera is attached as Exhibit 1007 part B-1, which provides additional context for this image.

The remainder of Amazon's Petition shows why the concept of a projector - camera system that captures the claimed images and displays them on a remote monitor would have been obvious to a POSITA in 2011. The Petition references are all closer prior art to the claims than any that were before the examiner during prosecution and are dated more than a year before the February 2011 earliest filing date of the '036 patent. There are no issues relative to the publication or public availability of these documents, as described in the accompanying declarations of (1) Kjeldsen himself, (2) librarian James Mullins, and (3) a declaration from Archive.org. Additionally, no other IPRs have been filed against the '036 patent. Finally, the *Fintiv* factors do not counsel in favor of denial, as discussed below.

Petitioner accordingly requests that the Board institute *inter partes* review, hold the challenged claims unpatentable, and cancel the challenged claims.

II. IDENTIFICATION OF CHALLENGES AND REQUESTED RELIEF

Petitioner requests *inter partes* review and cancellation of claims 1-12 (all claims) of the '036 patent.

Challenge #1: Claims 1-12 are obvious under (pre-AIA) 35 U.S.C. §103 over the combination of Kjeldsen (Ex. 1005) with Pinhanez-III (Ex. 1015).

Interacting with Steerable Projected Displays ("Kjeldsen") is an article published in 2002 in the Proceedings of the 5th International Conference on Automatic Face and Gesture Recognition (FG'02). *Projector-camera Systems for*

Telepresence (“Pinhanez-III”) was written in 2004 by Claudio Pinhanez and Gopal Pingali, both of whom were co-authors on the Kjeldsen paper. Kjeldsen and Pinhanez-III were publicly available because they were stored, catalogued, and made available for review by libraries and were cited in research papers well before the earliest priority date of the ’036 patent. Declaration of Librarian James Mullins, PhD. (Ex. 1008, “Mullins”) ¶¶ 45-65, 113-150. The Declaration of Rick Kjeldsen (Ex. 1009) ¶¶ 2-4 and the Internet Archive Declaration (Ex. 1007) at 1-2 and 72-78 also support public availability of Kjeldsen. Thus, Kjeldsen and Pinhanez-III are prior art to the ’036 patent under pre-AIA 35 U.S.C. §§ 102(a) and (b).

Challenge #2: Claims 1-12 are obvious under (pre-AIA) 35 U.S.C. §103 by Kjeldsen and Pinhanez-III in view of Pinhanez-I (Ex. 1006).

Ubiquitous Interactive Graphics (“Pinhanez-I”) is an IBM Research Report that was published and made publicly available by the latest 2003, more than a year before the ’036 patent’s earliest effective filing date. Kjeldsen Decl. (Ex. 1009) ¶¶ 2-3, 5. Pinhanez-I was also cited by other authors years before the earliest priority date of the ’036 patent, which also establishes its public availability. Mullins, ¶¶ 65-87. The Internet Archive Declaration (Ex. 1007) at 1-2 and 51-62 confirms that Pinhanez-I was publicly available several years before the earliest priority of the ’036 patent. Thus, Pinhanez-I is prior art under (pre-AIA) 35 U.S.C. §102(a) and (b).

Challenge #3: Claims 3, 6, 9, and 12 are obvious under (pre-AIA) 35 U.S.C. §103 by Kjeldsen and Pinhanez-III in view of Pinhanez-II (Ex. 1014).

Applications of Steerable Projector-Camera Systems (“Pinhanez-II”) was made publicly on the Internet and in the Proceedings of the ICCV Workshop on Projector-Camera Systems in 2003, more than a year before the ’036 patent’s earliest effective filing date as shown by the declaration of one of its co-authors, Rick Kjeldsen. Kjeldsen Decl. ¶¶ 2-3, 6. The Mullins Declaration confirms that Pinhanez-II was publicly available because it was cited by other authors long before the earliest priority of the ’036 patent. Mullins ¶¶ 88-112. The Internet Archive Declaration (Ex. 1007) at 1-2 and 63-71 also supports the authenticity and pre-2010 publication of Pinanez-II. Thus, Pinhanez-II is prior art under (pre-AIA) 35 U.S.C. §102(a) and (b).

Challenge #4: Claims 1-12 are obvious under (pre-AIA) 35 U.S.C. §103 over Machino-I and Machino-II.

Robot-Augmented Communication: a Remote-collaboration System based on a Shared Field of View in Real Space (Ex. 1016, “Machino-I”) is an article published in 2005 in the proceedings of the 2005 IEEE/RSJ International Conference on Intelligent Robots and Systems. *Remote-Collaboration System Using Mobile Robot with Camera and Projector* (Ex. 1017, “Machino-II”) was published in 2006 in the proceedings of the 2006 IEEE International Conference on Robotics and

Automation, and shares the same six authors as Machino-I. Machino-I and Machino-II are authentic and were publicly available because they were stored, catalogued, and made available for review by libraries and were cited in research papers well before the earliest priority date of the '036 patent. Mullins ¶¶ 151-212. Additionally, Machino-II was cataloged and available for download from IEEE Xplore as of 2006. *Id.* at ¶ 196. Thus, Machino-I and Machino-II are prior art to the '036 patent under at least pre-AIA 35 U.S.C. §§ 102(a) and (b).

III. LEVEL OF ORDINARY SKILL IN THE ART

The level of ordinary skill in the art may be reflected by the prior art of record. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). Here, the POSITA is someone who would have had at least a four-year degree in electrical engineering, mechanical engineering, computer science, or a closely related field, and at least a year of experience working in interactive computer applications with integrated cameras. Singhose, ¶¶ 46-52. Lack of work experience can be remedied by additional education, and vice versa. *Id.*, ¶ 46. Specific experience with projected light is not required since, by 2011, projecting light was a routine step that used essentially the same tools as any other display output. However, experience with laser projection would be a plus, as many prior art light-guided assembly tools used laser projection. *Id.*

IV. CLAIM CONSTRUCTION

Claim construction is required “[w]hen the parties present a fundamental dispute regarding the scope of a claim term.” *O2 Micro Intern. Ltd. v. Beyond Innovation Tech. Co.*, 521 F.3d 1351, 1362-63 (Fed. Cir. 2008). Here, the prior art at issue in this IPR does not present any such fundamental dispute, and thus no construction is required here (although it may be required in the district court). *Singhose* ¶¶ 54-56.

Amazon anticipates that it will argue that claims 1 and 7 are indefinite as to the terms “proximate to” and “located remotely,” and that at least claims 2-6, 11, and 12 are also indefinite. However, such issues do not bar *inter partes* review of the claims at issue unless the indefiniteness renders such a determination impossible. *Samsung Electronics America v. Prisia Engineering*, 948 F.3d 1342, 1355 (Fed. Cir. 2020) (“Even though the validity of the challenged claims may be subject to question for . . . indefiniteness, . . . [i]t does not necessarily preclude the Board from addressing the patentability of the claims on section 102 and 103 grounds.”); *Intel Corp. v. Qualcomm Inc.*, 21 F.4th 801, 812-813 (Fed. Cir. 2021).

V. THE ’036 CLAIMS ARE UNPATENTABLE OVER THE NEW AND HIGHLY MATERIAL PRIOR ART

A. Challenge 1: Claims 1-12 are obvious over the combination of Kjeldsen and Pinhanez-III

1. Claim 1

[1.0] “A method of projecting visual indicators to guide actions of an individual for a particular guided operation, said method comprising:”

To the extent the preamble is limiting, it is taught by Kjeldsen.

Kjeldsen concerns an IBM research prototype called the Everywhere Displays projector (“ED-projector”). Singhose ¶¶ 57-58. The system included a camera and a projector connected via one or more host computers. The ED-projector was “steerable,” meaning the projector and camera could be rotated to point at various locations. The system could project images, detect how users interacted with those images, and project new images in response. For example, if a user “pressed a button” that the system had projected on a wall, the ED-projector could detect the interaction and react to it, for example, by displaying a new image. A picture of a prototype ED-projector is shown below:



Kjeldsen, Fig. 1.

Kjeldsen also describes a proof-of-concept demonstration for the ED-projector. The demonstration occurred over several days at the SIGGRAPH'01 conference in Los Angeles in 2001.¹ *Id.* at 2. The demonstration involved “an augmented reality assembly task” where, “[a]s in any assembly task, each individual contributes to the assembly of an object by executing specific parts of the assembly process.” *Id.* Over 650 people participated in the demonstration. *Id.* at 5. The task involved assembling “a 60x50 picture made of M&M’s . . . where each M&M is regarded as a ‘pixel’ of the picture.” *Id.* at 2; Singhose ¶¶ 59-71.

Kjeldsen discloses the preamble as follows. The ED-projector is a tool for *projecting visual indicators*. Kjeldsen discloses using the ED-projector to “guid[e] several hundred first-time users through an assembly task.” Kjeldsen at 6; *see also id.* at Abstract (“We demonstrated the validity of our approach through an experiment involving hundreds of users interacting with projected interfaces.”) Some of these projected instructions are shown below:

¹ Further information about SIGGRAPH'01 appears in Ex. 1007 at 6-8 and Singhose ¶¶ 59-67. Exhibit 1007-B1 is a video taken by the ED-projector at SIGGRAPH'01.

Projected instructions (visual indicators to guide actions of an individual for a particular guided operation)

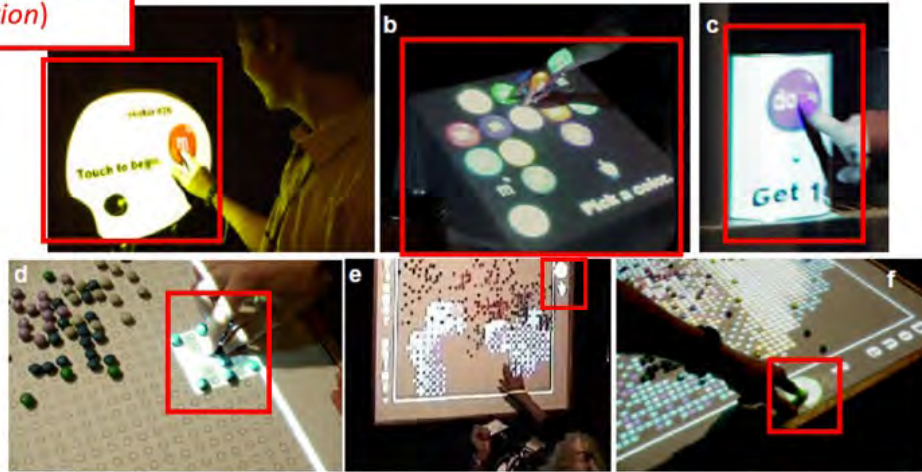


Fig. 2: Steps followed by each user when placing the M&M's in the SIGGRAPH'01 demo: a) the entrance panel is touched to start the process; b) a color is selected; c) the bucket containing the selected color is projected upon and the "done" button bucket is touched after the M&M's are picked up; e) the user places the M&M's on highlighted pixels; e) finger-painting to reveal the full image; and f) a "yes" button is touched after all interaction is done. (c&e from system camera)

Kjeldsen, Fig. 2 (annotated). These images are examples of *projecting visual indicators to guide actions of an individual for a particular guided operation*.

Singhose, ¶¶ 117-121.

Thus, Kjeldsen discloses [1.0].

[1.1] “projecting a visual indicator using a directional light device onto a physical object associated with the particular guided operation;”

As shown for [1.0], Kjeldsen discloses *projecting a visual indicator* using the ED-projector. Kjeldsen explains, “The ED-projector is composed of **an LCD projector, a computer-controlled pan/tilt mirror**, and a pan/tilt/zoom camera.”

Kjeldsen at 1 (emphasis added). The LCD projector and the pan/tilt mirror are the claimed *directional light device*, as shown below:



Fig. 1: Two prototypes of the Everywhere Displays projector.

Kjeldsen, Fig. 1 (annotated); Singhose, ¶ 123.

Kjeldsen discloses using the ED-projector in *projecting a visual indicator . . . onto a physical object associated with the particular guided operation*, as shown below:

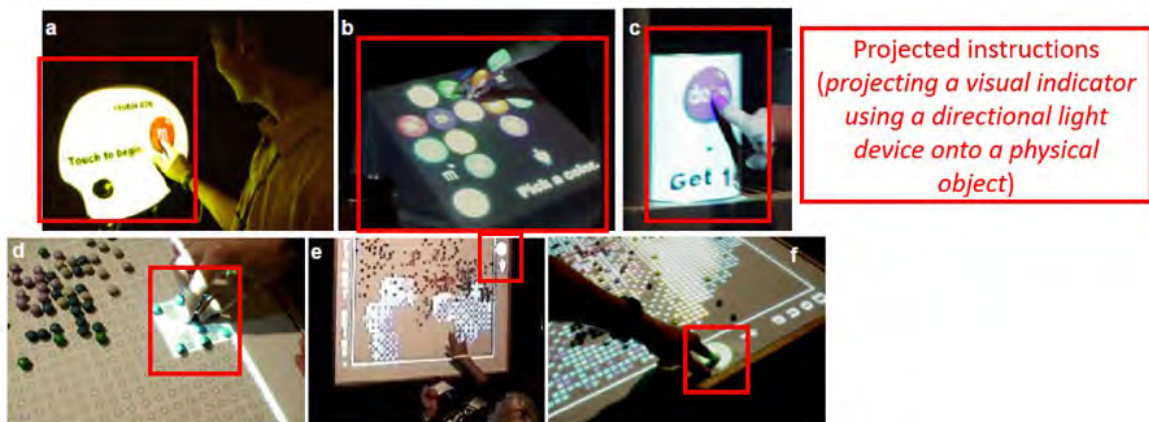


Fig. 2: Steps followed by each user when placing the M&M's in the SIGGRAPH'01 demo: a) the entrance panel is touched to start the process; b) a color is selected; c) the bucket containing the selected color is projected upon and the "done" button bucket is touched after the M&M's are picked up; e) the user places the M&M's on highlighted pixels; e) finger-painting to reveal the full image; and f) a "yes" button is touched after all interaction is done. (c&e from system camera)

Kjeldsen, Fig. 2 (annotated); Singhose, ¶ 122. Each of these *visual indicator(s)* satisfies limitation [1.1] as follows:

Figure 2(a) shows “the image of an M&M projected on the painter’s palette with the instruction ‘Touch to begin.’” Kjeldsen at 2. The painter’s palette is the *physical object* and is associated with the *particular guided operation* of building the M&M artwork, including the *particular guided operation* of touching the M&M projection to “start the process.” *Id.*; Singhose, ¶ 122.

Figure 2(b) shows a “foam-covered-board where images of different colored M&Ms are projected along with the invitation ‘Pick a color.’” Kjeldsen at 2. The “foam-covered-board” is another *physical object associated with the particular guided operation* of building the M&M artwork, including the *particular guided operation* of selecting a color from a set of colors to use in building the M&M artwork. Singhose, ¶ 122.

Figure 2(c) shows how the ED projector “highlights the bucket that contains the M&Ms of that color.” Kjeldsen at 2. The *visual indicator* includes the “message ‘Get n,’ (where n is the number of M&Ms to be picked up from the bucket).” *Id.* at 2-3. A further *visual indicator* is a “button with the word ‘done’ on it, i.e., an image of an M&M underlined by a pointing finger.” *Id.* at 3. The *physical object* is the bucket containing M&M’s and is *associated with the particular guided operations* of: (1) building the artwork; and (2) selecting a certain number of M&M’s and

pressing the word “done” when M&M’s are collected and are ready to be added to the artwork. Singhose, ¶ 122.

Figure 2(d) shows a projection that “indicates the precise location where the M&M’s should be placed by projecting an image of the target locations on the canvas.” Kjeldsen at 3. The ED-projector “also displays the instructions ‘Place the M&M’s,’ and ‘Done?’ and an M&M button labeled ‘yes’.” *Id.* The *physical object associated with the particular guided operation* is the canvas (including any already-placed M&M’s). The *guided operation* includes the steps of putting the M&M’s on the canvas in the positions indicated and selecting the “done” button to indicate that they have been placed. Singhose, ¶ 122.

Figures 2I and 2(f) show additional steps of *projecting a visual indicator* when “the user is invited to ‘Finger paint’” to reveal the rest of the image. Kjeldsen at 3. “The vision system tracks the position of the user’s hand and fills in circles of the appropriate color in the vicinity of the fingertip, interactively completing the picture.” *Id.* The *physical object* includes the canvas and any already-placed M&M’s, both of which are *associated with the guided operation* of building the M&M artwork. When finished, “the user can stop this activity by touching the ‘yes’ button to the right of the image.” Kjeldsen at 3. In this last step, the “yes” button is a claimed *visual indicator* and the canvas is a *physical object* associated with the guided operation of building the M&M artwork. Singhose, ¶ 122.

Thus, Kjeldsen discloses [1.1]. Singhose, ¶ 124.

[1.2] “*imaging the projected visual indicator with a camera located proximate to the directional light device;*”

As shown for [1.0] and [1.1], Kjeldsen discloses *projected visual indicators*. Kjeldsen also discloses a device (the ED-projector) in which “[t]he camera is located adjacent to the mirror assembly.” Kjeldsen at 3. This discloses the *camera located proximate to the directional light device* because it teaches that the camera is adjacent (i.e., immediately next to) the projector and/or the mirror (*directional light device*). Singhose, ¶ 125.

Confirming that the camera and projector are adjacent (i.e., next to one another, or *proximate*), Kjeldsen shows that the camera and projector are both part of the same device, and depicts them very close together:

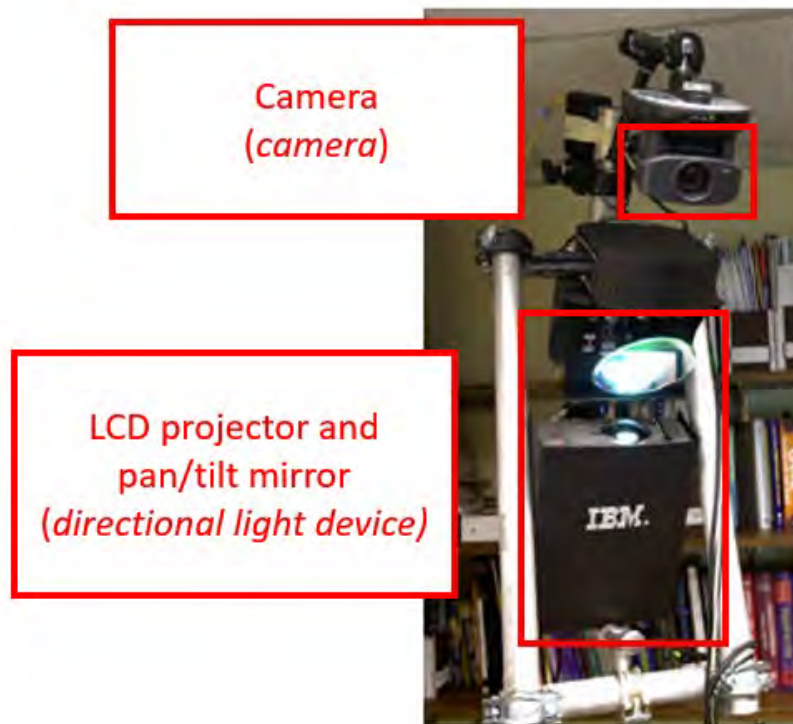


Fig. 1: Two prototypes of projector.

Kjeldsen Fig. 1; *see also id.* at 1 (“The ED-projector is composed of an LCD projector, a computer-controlled pan/tilt mirror, and a pan/tilt/zoom camera.”). Thus, while Amazon will argue in related litigation that the term “proximate to” is indefinite, this claim term is taught by Kjeldsen, which describes the camera and projector devices as “adjacent,” and depicts them co-located in the same device, very close together. Kjeldsen thus discloses *a camera located proximate to the directional light device*. Singhose, ¶ 125.

Kjeldsen also discloses that “[a] user’s interactions with the Everywhere Display are detected with a single pan/tilt/zoom camera ***that is steered to follow the projected image.***” Kjeldsen at 3 (emphasis added). This is a teaching of

imaging the projected visual indicator using the claimed camera. Singhose, ¶ 126.

Kjeldsen Figures 2I, 2I, and 4 are all examples of pictures of a projected visual indicator taken by the ED-projector system camera.

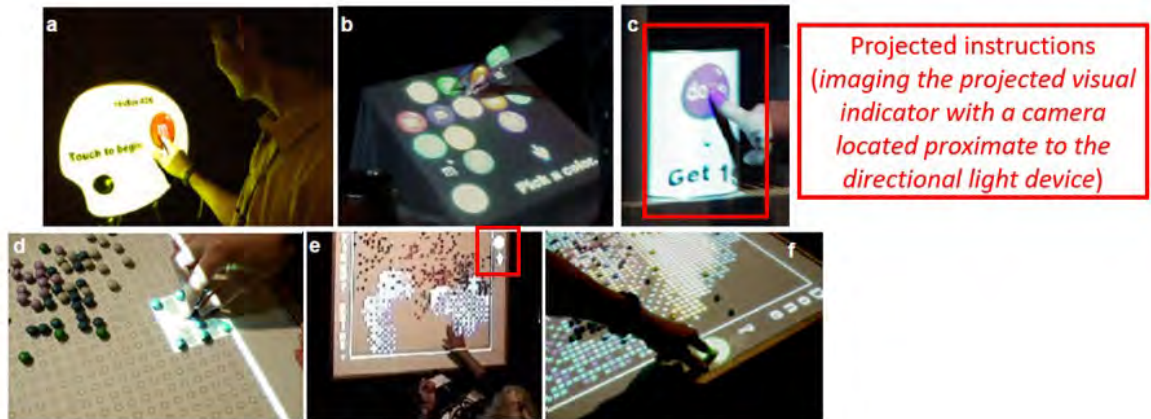


Fig. 2: Steps followed by each user when placing the M&M's in the SIGGRAPH'01 demo: a) the entrance panel is touched to start the process; b) a color is selected; c) the bucket containing the selected color is projected upon and the "done" button bucket is touched after the M&M's are picked up; e) the user places the M&M's on highlighted pixels; e) finger-painting to reveal the full image; and f) a "yes" button is touched after all interaction is done. (c&e from system camera)

Id. at 2; Singhose, ¶ 127.

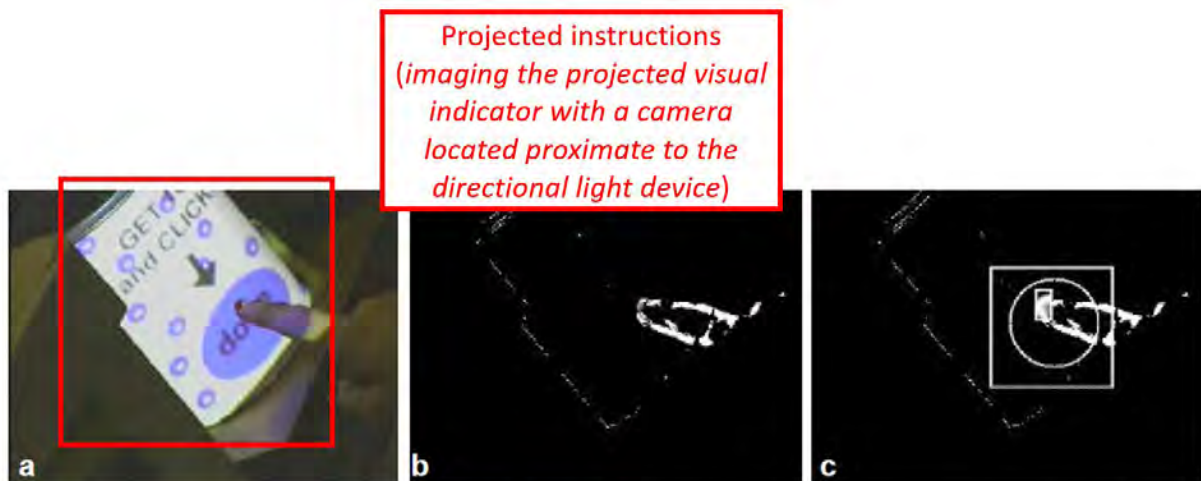


Fig. 4. a) Camera view of an interaction with a bucket; b) image difference data; c) overlay of search region (square), button active area (circle), and the fingertip template shown at the pointing location.

Id. at 4; Singhose, ¶ 127. As underlined, Kjeldsen explains that Figure 2 shows images "c&e from system camera" and that Figure 4(a) is a "[c]amera view of an

interaction with a bucket,” showing that these images were all taken by *a camera located proximate to the directional light device*.

Thus, Kjeldsen discloses [1.2]. Singhose, ¶ 128.

[1.3] “transmitting images from the camera to a monitor located remotely from the directional light device; and displaying images from the camera on the monitor;”

The Kjeldsen/Pinhanez-III combination renders obvious this element. Kjeldsen reports that “[t]he camera video stream was recorded onto tape and the users’ selections were logged.” Kjeldsen at 5. The existence of camera videos,² and the use of those videos in a follow-up study of gesture detection accuracy, Kjeldsen at 5, support a strong inherent anticipation or single-reference obviousness argument that Kjeldsen discloses or renders obvious the *transmitted from the camera to a monitor* limitation. In this Petition, however, Amazon presents an obviousness combination based on the combination of Kjeldsen with Pinhanez-III, another ED-projector reference that expressly discloses [1.3].

² The Internet Archive Declaration (Ex. 1007) at page 6 and Exhibit B-1 show that a video from the M&M exhibition camera was made available for display over the Internet.

Pinhanez-III (Ex. 1015) is a 2004 reference concerning remote transmission of information to and from the ED-projector. Ex. 1015 at 3 (“This demonstration uses a steerable projector-camera system – the Everywhere Display – in a local environment and provides a control interface to a user in a remote environment.”); Singhose ¶¶ 83-91, 130. Pinhanez-III explains how to adapt systems like the ED-projector so that “[a] user at a remote site can view the local environment through video from the remote camera.” *Id.*; see also *id.* at Abstract (“Projector-camera systems have the potential . . . to allow remote individuals to view each other’s environments”). Accordingly, Pinhanez-III expressly discloses [1.3], as illustrated below:

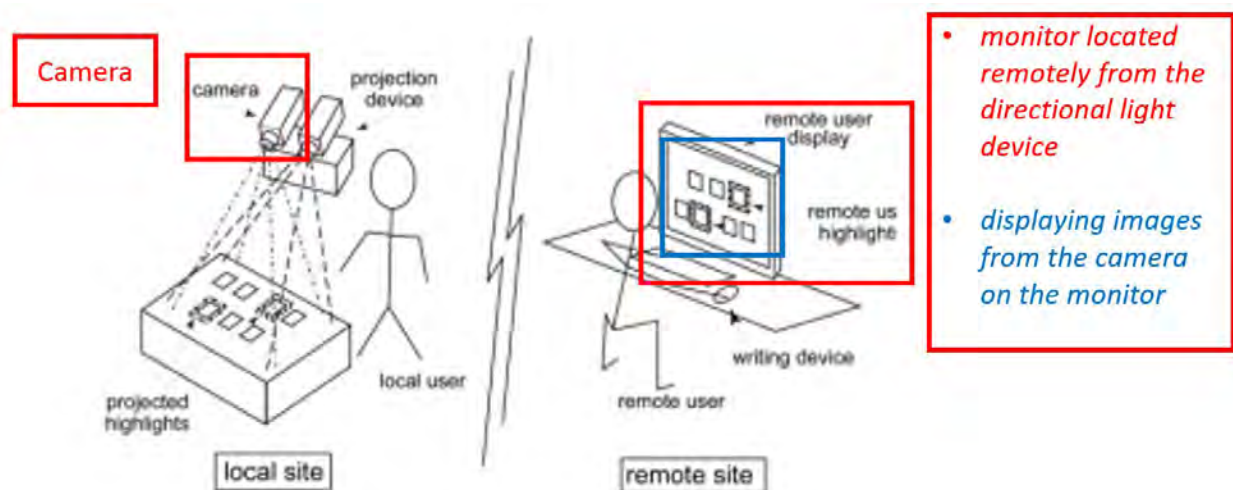


Figure 1. Overview of using a projector-camera system in a telepresence application.

Ex. 1015, Fig. 1 (annotated); Singhose, ¶¶ 84, 131. This figure shows all the requirements of [1.3]—a camera and a projection device (*directional light device*) at

the local site sending images of a tabletop from the camera to a remote user display (*monitor*) that displays said images. Singhose, ¶ 132.

It would have been obvious to a POSITA to combine Kjeldsen with Pinhanez-III's disclosure of transmitting images from the camera to a remote display for several reasons.

First, both references concern the same ED-projector system. Pinhanez III was written by two of Kjeldsen's co-authors (Pinhanez and Pingali) who worked together at IBM Research on the ED-projector with the other Kjeldsen co-authors. Singhose, ¶¶ 105, 113-114. Moreover, Pinhanez-III contains an express suggestion that the initial work on the Everywhere Displays projector should be extended to include remote display capabilities. Pinhanez-III at 2-3 ("While previous work on the camera-projector systems and steerable interfaces has been primarily focused on local augmentation, we begin to explore its potential in telepresence or remote augmentation here"); Singhose, ¶ 107, 114. Moreover, Pinhanez-III provides a motivation for using the ED-projector disclosed in Kjeldsen with a remote display, explaining that "[p]rojector-camera systems have the potential not only to allow remote individuals to view each other's environments but also to communicate in new ways by overlaying and embedding information and visualizations on real objects and surfaces in the remote environment." Pinhanez-III at 1. Thus, a POSITA would have readily understood to combine Kjeldsen with Pinhanez-III because they

were written by the same team, concern the same basic system, and Pinhanez-III provides for a new use case of the technology described in Kjeldsen. Singhose, ¶¶ 105-107.

Second, the example in Pinhanez-III Figure 1—of a camera and remote monitor working together to remotely display visual indicators from a tabletop surface (as shown in Pinhanez-III) —is directly applicable to the tabletop display used in Kjeldsen to hold the M&M artwork and to receive images of where the M&M’s should go. Singhose, ¶ 106. Specifically, Kjeldsen reveals that certain errors by the vision system, such as “false positive button presses [on the selection screen,] are very disruptive to the demo.” Kjeldsen at 4. Kjeldsen discusses software fixes to adjust the “inherent tradeoffs in the recognition system,” *id.* at 4-5, and also explains that “[s]ince most of our users were confronting a novel interaction paradigm, we were not shy of giving them instruction as needed,” *id.* at 5. Given these disclosures—of an ongoing study that needed both software fixes and human instruction in real time—it would have been obvious to a POSITA that the remote monitor and instruction capabilities from Pinhanez-III would have benefited the scenario disclosed in Kjeldsen, by allowing a team to observe the study remotely, give live instruction to the subjects, and make ongoing improvements to the system. Singhose, ¶¶ 110-112. The technology shown in Pinhanez-III allowing for the remote user to draw images for projection would be particularly useful in giving

instructions in real time. See Pinhanez-III Fig. 4 (projection timer and hand-drawn circle projected under the direction of the remote user); Singhose, ¶¶ 107-108.

Third, Kjeldsen’s disclosure that “[t]he camera video stream was recorded onto tape” shows that Kjeldsen envisioned that the camera images could be displayed remotely. Kjeldsen at 5. Kjeldsen itself includes images from the camera that were and are displayed on a remote monitor every time the Kjeldsen paper is read on a computer. *Id.* at Fig. 4. And videos taken by the ED-projector camera were available for download on the Internet and display on remote monitors. See Ex. 1007 at 6; *id.* at B-1. All of this would have suggested to a POSITA that video streams from the ED-projector camera could be displayed remotely with a reasonable expectation of success. Singhose, ¶ 109.

Fourth, adding the remote monitor capabilities from Pinhanez-III to the M&M assembly system of Kjeldsen would merely be combining prior art elements according to known methods (i.e., using a remote monitor to display the system camera images as disclosed in Pinhanez-III) to yield predictable results. *KSR v. Teleflex*, 550 U.S. 398, 416 (Fed. Cir. 2007). The combination is also obvious as the use of a known technique (Pinhanez-III’s remote monitor) to improve similar devices (using the ED-projector in both cases) in the same way. *Id.* at 417. Similarly, the combination is nothing more than applying a known technique (Pinhanez-III’s remote monitor) to a known device ready for improvement (the

M&M assembly system as disclosed in Kjeldsen) to yield predictable results. *Id.*; Singhose, ¶ 115.

Finally, Kjeldsen and Pinhanez-III are both analogous to the '036 patent. They are within the field of the '036 patent because they concern projector-camera systems. They are also both reasonably pertinent to the problem the '036 patent's inventors were trying to solve: projecting information to an individual, and then using a camera to monitor how the individuals reacted to that information. Singhose, ¶ 116.

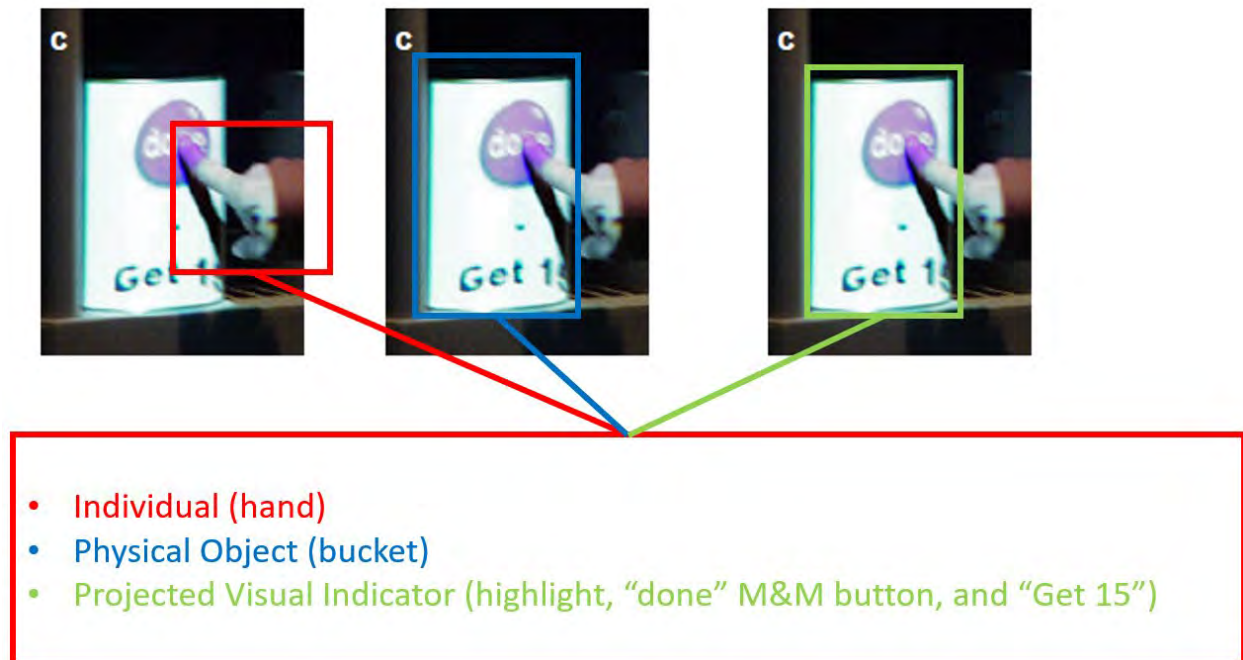
Thus, the combination of Kjeldsen and Pinhanez-III discloses and renders obvious [1.3]. Singhose, ¶ 133.

[1.4] “wherein said imaging, by the camera, captures images of at least the individual being guided, the physical object and the projected visual indicator.”

As discussed for [1.2], Kjeldsen discloses that “[a] user’s interactions with the Everywhere Display are detected with a single pan/tilt/zoom camera **that is steered to follow the projected image.**” Kjeldsen at 3 (emphasis added). This is an express disclosure of [1.4] because the camera follows the “projected image” and captures “[a] user’s interactions” with it, meaning the camera captures an individual, the projection, and any associated physical objects that the user interacts with. Singhose, ¶ 135; *see also* Kjeldsen at 3 (“The camera is located adjacent to the mirror assembly so that **the camera’s view of the user’s hand interacting with the display**

is generally occluded **only if she occludes the projected image** itself”) (emphasis added).

Figures 2I, 2I, and 4 of Kjeldsen demonstrate that the ED-projector camera images the person, object, and visual indicator. Each of these figures is an image taken by the ED-projector “system camera.” Kjeldsen Figure 2I is illustrative:



Demonstrative of Kjeldsen Fig. 2I; Singhose, ¶ 136. Similarly, the video attached to the Internet Archive declaration was taken by the system camera. Ex. 1007 (at B-1). Thus, Kjeldsen discloses [1.4]. Singhose, ¶ 137.

Notably, the claims require capturing images of the individual being guided, not the *entire individual’s body*. For example, the ’036 patent describes “sensors 423 for monitoring activities of an operators [sic] body, **hand, etc.**” ’036 patent at 21:54-59 (emphasis added). The ’036 patent also describes an example of a remote

surgeon/trainer who can “view ... the object being worked on by the students via [a] camera” ... and “control aspects of the camera 313, such as the camera’s viewing position, focus, and zoom.” ’036 patent at 20:57-67. The ability to control viewing position, focus, and zoom indicates that the ’036 patent intended to enable the remote surgeon to focus on just the relevant scene, which may or may not include the entire body of the local surgeon. Singhose, ¶ 134. The same analysis applies for Challenge 5 below.

Thus, the combination of Kjeldsen and Pinhanez-III renders claim 1 obvious. Singhose, ¶ 137.

2. Claim 2

“The method of claim 1, further comprising receiving, by the guide system controller, a sequence of one or more input signals and prompting the directional light device to project the visual indicator for the particular guided operation.”

This claim is likely indefinite because, among other reasons, the claim lacks antecedent basis for “the guide system controller,” which does not appear anywhere in claim 1.³ Singhose, ¶ 139. However, claim 2 is obvious because the prior art discloses a *guide system controller* (which the ’036 patent describes as something that “causes the projector to project the visual indicator(s),” (’036 patent, 3:8-9; see also *id.*, 24:18-22 (Claim 7)).

³ Claims 3-5 are indefinite because they depend from claim 2.

In Kjeldsen, the “projector is connected to the display output of a host computer.” Kjeldsen at 1. The host computer includes a *guide system controller* because it: (1) causes (through its display output) the projector to display visual indicators; and (2) includes application software that determines what the projector should display. Singhose, ¶¶ 140-141.

Kjeldsen discloses that the host computer (*guide system controller*) receives, from the Everywhere Displays camera, *a sequence of one or more input signals*. In Kjeldsen, “[a] user’s interactions with the Everywhere Display are detected with a single pan/tilt/zoom camera that is steered to follow the projected image.” *Id.* at 3. The result is a “video stream” that is a *sequence of one or more input signals*. Singhose, ¶¶ 142-143. The “video stream” is sent to the ED-projector “vision system,” which “examines the video stream for user actions and generates events for the application software.” Kjeldsen at 3. The events generated by the vision system are a second *sequence of one or more input signals*, sent to a *guide system controller* including the application software. Singhose, ¶¶ 142-143; *see also* Kjeldsen at 3 (“The vision system ... examines portions of the video stream for image events that indicate a user has interacted with a widget, and generates an application event in response.”).

Kjeldsen also discloses that the video stream/events (*input signals*) prompt[] *the directional light device to project the visual indicator for the particular guided*

operation. Specifically, as discussed above for [1.1], when the ED-projector detects (from the video stream) that a participant has touched a “button,” it causes the system to project a new image (*visual indicator*):

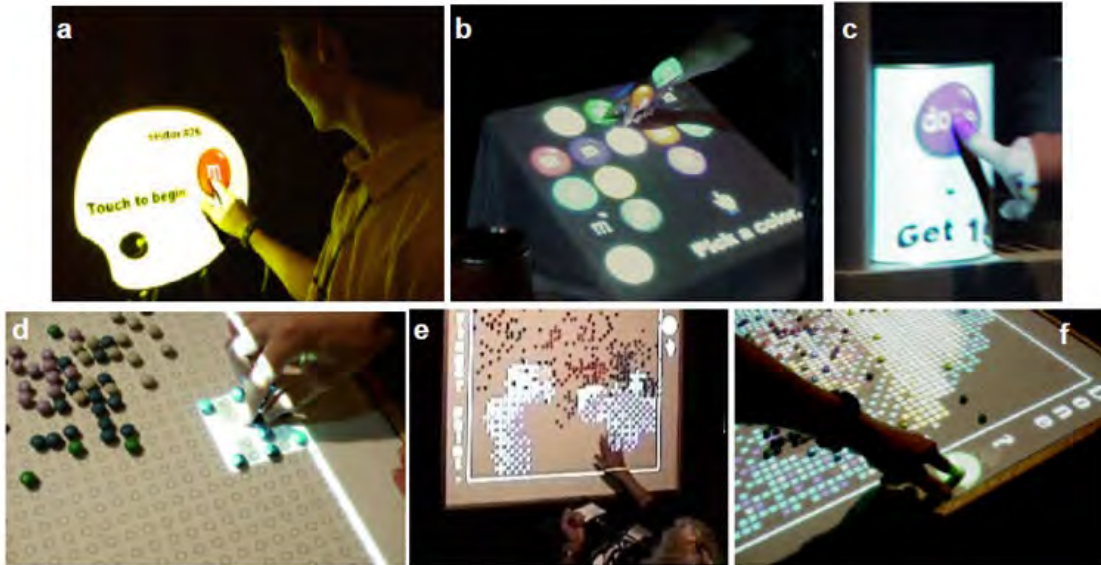


Fig. 2: Steps followed by each user when placing the M&M's in the SIGGRAPH'01 demo: a) the entrance panel is touched to start the process; b) a color is selected; c) the bucket containing the selected color is projected upon and the “done” button bucket is touched after the M&M's are picked up; e) the user places the M&M's on highlighted pixels; e) finger-painting to reveal the full image; and f) a “yes” button is touched after all interaction is done. (c&e from system camera)

Kjeldsen, Fig. 2 and accompanying text. For example, when the ED-projector detects that a person touched the M&M button in Figure 2(a), that prompts the system to (1) invite the user to enter; and (2) display the visual indicator in Figure 2(b). Singhose, ¶¶ 144-145; Kjeldsen at 2 (“When the visitor touches the M&M ‘button,’ the system responds by projecting an arrow onto the palette and a message inviting the visitor to ‘Come in.’ The ED-projector is then steered towards the foam-covered-board where images of different colored M&M's are projected along with the invitation ‘Pick a color’ (see Fig. 2b).”) A similar change

occurs when the system detects that the user touches a particular color button in Fig. 2(b) (which causes the corresponding bucket to be highlighted as shown in Fig. 2(c)), and so forth. Singhose, ¶¶ 144-145.

Thus, Kjeldsen discloses claim 2 and the Kjeldsen/Pinhanez-III combination renders obvious claim 2. Singhose, ¶ 146.

3. Claim 3

“The method of claim 2, wherein the sequence of one or more input signals are provided by a separate computer system or controller to the guide system controller.”

As discussed for claim 2, the Everywhere Displays camera provides a *video stream* that is a *sequence of one or more input signals*. Singhose, ¶ 149. The Everywhere Displays camera is *a separate computer system or controller to the guide system controller*. Singhose, ¶ 150. As in claim 2, the *guide system controller* is formed from portions of the “host computer” of Kjeldsen. Kjeldsen at 1 (“The projector is connected to the display output of a **host computer** that also controls the mirror and the camera.”) (emphasis added). This “host computer” is separate from the camera. Singhose, ¶ 150; *see also* Kjeldsen Fig. 1 (showing camera as discrete component).

A POSITA would recognize that the ED-projector camera had its own controller, used to read out data from the image sensor and to generate a video

stream. Singhose, ¶ 151 (using Ex. 1010 (U.S. Patent No. 6,833,863) to illustrate typical digital cameras including both image sensors and “logic circuitry and/or a programmed processor” to convey images to a computer); *see also* ’863 patent, 1:23-45, Fig. 2 (digital camera block diagram).⁴

Thus, Kjeldsen discloses claim 3 and the combination of Kjeldsen and Pinhanez-III renders obvious claim 3. Singhose, ¶ 153.

4. Claim 4

“The method of claim 1, further comprising receiving, by the guide system controller, a sequence of input signals and prompting the directional light device to dynamically project a sequence of visual indicators onto the physical object for the particular guided operation based on the sequence of the input signals.”

⁴ If LightGuide argues Kjeldsen does not adequately disclose that its camera constitutes a *separate computer system or controller*, it would have been obvious to substitute a digital camera having a controller, such as in the ’863 patent. Additionally, the ’863 patent confirms the POSITA’s understanding that digital cameras contain their own separate controller circuitry. Singhose, ¶ 152. The ’863 patent issued in 2004, more than a year before the alleged ’036 patent priority date of February 2011.

Most claim 4 elements are addressed above. For example, [1.1] shows that Kjeldsen discloses a *directional light device*, and [1.0] and [1.1] show how Kjeldsen's *directional light device* projects *visual indicators* onto *the physical object for the particular guided operation*. Similarly, as with claim 2, Kjeldsen discloses a *guide system controller, receiving . . . a sequence of input signals*. Singhose, ¶ 156, 159.

Claim 4 further requires *dynamically project[ing] a sequence of visual indicators . . . based on the sequence of input signals*. In Kjeldsen, the M&M demonstration dynamically reacts to a current user's choices and selections from previous users. For example, Figure 2's explanatory text states that in step "b) a color is selected;" and in step "c) the bucket containing the selected color is projected upon." Kjeldsen at 2. This indicates that the projections in Kjeldsen are dynamically reactive to the current user's selection of a particular color. Later, Kjeldsen discloses identifying particular locations for the M&M's based on the color selected and the M&M's previously placed. *Id.* (discussing Figure 2(d)⁵, where "the user places the M&M's on highlighted pixels"). Because Kjeldsen discloses that the visual indicators displayed during the bucket retrieval and M&M placement steps are

⁵ Kjeldsen Figure 2 includes two entries describing step "e)". The first one is a typo and should refer to step "d)".

dynamically responsive to past and present users' selections, Kjeldsen teaches the step of *dynamically project[ing] a sequence of visual indicators . . . based on the sequence of input signals*. Singhose, ¶¶ 157-158.

Thus, the combination of Kjeldsen and Pinhanez-III renders obvious claim 4. ¶ 160.

5. Claim 5

“The method of claim 4, further comprising receiving, by the guide system controller, a combination of the sequence of the input signals and generation of a dynamic, real-time projection, via the directional light device, of the sequence of said visual indicators.”

As with claims 2 and 4, Kjeldsen discloses *receiving, by the guide system controller, a . . . sequence of the input signals*. As with claim 4, Kjeldsen discloses *generat[ing] a dynamic . . . projection of the sequence of said visual indicators* as a result of *receiving ... the sequence of the input signals* by the guide system controller. Singhose, ¶ 163. The mapping of the additional claims elements to the prior art is discussed below for claim 11, which contains similar requirements. Singhose, ¶¶ 162-164, 196-198. Thus, if claim 11 is invalid, then so is claim 5. This claim may still be found invalid under 35 U.S.C. §§ 102 or 103 even if it is also invalid under § 112.

Thus, the combination of Kjeldsen and Pinhanez-III renders this claim obvious. Singhose, ¶ 165.

6. Claim 6

“The method of claim 5, wherein the sequence of input signals are provided by a separate computer system or controller to the guide system controller.”

This claim is disclosed by Kjeldsen as described for claim 3. Thus, the Kjeldsen/Pinhanez-III combination renders this claim obvious. Singhose, ¶¶ 166-168.

7. Claim 7

[7.0] “A guide system adapted to provide visual indicators to an individual to guide actions of the individual for a particular guided operation, said guide system comprising:”

To the extent the preamble is limiting, Kjeldsen discloses it. See [1.0]. The only differences to [1.0] are (1) that this element does not require projection; and (2) that this element requires a *guide system*. The ED-projector is a *guide system* because it guides individuals in a set of actions (e.g., assembling a picture made of M&M’s). Singhose, ¶¶ 169-170. Thus, Kjeldsen discloses [7.0].

[7.1] “a directional light device, said directional light device being selectively operable to project and target at least one indicating light;”

Kjeldsen discloses the *directional light device* as discussed for [1.1]. Singhose, ¶ 171.

[7.1] further requires that the system is *selectively operable to project and target at least one indicating light*. Kjeldsen discloses this as discussed for [1.1]. The ED-projector can selectively target where its images are displayed using the steerable mirror:

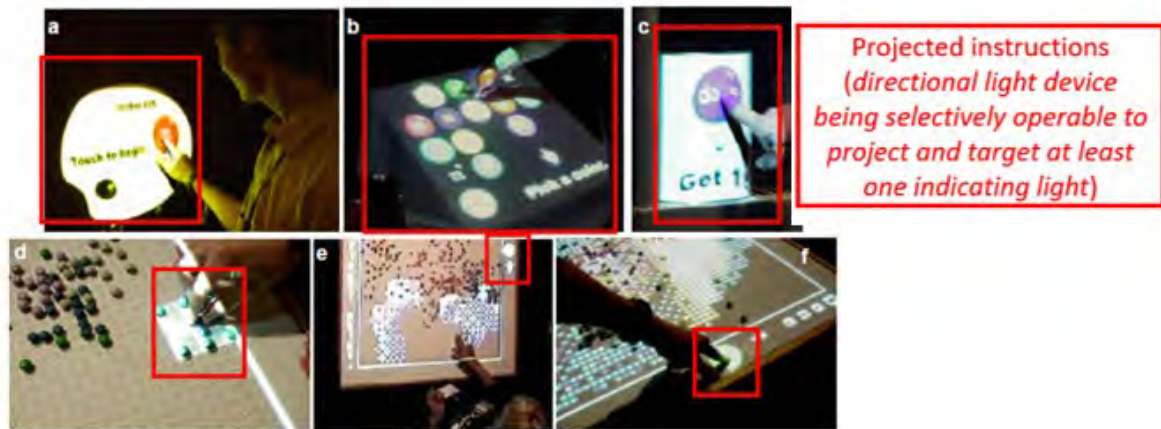


Fig. 2: Steps followed by each user when placing the M&M's in the SIGGRAPH'01 demo: a) the entrance panel is touched to start the process; b) a color is selected; c) the bucket containing the selected color is projected upon and the "done" button bucket is touched after the M&M's are picked up; e) the user places the M&M's on highlighted pixels; e) finger-painting to reveal the full image; and f) a "yes" button is touched after all interaction is done. (c&e from system camera)

Kjeldsen, Fig. 2 (annotated); Singhose, ¶¶ 172-173. Notably, Kjeldsen selects what graphics to project, and where to target them based on the actions of the user. *Id.* Thus, Kjeldsen discloses [7.1].

[7.2] “a guide system controller, said guide system controller being operable to control said directional light device to project a visual indicator with said indicating light onto a physical object associated with the particular guided operation;”

Kjeldsen discloses *a guide system controller* (part of the “host computer” in Kjeldsen) as discussed for claim 2. Singhose, ¶ 174.

Kjeldsen further discloses *said guide system controller being operable to control said directional light device*. In Kjeldsen, as discussed for claim 2, “[t]he projector [*directional light device*] is connected to the display output of a host computer that also controls the mirror and the camera.” Kjeldsen at 1. The *guide system controller* (part of the “host computer”) in Kjeldsen is *operable to control said directional light device* (“projector”) using this display output. Singhose, ¶¶ 174-175.

Kjeldsen further discloses *to project a visual indicator with said indicating light onto a physical object associated with the particular guided operation* as discussed above for [1.1]. Thus, Kjeldsen discloses [7.2]. Singhose, ¶¶ 175-176.

[7.3] “a camera located proximate to said directional light device and configured to capture an image of at least the individual, the physical object and said visual indicator when said visual indicator is projected onto the physical object;”

Kjeldsen discloses *a camera located proximate to said directional light device* as discussed for [1.2]. Kjeldsen further discloses *a camera . . . configured to capture an image of at least the individual, the physical object and said visual indicator when said visual indicator is projected onto the physical object* as discussed for [1.4]. Thus, Kjeldsen discloses [7.3]. Singhose, ¶¶ 177-179.

[7.4] “a monitor, said monitor being remote from said directional light device and said guide system controller, with said monitor being operably interfaced with said camera to display the image captured by said camera.”

Pinhanez-III discloses (1) *a monitor*; (2) *said monitor being remote from said directional light device*; and (3) *said monitor . . . to display the image captured by said camera* as discussed for [1.3]. Singhose, ¶ 180.

The Kjeldsen/Pinhanez-III combination discloses the remaining elements (i.e., that the *monitor is remote from . . . said guide system controller* and is *operably interfaced with said camera*). As noted in claim 2, in Kjeldsen, the *guide system controller* is part of the “host computer” that controls the ED-projector. Pinhanez-III teaches to put that ED-projector in a “local environment” while providing a “control interface to a user in a remote environment.” Ex. 1015 at 3. This allows a remote user to “view the [events] live from a remote location through on-site cameras.” *Id.* Thus, in the Kjeldsen/Pinhanez-III combination, the monitor is *remote from . . . said guide system controller*, but nevertheless *operably interfaced with said camera*. Singhose, ¶¶ 181-182.

Thus, Pinhanez-III discloses element [7.4] and the Kjeldsen/Pinhanez-III combination renders claim 7 obvious. Singhose, ¶ 183.

8. Claim 8

“The system of claim 7, wherein said guide system controller is configured to receive a sequence of one or more input signals causing said directional light device to project said visual indicator for the particular guided operation.”

Kjeldsen discloses this element as discussed for claim 2. The *input signals* in Kjeldsen (i.e., the video stream or application events) have the effect of *causing said directional light device to project said visual indicator* (as discussed for claim 2 relative to how “button” events cause the visual indicators to change). Thus, the Kjeldsen/Pinhanez-III combination renders obvious claim 8. Singhose, ¶¶ 184-186.

9. Claim 9

“The system of claim 8, further including a separate computer system or controller and wherein said separate computer system or controller is configured to provide the sequence of one or more input signals to said guide system controller.”

Kjeldsen discloses this element as discussed for claim 3. Thus, the Kjeldsen/Pinhanez-III combination renders obvious claim 9. Singhose, ¶¶ 187-189.

10. Claim 10

“The system of claim 7, wherein said guide system controller is configured to receive a sequence of input signals and to cause said directional light device to dynamically project a sequence of visual indicators onto the physical object for the particular guided operation based on the sequence of the input signals.”

Kjeldsen discloses claim 10 as discussed for claim 4. Thus, the Kjeldsen/Pinhanez-III combination renders obvious claim 10. Singhose, ¶¶ 190-192.

11.Claim 11

“The system of claim 10, wherein a combination of the sequence of the input signals results in a generation of a dynamic, real-time projection of the sequence of said visual indicators.”

As discussed for claims 4 and 10, Kjeldsen discloses *to dynamically project a sequence of visual indicators onto the physical object*. Claim 11 further requires that *the input signals result[] in a generation of a dynamic, real-time projection of the sequence of said visual indicators*. To the extent this refers to “real time or dynamic creation of visual indicators or display images . . . for guiding the activities of an individual” (’036 patent at 18:8-10), Kjeldsen discloses it. The bucket location projection and the projections where a participant should put a collection of M&M’s are generated dynamically and in real time based on which colors are selected and when buttons are pressed. Thus, the Kjeldsen/Pinhanez-III combination renders this claim obvious. Singhose, ¶¶ 195-198.

12. Claim 12

“The system of claim 11, further including a separate computer system or controller and wherein said separate computer system or controller is configured to provide the sequence of input signals to said guide system controller.”

This claim is disclosed by Kjeldsen as discussed for claim 6. Thus, the Kjeldsen/Pinhanez-III combination renders this claim obvious. Singhose, ¶ 199-201.

B. Challenge 2: Claims 1-12 are rendered obvious by Kjeldsen and Pinhanez-III in combination with Pinhanez-I.

If LightGuide argues Kjeldsen does not disclose a *guide system controller*, the claims are nevertheless obvious through a further combination with Pinhanez-I. Singhose, ¶¶ 202, 204. Similarly, if LightGuide argues Kjeldsen lacks a camera *proximate to* the projector, Figure 3 of Pinhanez-I, which discloses a prototype with a camera located mere centimeters from the pan/tilt mirror of the *directional light device*, discloses this element. Singhose, ¶ 203.

The further combination with Pinhanez-I is obvious. All three references concern the Everywhere Displays projector. Singhose, ¶ 205. Pinhanez and Pingali are co-authors on all three papers. Pinhanez-I expressly cites to Kjeldsen as describing “the ability to interact on any surface.” See Ex. 1006 at 6, 11, n.31. However, Pinhanez-I includes additional details regarding the ED-projector hardware and internal workings. Singhose, ¶¶ 72-79. Thus, a POSITA seeking

additional details regarding implementation of the ED-projector would look to Pinhanez-I. Singhose, ¶ 206. This is especially so for the *proximate to* limitation, because Kjeldsen explicitly discloses the utility of putting the camera and projector close together. See Kjeldsen at 3 (“The camera is located adjacent to the mirror assembly so that the camera’s view of the user’s hand interacting with the display is generally occluded only if she occludes the projected image itself....”). Singhose, ¶ 203. The combination would have a reasonable expectation of success because the references concern the same ED-projector system.

Pinhanez-I is analogous to the ’036 patent for the same reasons discussed for Kjeldsen and Pinhanez-III, which also concern the ED-projector system. Singhose, ¶ 207.

1. Obviousness of claims 2-12 as to *guide system controller*

Claims 2-9 and 12 expressly recite a *guide system controller*. Claims 10-11 depend from claim 7 and thus also require a *guide system controller*. Using the language of claim 2, which is representative, the claimed *guide system controller* is responsible for *receiving a sequence of one or more input signals and prompting (or cause/causing in claims 8/10) the directional light device to project the visual indicator*.

As discussed in Challenge 1, Kjeldsen discloses the claimed *guide system controller*, stating: “[t]he projector is connected to the display output of a host

computer,” thus indicating the host computer controls the projector via the display output. Kjeldsen at 1; Singhose, ¶ 140. As discussed for claim 2, Kjeldsen teaches that the projector is controlled in response to *input signals* (i.e., the camera video stream or application events). However, if invalidation requires additional information about Kjeldsen’s host computer or application software, Pinhanez-I can supply that information.

For example, Pinhanez-I describes the ED-projector host computer in additional detail. Like Kjeldsen, Pinhanez-I discloses that “[t]he projector is connected to the display output of a host computer that also controls the mirror and the camera (see Figure 2).” Figure 2 of Pinhanez-I shows that the ED-projector “computer(s)” include components such as a graphics board, projector control, and mirror control:

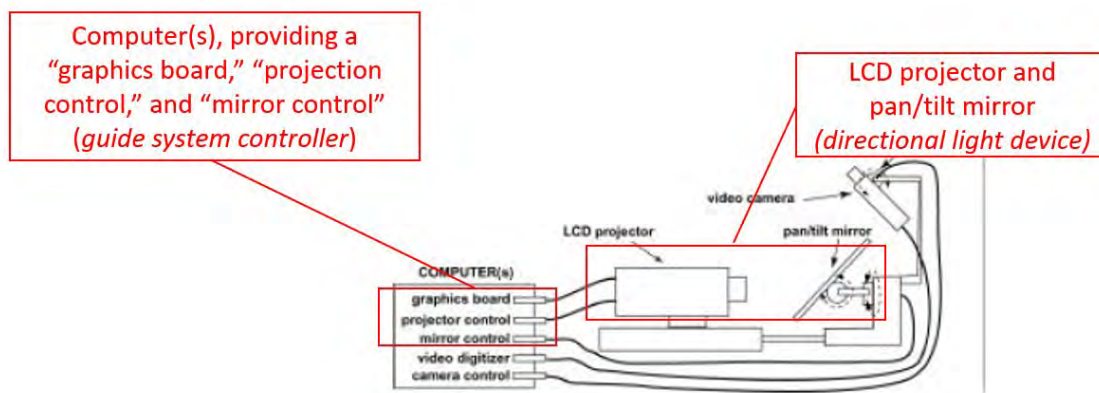


Figure 2. Diagram of the components of the ED-projector.

Ex. 1006, Fig. 2 (annotated); Singhose, ¶ 209. Pinhanez-I also explains how the computer graphics board controls the projector to create undistorted images on. *Id.*

at 4-5 (§ 3.1). Pinhanez-I further explains how input events from the computer vision system result in new images being projected. *Id.* at 5-6 (§§ 3.2-3.3). Thus, Pinhanez-I provides additional details of how portions of the “host computer” control the projector element of the ED-projector and are the claimed *guide system controller*. Singhose, ¶¶ 210-213.

Thus, the Kjeldsen/Pinhanez-III/Pinhanez-I combination renders obvious the *guide system controller* limitation. Claims 2-12 are thus obvious under this analysis. Singhose, ¶ 214.

C. Challenge 3: Claims 3, 6, 9, and 12 are rendered obvious by the combination of Kjeldsen, Pinhanez-III and Pinhanez-II (with or without Pinhanez-I)

As discussed in Challenge 1, Kjeldsen and Pinhanez-III disclose all elements of the challenged claims and render them obvious. However, if LightGuide argues Kjeldsen lacks sufficient detail of a *separate computer system or controller* of claims 3, 6, 9, and 12, it would have been obvious to incorporate the teachings of Pinhanez-II (Ex. 1014) into those of Kjeldsen and/or Pinhanez-I. Pinhanez-II is another publication that describes the ED-projector and the M&M experience disclosed in Kjeldsen. Singhose ¶¶ 80-81.

It would have been obvious to combine Kjeldsen/Pinhanez-III/Pinhanez-I with teachings from Pinhanez-II for several reasons. All four references concern the ED-projector and have Pinhanez and Pingali as co-authors. Pinhanez-II cites

Kjeldsen as providing additional details for the ED-projector system's widget components. *See* Ex. 1014 at 2, 8, n.4. However, Pinhanez-II includes an additional teaching that its system can “run on two different computers,” with one controlling the projector and the other handling inputs from the camera. Pinhanez-II at 2; Singhose, ¶ 215. Thus, a POSITA would understand that Pinhanez-II describes a different way to implement the ED-projector (i.e., using two computers instead of one). *Id.*

Accordingly, combining the teachings of using multiple computers (from Pinhanez-II) with the system described in Kjeldsen (and Pinhanez-I) is using a known technique (separate computers for the projector and computer vision systems from Pinhanez-II) to improve similar devices (i.e., the ED-projector systems described in Kjeldsen) in the same way. Singhose, ¶ 216. Moreover, using multiple computers to handle the ED-projector computing load (which operated using hardware from the 2001-2003 era) is nothing more than combining prior art elements (multiple computers from Pinhanez-II with the overall system of Kjeldsen) according to known methods to achieve predictable results (especially since the ED-projector team made the combination). *Id.* Because the references all concern the same ED-projector system, a POSITA would have reasonably expect the combination to succeed. *Id.*

Finally, Pinhanez-II is analogous to the '036 patent for the same reasons discussed for Kjeldsen and Pinhanez-III, which also concern the ED-projector system. Singhose ¶ 217.

1. Obviousness of claims 3, 6, 9, and 12 as to *separate computer system or controller*

Claims 3, 6, 9, and 12 all require *input signals* that are provided by *separate computer system or controller to the guide system controller*. As noted above, the claimed *guide system controller* for Challenge 1 and 2 is taught as being part of the “host computer” of Kjeldsen/Pinhanez-I.

For this challenge, the *guide system controller* is those portions of the host computer that are “responsible for the application software and the projector software.” Ex. 1014 at 2; Singhose, ¶ 220. The *input signals* are the events generated for the application software reflecting user interactions detected in the camera video stream. Kjeldsen at 3 (“A vision system examines the video stream for user actions and generates events for the application software.”). Pinhanez-II confirms these events are generated by the computer vision system. Ex. 1014 at 3 (“The vision system implements widgets that detect touch events and that report continuous motion of the user’s hand on a surface.”); at 5 (“The vision system is able to detect touch events, hand position and movement”); at 6 (“The vision system can detect user activity in each of the . . . touch events.”); Singhose, ¶ 221.

Pinhanez-II discloses the use of a *separate computer* to implement the computer vision system that processes the video stream and generate these events: “The system is currently run on ***two different computers***, one responsible for the application software and the projector software; ***the other controlling the positioning of the camera and runs the computer-vision system responsible for detecting user interaction.***” Pinhanez-II at 2 (emphasis added). In this passage, the computer that “runs the computer-vision system” (the computer providing the *input signals*) is separate from the *guide system controller* (the computer responsible for the projector software). Thus, Pinhanez-II expressly discloses *input signals* that *are provided by separate computer system or controller to the guide system controller*. Singhose, ¶¶ 221-222.

Accordingly, to the extent Challenge 1 or Challenge 2 is unsuccessful relative to the *separate computer system or controller* limitations of claims 3, 6, 9, or 12, those claims are rendered obvious by the combination of Kjeldsen, Pinhanez-III, and Pinhanez-II (with or without Pinhanez-I). Singhose, ¶¶ 223-224.

VI. Challenge 4: Claims 1-12 are obvious over Machino-I and Machino-II

The obviousness analysis below is based on the combined teachings of Machino-I and Machino-II. While it is likely that these references in isolation would anticipate and/or render obvious the claims of the '036 patent, this Petition is based

on both references in combination to avoid any arguments regarding what the references disclose to a POSITA.

1. Claim 1

Claim 1 is rendered obvious by Machino-I in combination with Machino-II as follows:

[1.0] “A method of projecting visual indicators to guide actions of an individual for a particular guided operation, said method comprising:”

To the extent the preamble is limiting, it is taught by Machino-I and Machino-II. Machino-I describes a remote collaboration system, called “SCOPE,” that combines a projector, a camera, and a remote monitor to facilitate communications between on-site personnel and remote supporters. The projector is mounted to a robot and projects “information needed for carrying out operations.” Machino-I at 3. The camera is also mounted to the robot and captures the same field of view as the projector. *Id.* Both projector and camera are connected to an on-site PC plugged into an IP network, allowing video and other information to be shared with a remote user. Singhose, ¶¶ 93-97.

The following images show aspects of how Machino-I functioned.



Fig. 5 Scenes of verification experiments.

Machino-I at 4. As shown in this and other figures, SCOPE has a projector, a camera, and a remote monitor. The figure in the top-left (“Shared View”) shows the image that is captured by the SCOPE camera and sent back to the remote display, including both a person and the object they are working on. The figure in the bottom left shows the remote individual and their remote monitor. The other figures show the projector and a different camera angle of the scene. Singhose, ¶ 94.

Building onto the system disclosed in Machino-I, Machino-II describes a mobile configuration for SCOPE in which: (1) the projector and camera are mounted on a mobile robot; and (2) information from the camera is displayed to a remote user:



Fig. 1 Future scene of remote support using mobile SCOPE

Machino-II, Fig. 1; Singhose, ¶¶ 98-101. This mobile SCOPE system was also implemented in the laboratory, as shown in Figures 10-13 of Machino-II.

Relative to the preamble, Machino I and Machino-II describe the SCOPE system, which *project[s] visual indicators* by “projecting meta-information onto the objects” including at least text, images, and videos. Machino-I at Abstract; *see also id.* at 3-4 (describing SCOPE’s “indexing function” for displaying “text, still images, video[s], . . . and program administration”); Machino-II at 3 (same); Singhose, ¶¶ 232-235. These *visual indicators* convey “information needed for carrying out operations” (Machino-I at 3; Machino-II at 3) and are used by a remote supporter to guide an on-site worker (*guide actions of an individual*) through a maintenance operation (i.e., *for a particular guided operation*). Machino-I at 4 (explaining the SCOPE system permitted “receiving instructions regarding equipment maintenance work from a skilled worker at a remote support center” via a robotic

projector/camera system). Singhose, ¶¶ 230-232. This is illustrated in Machino-II, Fig. 1 (shown above). *See also* Machino-I, Figs. 2-3; Machino-II, Figs. 3, 11. Thus, the combined teachings of Machino-I and II disclose [1.0]. Singhose, ¶¶ 232-235.

While Machino-I and II each independently disclose the preamble, it would have been obvious to a POSITA to combine the teachings in Machino-I with Machino-II because they describe the same system (SCOPE) and reference one another directly or indirectly. *See* Machino-I at 6-7 (describing future research regarding a “mobile robot”); Ex. 1016 at 1-3 (describing stationary SCOPE configuration), 6 (referencing Machino-I); Singhose, ¶ 102. Both references share the same group of authors and were published within one year of each other. Further, the combination would have merely been combining known elements using known methods (implementing stationary and/or mobile SCOPE) to yield predictable results. A POSITA would therefore have combined the teachings of these references to gain a more fulsome understanding of what the SCOPE system could do. Singhose, ¶ 103. A POSITA would have had a reasonable expectation of successfully combining these teachings given that Machino-I and Machino-II both concern the SCOPE system and were written by the same team. Singhose, ¶¶ 102-103.

Machino-I and Machino-II are both analogous to the '036 patent—i.e., within the field of the invention and reasonably pertinent to the '036 patent—because they

are a projector-camera system used to (1) project information to an individual; and (2) take and remotely display images of the projection and the individual's response to that projection. Singhose, ¶ 104.

[1.1] “projecting a visual indicator using a directional light device onto a physical object associated with the particular guided operation;”

As shown for [1.0], both Machino-I and II disclose *projecting a visual indicator* with SCOPE. Specifically, SCOPE “consists of **a projector unit** with a camera.” Machino-I at 1 (emphasis added); *see also* Machino-II at 1 (“This SCOPE system, equipped with a projector and a camera ...”). Said projector unit/projector is *a directional light device* for *projecting* said *visual indicator*. Singhose, ¶ 236.

Both Machino references further disclose *projecting a visual indicator ... onto a physical object associated with the particular guided operation*. SCOPE projects images and attribute information at physical objects by “affixing notes on the target object[s] with light.” Machino-II at 3; *see also* Machino-I at 3-4 (“[T]he projected object and the attribute information can be presented in real space in a stationary manner.”). This is illustrated below:

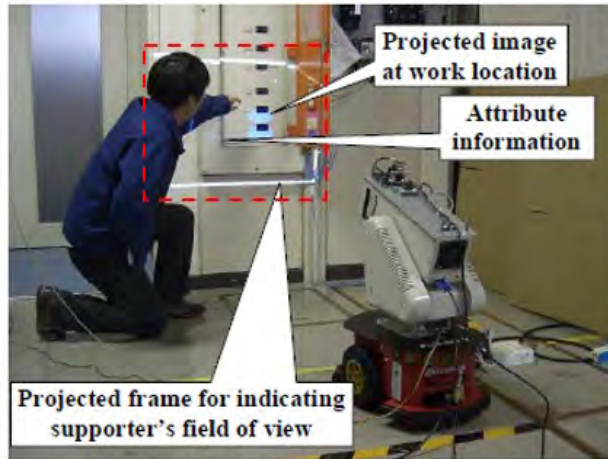


Fig. 11 Mobile SCOPE (on-site location).

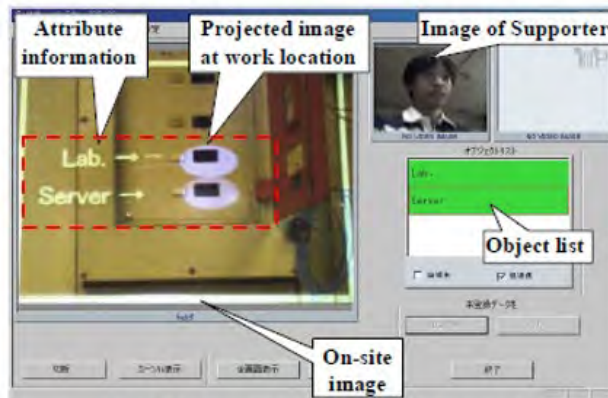
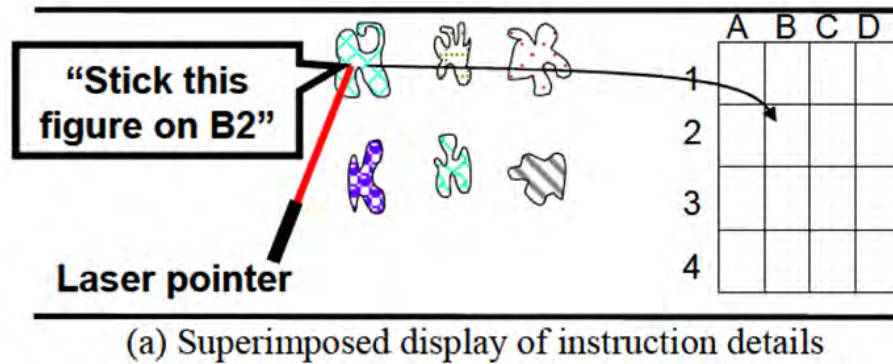


Fig. 12 Screen shot (supporter's location).

Machino-II, Figs. 11-12 (annotated); Singhose, ¶¶ 237-241. Here, both images and attribute information (*visual indicator[s]*) are projected onto an electrical panel (*a physical object*) where target objects for the operation are located (*associated with the particular guided operation*). Singhose, ¶ 241; *see also* Machino-I at 4 (describing projecting image “at the location of the bottle containing [the] chemical [to be selected]”), Fig. 4.

As another example, Machino-I describes a scenario where a worker selects an item using a laser pointer. The SCOPE system detects which object was selected,

and displays instructions on what should be done (in this example, “Stick this figure on B2”).

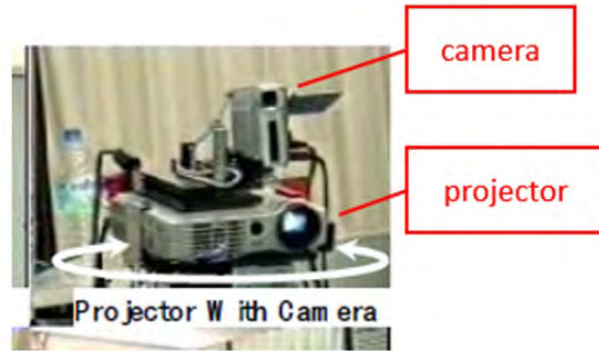


Machino-I, Fig. 7(a); *see also id.* at 4-5. As shown, the projected instruction is the *visual indicator*, while the selected object is the *physical object associated with the particular guided operation*. Singhose, ¶ 238.

Thus, the combined teachings of Machino-I and II disclose [1.1]. Singhose, ¶ 242.

[1.2] “imaging the projected visual indicator with a camera located proximate to the directional light device”

As shown for [1.0] and [1.1], both Machino-I and II disclose *projected visual indicator[s]*. Both references also disclose *a camera located proximate to the directional light device*. For example, Machino-I and II depict the camera proximate to the projector:



Machino-I, Fig. 5; *see also* Machino-I, Fig. 3 (showing projector and camera in same robot); Machino-II, Figs. 3 & 4 (showing camera mounted directly on projector); *id.* at Figs. 5 & 8 (showing projector and camera close to one another within same device); Singhose, ¶¶ 244-245 (for these and additional examples).

The SCOPE camera also *imag[es] the projected visual indicator*. In the figure below, the words “Lab” and “Server” and the projected ovals are *projected visual indicator[s]* that have been imaged by the SCOPE camera and displayed on the remote display:

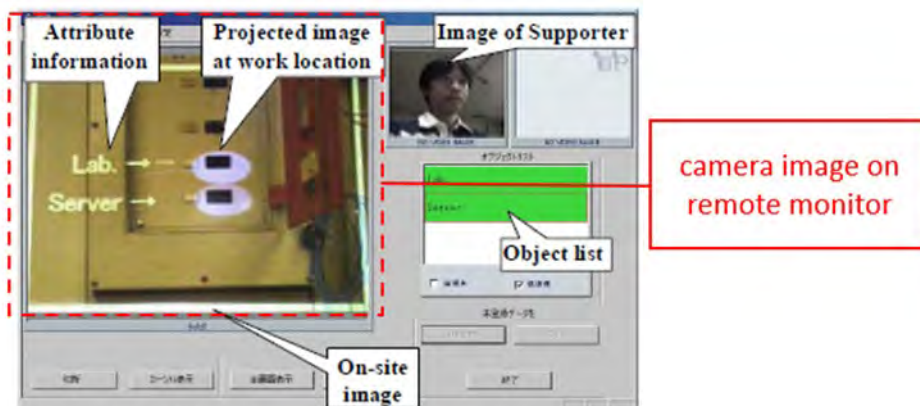


Fig. 12 Screen shot (supporter's location).

Machino-II, Fig. 12 (annotated); *see also* Machino-I, Fig. 4; *id.* at Fig 5 (top left); Machino-I at 4 (“on the supporter’s side, the projected object is shown on a communication screen displaying images transmitted from the on-site worker’s side ...”); Singhose, ¶¶ 246-247. Notably, the SCOPE camera is specifically designed for “unifying the camera’s viewing field and [the] projector’s projection area,” which results in the camera capturing the any *projected visual indicators* Machino-I at 3; Singhose ¶ 246; *see also* Machino-II at 3.

Thus, the combined teachings of Machino-I and II disclose [1.2].

[1.3] “transmitting images from the camera to a monitor located remotely from the directional light device; and displaying images from the camera on the monitor;”

As discussed in [1.2], the SCOPE camera captures images of the on-site location. Such camera images are *transmitted ... to a monitor located remotely from the directional light device* (remote supporter’s computer monitor) over an IP network (*e.g.*, the internet) and are displayed on that monitor (*displaying images from the camera on the monitor*). *See* Machino-I at 4 (“[O]n the supporter’s side, the projected object is shown on a communication screen displaying images transmitted from the on-site worker’s side ...”); *see also* Machino-II at 3 (“At the supporter’s location, the projected image is shown on a communication screen,

which displays images transmitted from the on-site worker's location.”). This is illustrated below:

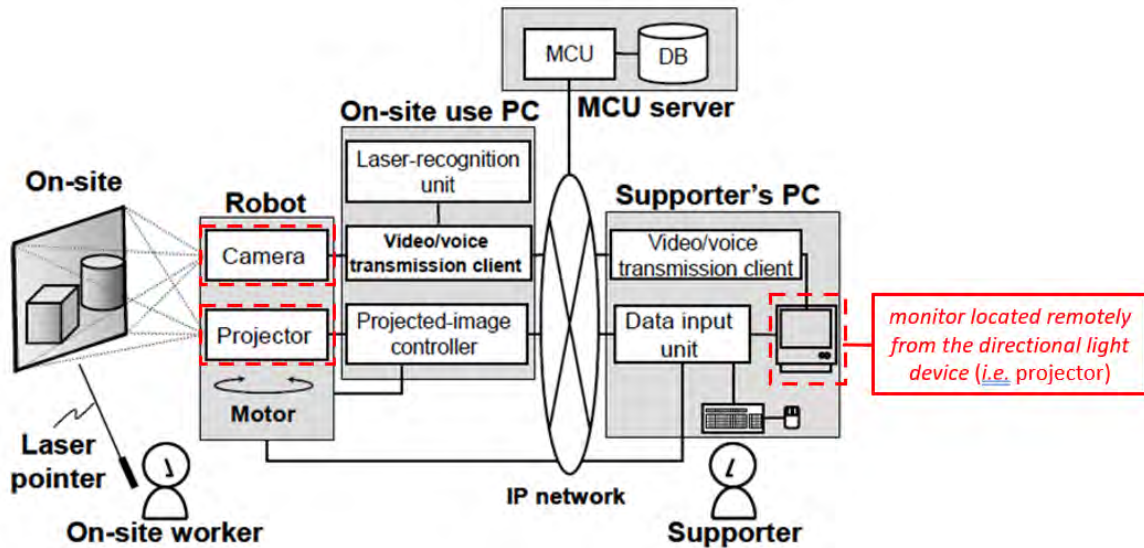


Fig. 3 Schematic configuration of SCOPE system.

Machino-I, Fig. 3 (annotated); *see also* Machino-II, Figs. 1 and 3; Singhose, ¶ 248.

A screenshot showing the remote supporter's monitor remotely displaying camera images is shown below:

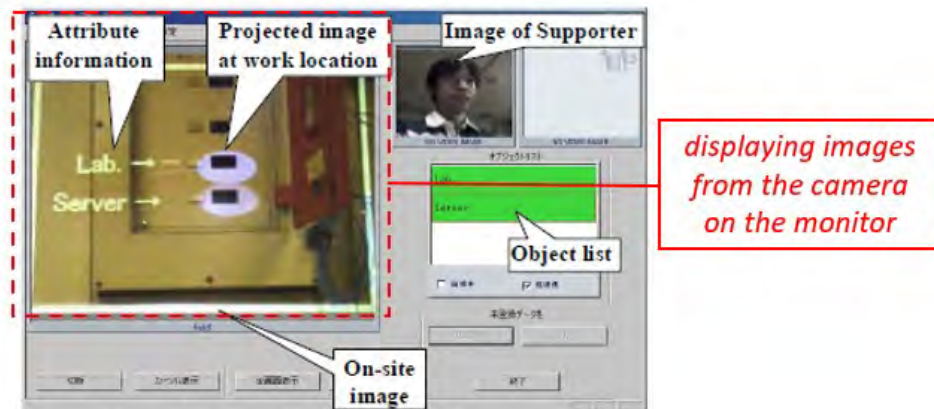


Fig. 12 Screen shot (supporter's location).

Machino-II, Fig. 12 (annotated); *see also* Machino-I, Fig. 4; Machino-II, Fig. 1; Singhose, ¶ 249.

Thus, the combination of Machino-I and II discloses [1.3]. Singhose, ¶ 250.

[1.4] “wherein said imaging, by the camera, captures images of at least the individual being guided, the physical object and the projected visual indicator.”

As discussed for Challenge 4, element [1.2], Machino-I and II disclose the camera in SCOPE *imaging the projected visual indicator with a camera*. Machino-I and II also disclose or render obvious, that the *imaging, by the camera, captures images of at least the individual being guided, the physical object and the projected visual indicator*.

First, the SCOPE camera *captures images of at least the individual*. Specifically, the SCOPE camera captures images of individuals whenever they enter the “Shared View” scene.



Machino-I at 4. This image is labeled “Shared View,” meaning it is taken by the SCOPE camera. Machino-I at 3 (“To attain the capability of a ‘shared viewing field’

as explained later, the domains of the viewing fields of the camera and the projector are adjusted so that they line up as one.”); Singhose, ¶ 253.

Second, the SCOPE camera *captures images of . . . the physical object and the projected visual indicator*. For example, Figure 12 in Machino-II shows a screenshot of the remote supporter’s monitor including a camera image of projected images and attribute information (*visual indicator[s]*) on an electrical panel subject to maintenance (*the physical object*).

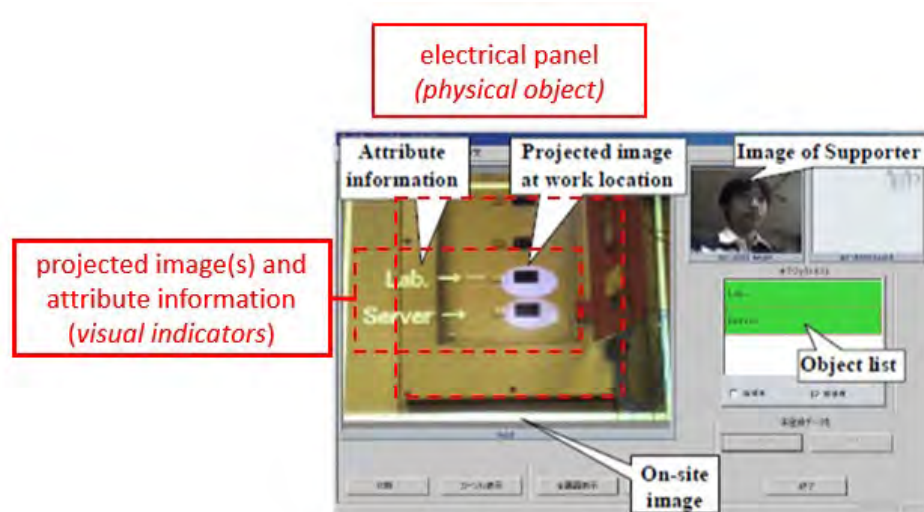


Fig. 12 Screen shot (supporter's location).

Machino-II, Fig. 12 (annotated); Singhose, ¶ 252. Similarly, Machino-I, Figure 4 illustrates the remote monitor in a different use case, where the projected image is “manipulated by [remote supporter’s] PC mouse” (Machino-I at 4):

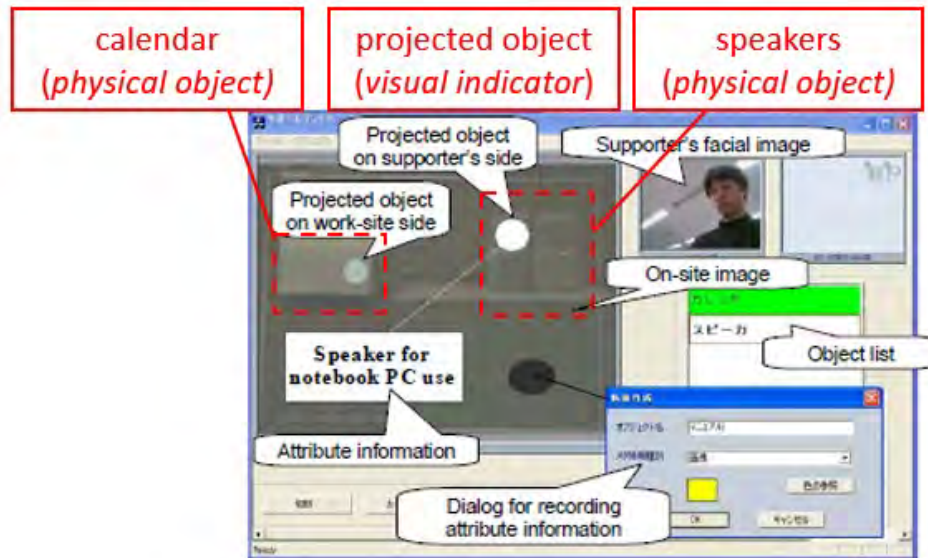


Fig. 4 View of a support screen.

Machino-I, Fig. 4 (annotated); Singhose, ¶ 252. Here, the camera again has *captur[ed] an image of at least ... the physical object* (calendar and/or speakers) *and the projected visual indicator* (circular image).

These pictures show the SCOPE “Shared View” camera capturing images of each of the three elements of [1.4]—the *individual being guided*, the *physical object*, and the *projected visual indicator*. A POSITA would understand, from this combination of images and the other teachings of Machino-I and II, that it was obvious to capture all three elements in a single image or video. The obviousness of capturing all three elements is particularly apparent in the figure below, showing an on-site worker reaching into the shared field of view.

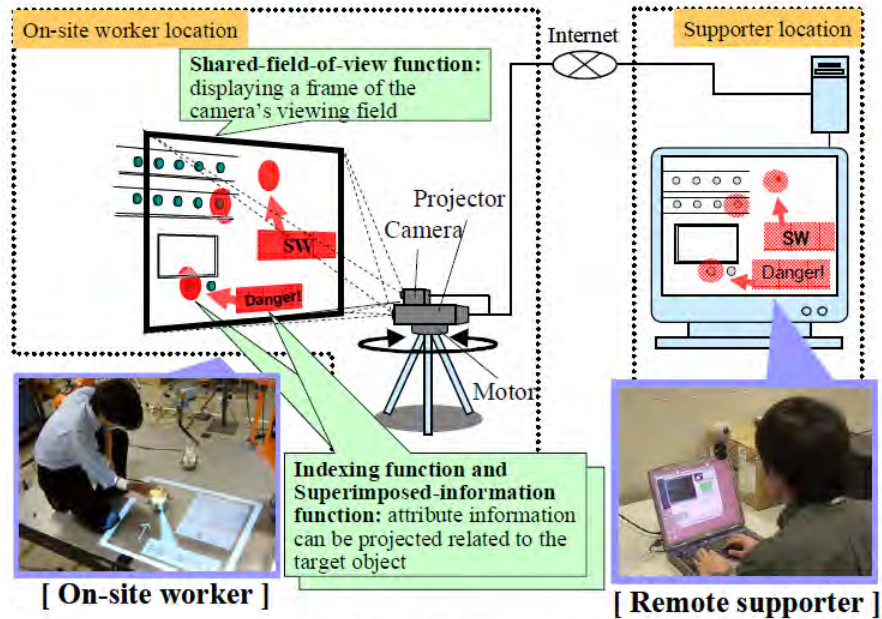
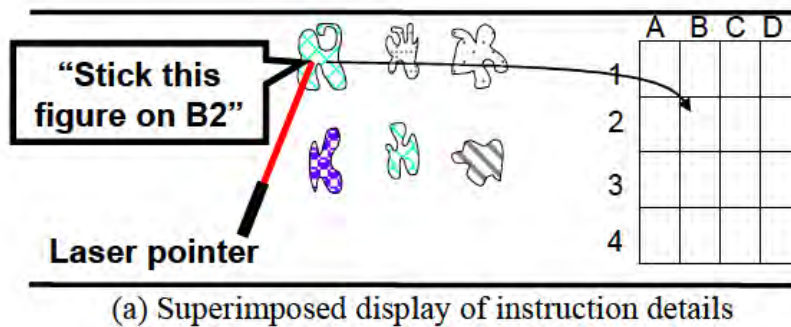


Fig. 3 SCOPE system.

Machino-II Fig. 7. It is obvious from this image that the SCOPE camera would capture an image of the individual's arm, as well as objects and projected visual indicators, and that SCOPE sends captured images to a remote supporter's monitor. Singhose, ¶ 256, 259. Machino-II Figures 1 and 10-13 also show this. Singhose, ¶¶ 257-258, 261. The advantages of capturing the *visual indicator*, *individual*, and *physical object* are also obvious from the purpose of the Machino references, which was to permit a remote supporter in aiding a local user. Singhose, ¶¶ 256, 262.

Similarly, it would have been obvious to a POSITA that an individual following the guidance shown in Machino-I Figure 7 ("Stick this figure on B2") would reach into the field of view to move the object as instructed. Singhose, ¶ 260. When the individual followed such instructions, the camera would capture (and the

monitor would show) *the individual being guided, the physical object, and the projected visual indicator.*



Machino-I Fig. 7. Singhose, ¶ 260.

Thus, the combination of Machino-I and II discloses or renders obvious [1.4] and renders obvious claim 1. Singhose, ¶ 263.

2. Claim 2

“The method of claim 1, further comprising receiving, by the guide system controller, a sequence of one or more input signals and prompting the directional light device to project the visual indicator for the particular guided operation.”

As discussed in Challenge 1, claim 2, this claim is likely indefinite because the claim lacks antecedent basis for “the guide system controller,” which does not appear anywhere in claim 1. Nevertheless, it is disclosed by the combination of Machino-I and II.

First, the on-site PC (or “on-site use PC”) is a *guide system controller* operable to control the projector (*directional light device*) to project a *visual indicator*, as illustrated below:

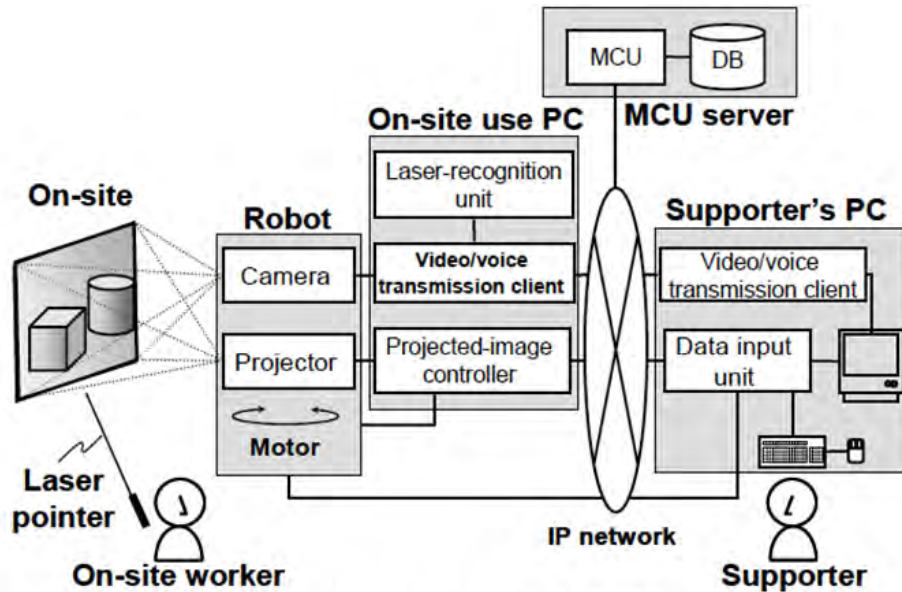


Fig. 3 Schematic configuration of SCOPE system.

Machino-I, Fig. 3; *see also* Machino-I at Abstract. The on-site use PC includes a “projected-image controller” connected to the on-site projector. Machino-I, Fig. 3; Singhose, ¶ 266.

Second, the on-site user PC *receiv[es] a sequence of one or more input signals and prompt[s] the directional light device to project the visual indicator for the particular guided operation*. As discussed in [1.1], the remote supporter may send signals directing the SCOPE projector to project images and attribute information concerning target objects through a program on their PC. *See* Machino-I at 4 (“[T]he camera and projector on the on-site worker’s side can be manipulated from the

supporter's side, and the domains of the viewing field and the information presentation can be changed...."); Machino-II at 3 (“[T]he camera/projector at the on-site worker's location can be manipulated from the supporter's location.”).

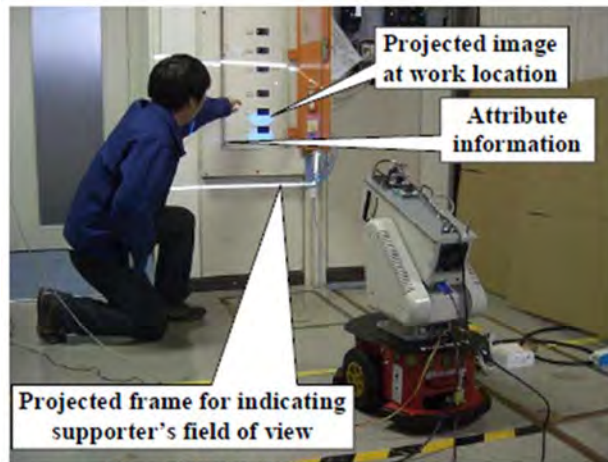


Fig. 11 Mobile SCOPE (on-site location).

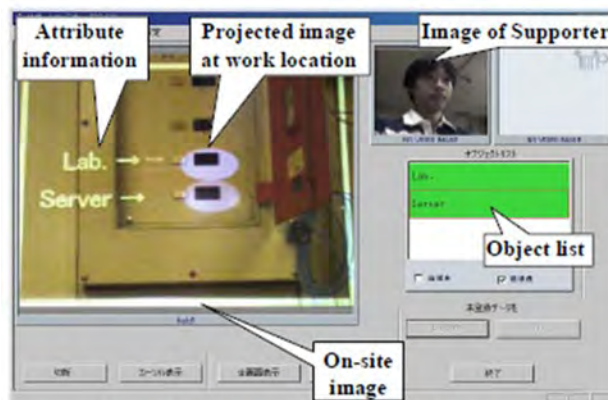


Fig. 12 Screen shot (supporter's location).

Machino-II, Figs. 11-12; *see also* Machino-I, Fig. 4. Singhose, ¶¶ 267-269.

Machino-I further discloses a “pseudo-finger pointing” function where movement of the remote supporter's mouse is projected before the on-site worker to “write simple text and draw signs in real space.” Machino-I at 4. The purpose is to help an on-site worker through a guided task, such as a maintenance operation. *Id.*

at 1. Accordingly, the on-site use PC receives one or more *input signals and prompt[s] the directional light device (projector) to project the visual indicator for the particular guided operation.* Singhose, ¶ 270.

Thus, the combination of Machino-I and II renders obvious claim 2. Singhose, ¶ 271.

2. Claim 3

“The method of claim 2, wherein the sequence of one or more input signals are provided by a separate computer system or controller to the guide system controller.”

This claim is likely indefinite because it depends from claim 2. Regardless, it is disclosed by Machino-I and II. As discussed for Challenge 4, claim 2, the remote supporter’s PC provides a *sequence of one or more input signals*. The supporter’s PC is also *a separate computer system or controller to the guide system controller* (on-site use PC). See Machino-I, Abstract (“PCs connected via a network”). This is also shown in Machino-I:

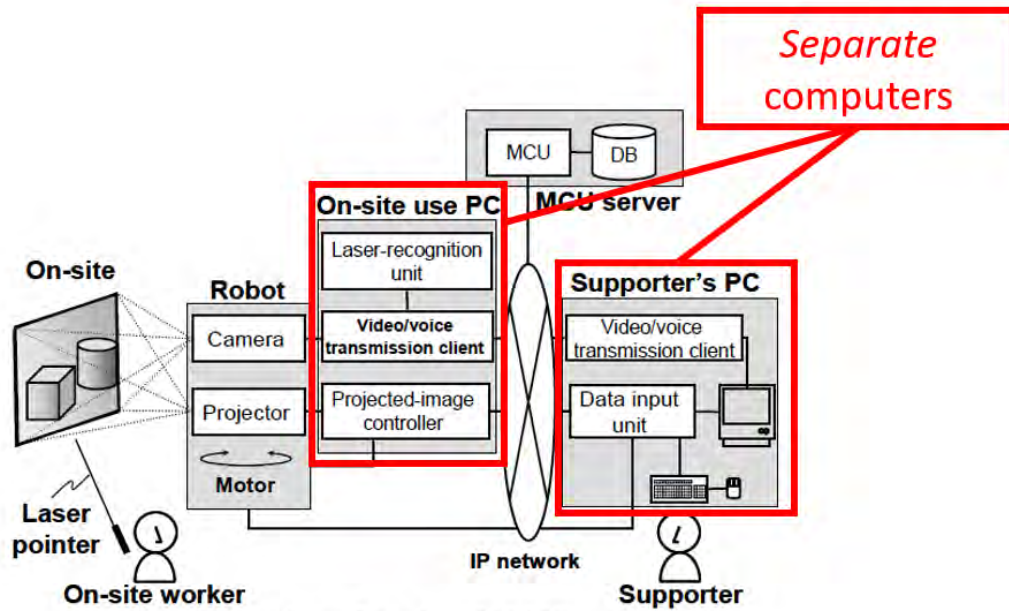


Fig. 3 Schematic configuration of SCOPE system.

Machino-1, Fig. 3; Singhose, ¶ 274. Thus, the combination of Machino-I and II renders obvious claim 3. Singhose, ¶ 275.

3. Claim 4

“The method of claim 1, further comprising receiving, by the guide system controller, a sequence of input signals and prompting the directional light device to dynamically project a sequence of visual indicators onto the physical object for the particular guided operation based on the sequence of the input signals.”

As discussed in Challenge 4, element [1.1], Machino-I and II disclose a *directional light device* that projects visual indicators onto the physical object for the particular guided operation. Similarly, as discussed for claim 2, Machino-I and II disclose a *guide system controller*, receiving . . . a sequence of input signals. Singhose, ¶ 278.

Claim 4 further requires *dynamically project[ing] a sequence of visual indicators . . . based on the sequence of input signals*. For example, Machino-I and II describe systems for selectively displaying *visual indicators*, including the “projected object[s]” and “attribute information” shown below:

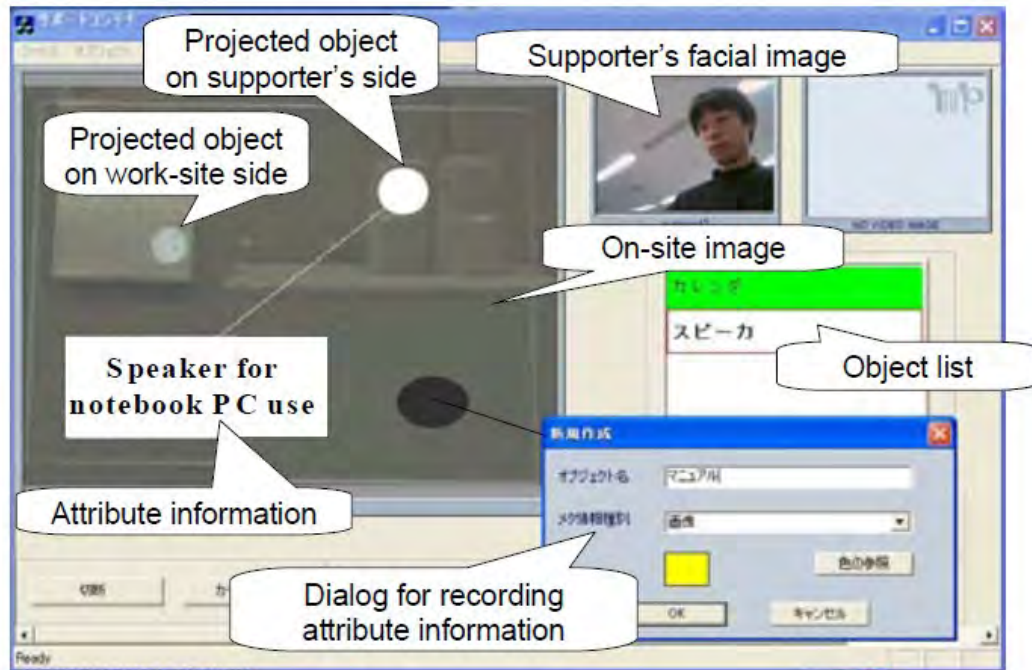


Fig. 4 View of a support screen.

Machino-I, Fig. 4; Singhose, ¶ 279. The Machino references explain that projected images are displayed “as occasion demands.” Machino-I at 3 (“Information needed for carrying out operations (referred to as ‘attribute information’ hereafter”), is affixed to the target object in terms of position coordinates in the working space, controlled, and **displayed as occasion demands.**”) (emphasis added). This projection of attribute information or

projected objects is *dynamic* because it is based on *input signals* generated from the actions of either the on-site worker or the remote user:

By manipulating the projected object, the display status of attribute information can also be manipulated. On the on-site worker's side, the laser pointer is used to manipulate the projected object. On the supporter's side, the projected object is shown on a communication screen displaying images transmitted from the on-site worker's side and manipulated by PC mouse.

Machino-I at 4. As this passage shows, *input signals* to the SCOPE projector can come from detection of a laser pointer spot (from the on-site worker) or from mouse inputs from the remote supporter. For example, the remote supporter's user interface allows them to influence what images are displayed by the projector.

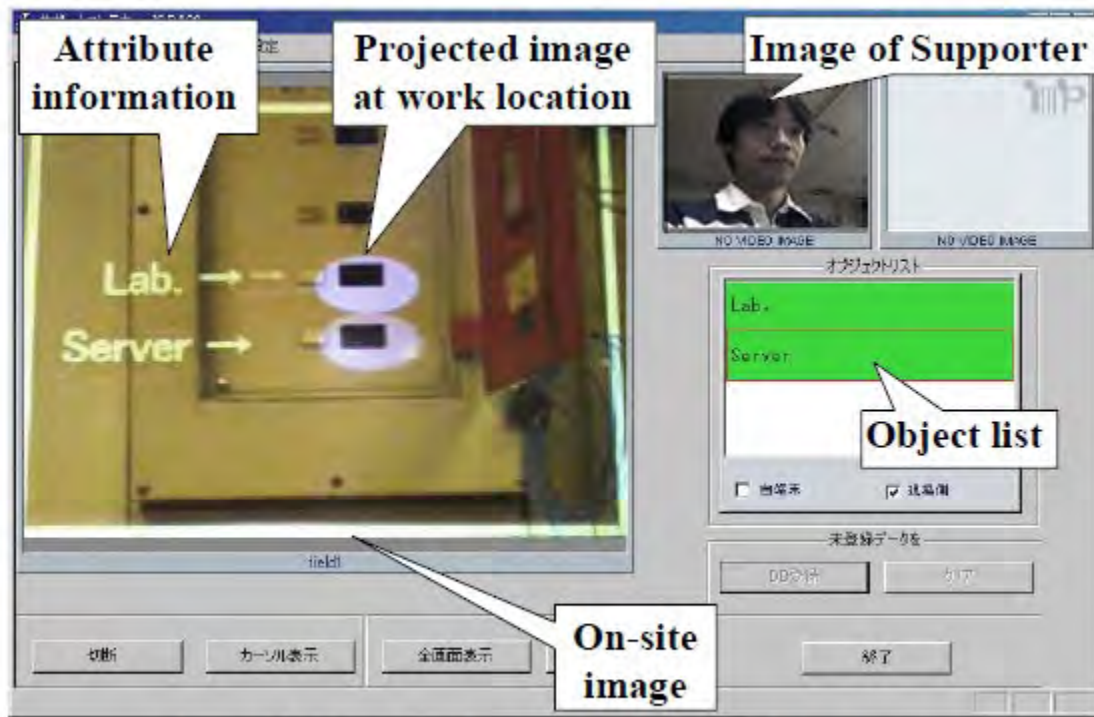


Fig. 12 Screen shot (supporter's location).

Machino-II, Fig. 12; see also Machino-I, Fig. 4 (showing the same remote supporter's interface). Dr. Singhose explains that this figure shows a remote supporter user interface for dynamically creating and manipulating projected visual indicators in real time using *input signals* sent from the remote supporter's PC to the local PC. Singhose, ¶¶ 279-281.

Additionally, in Machino-I, visual indicators from the remote supporter are *dynamically projected* in real-time using *input signals* from the remote supporter's mouse to implement “pseudo-finger pointing,” i.e., displaying a “track” based on the motion of the remote supporter's mouse. Machino-I at 4

(“by displaying the PC mouse cursor, specified points within the shared viewing field can be pointed out”). Singhose, ¶ 282.

In other examples, figures were projected dynamically in response to the on-site worker using a laser pointer. Machino-I at 5 (“When the card is pointed out by laser pointer, the recorded instructions are superimposed onto the card.”); *id.* at 6 (“Cards are selected by laser pointer, and their descriptions (letters of the alphabet) are superimposed on them.”); Singhose, ¶ 283. As shown in Figure 3 of Machino-I, the *input signals* may come from the “Laser-recognition unit” on the “On-site use PC”, or they may be sent over an IP network from the “Supporter’s PC.” Machino-I at 3.

In these examples, the *input signals* result from intervention by the remote supporter. These *input signals* cause the SCOPE projector to *dynamically project a sequence of visual indicators onto the physical object* (i.e., the cards) *for the particular guided operation* (i.e., one of the experimental game operations in Machino-I or the maintenance operation in Machino-II) *based on the sequence of the input signals* (i.e., based on the detected laser pointer or detected input by the remote supporter). Singhose, ¶¶ 277-284.

Thus, the combination of Machino-I and II renders obvious claim 4. Singhose ¶ 275.

4. Claim 5

“The method of claim 4, further comprising receiving, by the guide system controller, a combination of the sequence of the input signals and generation of a dynamic, real-time projection, via the directional light device, of the sequence of said visual indicators.”

As discussed in Challenge 1, this claim is obvious to the same extent as claim 11, discussed below. Singhose ¶¶ 285-289, 311-315.

5. Claim 6

“The method of claim 5, wherein the sequence of input signals are provided by a separate computer system or controller to the guide system controller.”

This claim may be indefinite, as discussed above for Challenge 1. Nevertheless, it is disclosed by Machino-I and II. As discussed in Challenge 4, claim 2, the remote supporter’s PC *provides the sequence of input signals to said guide system controller*. As discussed in Challenge 4, claim 3, said remote supporter PC is also *a separate computer system or controller*. Singhose, ¶¶ 290-292.

Thus, the combination of Machino-I and II renders obvious claim 6.

6. Claim 7

Claim 7 is obvious in view of the combination of Machino-I and II.

[7.0] “A guide system adapted to provide visual indicators to an individual to guide actions of the individual for a particular guided operation, said guide system comprising:”

If the preamble is limiting, the combination of Machino-I and II discloses it. See Challenge 4, element [1.0]. SCOPE is a *guide system* because it provides projections to a worker to guide operations. See, e.g., Machino-I, Fig. 3; Singhose, ¶ 293.

[7.1] “a directional light device, said directional light device being selectively operable to project and target at least one indicating light;”

Element [7.1] further requires that the system is *selectively operable to project and target at least one indicating light*. Machino-I and II disclose this limitation as discussed for Challenge 4, element [1.1]. Singhose, ¶ 294. Additionally, Machino-II discloses “automatic correction” functionality that *project[s] and target[s]* onto a specific object, even if the robot is rotated:

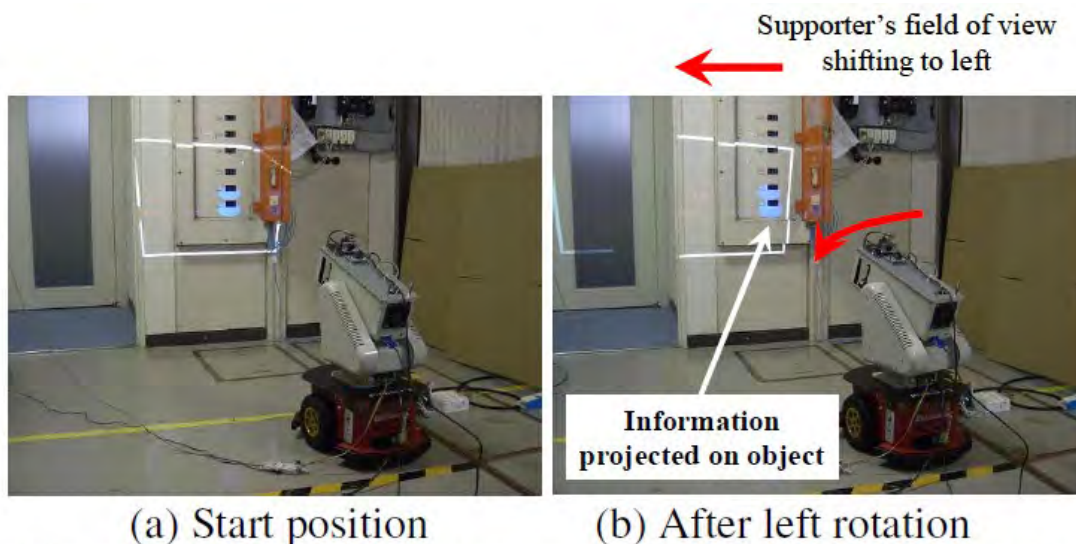


Fig. 13 Result of automatic correction of projected attribute information.

Machino-II, Fig. 13; Singhose, ¶¶ 295-296.

[7.2] “a guide system controller, said guide system controller being operable to control said directional light device to project a visual indicator with said indicating light onto a physical object associated with the particular guided operation;”

Machino-I and II disclose *a guide system controller* (the “on-site use PC”) as discussed for Challenge 4, claim 2. *Said guide system controller is operable to control said directional light device*, for reasons discussed for claim 2. *See also* Machino-I, Fig. 3 (showing that on-site use PC includes “Projected-image controller”); *id.*, Fig. 4 (showing projected indicator); Machino-II, Figs. 11-13 (same); Singhose, ¶ 297. As discussed in Challenge 4 at [1.1], Machino-I and II also disclose *project[ing] a visual indicator ... onto a physical object associated with the particular guided operation. Id.* The *visual indicator* is further projected with an *indicating light*. *See analysis in Challenge 4, [7.1]. Id.*

[7.3] “a camera located proximate to said directional light device and configured to capture an image of at least the individual, the physical object and said visual indicator when said visual indicator is projected onto the physical object;”

Machino-I and II disclose *a camera located proximate to said directional light device* as discussed for Challenge 4, element [1.2]. Singhose, ¶ 299. Machino-I and II further disclose *a camera . . . configured to capture an image of at least the*

individual, the physical object and said visual indicator when said visual indicator is projected onto the physical object as discussed for Challenge 4, element [1.4]. Id. [7.4] “a monitor, said monitor being remote from said directional light device and said guide system controller, with said monitor being operably interfaced with said camera to display the image captured by said camera.”

Machino-I and II disclose (1) *a monitor*; (2) *said monitor being remote from said directional light device*; and (3) *said monitor . . . to display the image captured by said camera* as discussed for Challenge 4, element [1.3]. Singhose, ¶ 300. The camera is *operably interfaced* with and able to transmit images to the monitor. See Challenge 4, element [1.3]; see also Machino-I, Fig 3 (showing hardware and network connection path between camera and remote monitor); *id.*, Fig. 4 (showing that remote monitor can display information from camera); Machino-II, Fig. 12 (same); Singhose, ¶ 300. Thus, the combination of Machino-I and II renders claim 7 obvious. Singhose, ¶¶ 301.

7. Claim 8

“The system of claim 7, wherein said guide system controller is configured to receive a sequence of one or more input signals causing said directional light device to project said visual indicator for the particular guided operation.”

Machino-I and II disclose this element for the reasons discussed for Challenge 4, claim 2. This includes the requirement that *input signals* in SCOPE caus[e] *said*

directional light device to project said visual indicator, as discussed with respect to claim 2. Singhose, ¶¶ 303-304.

Thus, the combination of Machino-I and II renders obvious claim 8.

8. Claim 9

“The system of claim 8, further including a separate computer system or controller and wherein said separate computer system or controller is configured to provide the sequence of one or more input signals to said guide system controller.”

Machino-I and II disclose this element for the reasons discussed for Challenge 4, claim 3. Singhose, ¶¶ 305-307. Thus, the combination of Machino-I and II renders obvious claim 9.

9. Claim 10

“The system of claim 7, wherein said guide system controller is configured to receive a sequence of input signals and to cause said directional light device to dynamically project a sequence of visual indicators onto the physical object for the particular guided operation based on the sequence of the input signals.”

Machino-I and II disclose the elements of claim 10 for the reasons discussed for Challenge 4, claim 4. Singhose, ¶¶ 308-310. Thus, the combination of Machino-I and II renders obvious claim 10.

10.Claim 11

“The system of claim 10, wherein a combination of the sequence of the input signals results in a generation of a dynamic, real-time projection of the sequence of said visual indicators.”

As discussed in Challenge 1, claim 11, *a combination of the sequence of the input signals* may be indefinite. Nevertheless, this limitation is taught by Machino-I and II. As discussed for Challenge 4, claims 2 and 4, the Machino references disclose that the SCOPE system generates a *dynamic projection of the sequence of said visual indicators* in response to *receiving the sequence of input signals*, either relative to the detected laser spot or based on instructions from the remote supporter. These are *dynamic, real-time projection[s]* because they are based on input signals not known in advance and because they appear to happen relatively quickly. Singhose, ¶ 313.

Machino-I also describes “pseudo-finger pointing” functionality by projecting the remote supporter’s mouse location. Machino-I at 4. This also shows *a dynamic, real-time projection of the sequence of said visual indicators*. Singhose, ¶ 314.

Thus, the combination of Machino-I and II renders obvious claim 11.

11.Claim 12

“The system of claim 11, further including a separate computer system or controller and wherein said separate computer system or controller is configured to provide the sequence of input signals to said guide system controller.”

This claim may be indefinite as being dependent from claim 11. Nevertheless, it is disclosed by Machino-I and II as set forth in Challenge 4, claim 6. Singhose, ¶¶ 316-319. Thus, the combination of Machino-I and II renders obvious claim 12.

VII. DISCRETIONARY DENIAL IS INAPPROPRIATE

Discretionary denial of institution is not warranted here. None of the references at issue in this Petition were before the examiner, nor are they cumulative. One file history reference mentions the ED-projector, but it does not provide the detail set forth in this Petition.

The *Fintiv* factors also weigh against discretionary denial as to both co-pending district court cases. In the Eastern District of Texas (“EDTX”) action, currently scheduled for jury selection July 15, 2024, a motion to dismiss for improper venue is pending. Ex. 1012 (Docket Control Order). Although a magistrate has recommended that the district court deny the motion, the record is clear that before LightGuide filed suit, Amazon had not committed any allegedly infringing act in EDTX. Amazon accordingly expects that the EDTX case will ultimately be dismissed for improper venue.⁶ The second, appropriately-venued

⁶ Given the pending venue question, Amazon is not offering a stipulation relative to estoppel at this time but may do so after the district court reviews the magistrate’s order.

action in the Western District of Washington (“WDWA”) is still in its infancy. *See* Ex. 1013 (WDWA Docket).

A. *Fintiv* Factor 1: Institution Will Enable a Stay

This factor favors institution. Petitioner will promptly move to stay the district court cases should institution be granted. The WDWA court adopts a “liberal policy” in favor of granting such stays. *See, e.g. New World Medical Inc. v. MicroSurgical Technology Inc.*, No. 2:20-cv-01621-RAJ-BAT, 2021 WL 952456, at *2 (W.D. Wash. Feb. 18, 2021) (citing *Supercell Oy v. Rothschild Digital Media Innovations, LLC*, No. C15-1119JLR, 2016 WL 9226493, at *2-3 (W.D. Wash. July 28, 2016)). Even assuming the Texas action is not dismissed, EDTX courts have stayed cases in similar or more advanced stages once the Board instituted trial. *See, e.g., CyWee Group Ltd. v. Samsung Electronics Co. Ltd.*, No. 2-17-cv-00140-WCB-RSP, 2019 WL 11023976, at *7 (granting stay two months from trial) (collecting cases).

B. *Fintiv* Factor 2: District Court Schedule

The second factor strongly favors institution. The medium time-to-trial for civil actions in WDWA⁷ places the estimated trial date in July 2025, five months

⁷ *See* United States District Courts National Judicial Case Load Profile (Mar. 31, 2023), <https://www.uscourts.gov/file/71612>.

after the final written decision is expected for this Petition. Meanwhile, even if the Texas action is not dismissed, this factor only weighs slightly against institution. Although the current docket control order in EDTX has scheduled jury selection for July 2024, the Board has previously found that even a multi-month gap between the start of trial and the expected final decision weighs only “somewhat in favor” of exercising discretion. *Equipmentsshare.com Inc. v. Ahern Rentals, Inc.*, IPR2021-00834, Paper 19 at 13 (PTAB Nov. 16, 2021); *see also Resi Media LLC v. Boxcast Inc.*, IPR2022-00067, Paper 16 at 10 (PTAB Apr. 26, 2022) (instituting IPR even though trial was scheduled to begin “approximately eight months before [the] deadline to reach a final decision.”).

C. *Fintiv* Factor 3: Investment in Parallel Proceedings

The third factor also strongly favors institution. The WDWA case is still in its infancy and has yet to receive a scheduling order. Ex. 1013. The Court is unlikely to have issued substantive decisions by the time the Board issues its institution decision.

Even for EDTX, this factor only weighs slightly against institution. The Markman hearing is currently scheduled for January 26, 2024, near when the Board’s institution decision would likely be issued. Ex. 1012. Thus, the court will likely not have issued its claim construction order. The close of fact and expert discovery would not occur for another one to two months after the Board’s

institution decision. *Id.* The Board has ruled that a similar timeline weighs only somewhat in favor of discretionary denial. *Cisco Systems, Inc. v. Ramot at Tel Aviv University Ltd*, IPR 2020-00122, Paper 15 at 9 (PTAB May 15, 2020).

D. *Fintiv* Factor 4: Overlap between Issues Raised in the Petition and in the Parallel Proceeding

The fourth factor is neutral. Although the challenged claims 1-12 are also at issue in EDTX, the underlying action will likely be dismissed or stayed before the issue of their validity would be resolved. Additionally, even if the EDTX case were to proceed to trial without interruption, at least seven of the claims will be dropped before trial, leaving the Board the only tribunal to assess their validity.⁸

E. *Fintiv* Factor 5: Same Parties Between the Petition and Parallel Proceedings

The fifth factor is neutral. While the Petitioner is the defendant/declaratory judgment Plaintiff in the district court litigations, the district courts' willingness to grant stays where the Board has instituted review minimizes the risk of duplicating work between tribunals. Further, Board members have noted that *Fintiv* does not require having the same party in both proceedings to automatically weigh against institution, because it "says nothing about situations in which the petitioner is the

⁸ See General Order No. 13-20 re Focusing Patent Claims, ¶ 3, available at <https://www.txed.uscourts.gov/sites/default/files/goFiles/13-20.pdf>

same as ... the district court defendant.” *Cisco Sys., Inc. v. Ramot at Tel Aviv Univ. Ltd.*, IPR2020-00122, Paper 15, at *10-11 (PTAB May 15, 2020) (APJ Crumbley, dissenting) (noting the opposite presumption is “contrary to the goal of providing district court litigants an alternative venue to resolve questions of patentability.”).

F. *Fintiv* Factor 6: Other Considerations Support Institution

The sixth factor strongly favors institution. First, as to the EDTX matter, even if the district court finds that venue is proper, despite the fact that Amazon never committed the acts that are accused of infringement in the Eastern District of Texas, then any trial judgment against Amazon would likely be vacated on appeal due to improper venue. *Goglin & Stelter v. Karn’s Auto Imports, Inc.*, 886 F.2d 100 (5th Cir. 1989). The existence of an appealable issue that would undermine any verdict against Amazon is another factor that weighs against discretionary denial.

In any event, Amazon’s Petition presents compelling evidence that the challenged claims are invalid, thus overcoming any claim that LightGuide may make relative to the other factors. Interim Guidance, 4-5.

Thus, discretionary denial is inappropriate here. Relative to the action in the WDWA, all factors either favor institution or are neutral. And even as to the case in the EDTX, the only factor favoring institution is the current trial date—which will cover at most five of the twelve claims challenged in this Petition. As Director Vidal’s Memorandum explains, “when other relevant factors weigh against

exercising discretion to deny institution or are neutral, the proximity to trial should not alone outweigh all of those other factors.” June 21, 2022 Interim Procedure Memorandum. Thus, discretionary denial is not appropriate.

VIII. MANDATORY NOTICES

A. Real Party-in-Interest

The Petitioner is Amazon.com, Inc. and Amazon.com Services LLC, both of whom are the real parties-in-interest.

B. Related Matters

As of the filing date of this petition and to the best knowledge of the Petitioner, the '036 patent is or has been involved in the following litigations:

- *LightGuide, Inc. v. Amazon.com, Inc. and Amazon.com Services LLC*, 2:22-cv-00433 (E.D. Tex. 2022) (served on Amazon November 8, 2022); and
- *Amazon.com, Inc. and Amazon.com Services LLC v. LightGuide, Inc.*, 2:23-cv-00053 (W.D. Wash. 2023) (filed January 10, 2023; seeking declaratory judgment of noninfringement only).

C. Designation of Lead and Back-up Counsel and Service Information

Petitioner is filing a power of attorney appointing the lead and back-up counsel designated herein. Petitioner designates the following counsel:

Lead Counsel:

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Please direct all correspondence to lead and back-up counsel at the addresses listed above. Amazon consents to electronic service at the email addresses listed above with cc: to amazon-lightguide@hueston.com.

IX. FEES

Petitioner is submitting the required fees for this Petition via deposit account. The Board is authorized to charge any inadvertent underpayment to this account.

X. GROUNDS FOR STANDING

Petitioner certifies that the '036 patent is available for *inter partes* review and that Petitioner is not barred or estopped from challenging the claims.

Respectfully submitted,

Dated: September 15, 2023

HUESTON HENNIGAN LLP

By: /s/ Christina V. Rayburn
Christina V. Rayburn
Lead Counsel for Petitioner

CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. § 42.24, the undersigned attorney for the Petitioner, declares that the sections of this Petition subject to word limit (i.e., Sections I-VII, IX-X) have a total of 13,688 words, according to the word count tool in Microsoft Word.

/s/ Christina V. Rayburn
Christina V. Rayburn
Lead Counsel for Petitioner

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF SERVICE

The undersigned certifies, in accordance with 37 C.F.R. § 42.205, that service was made on the Patent Owner as detailed below.

Date of service	September 15, 2023
Manner of service	U.S. Express Mail
Documents served	Petition for <i>Inter Partes</i> Review; Exhibits 1001-1018
Persons served	Karl Ondersma Gardner, Linn, Burkhardt & Ondersma LLP 2900 Charlevoix Dr., SE, Suite 300 Grand Rapids, MI 49546

/s/ Christina V. Rayburn

Christina V. Rayburn
Lead Counsel for Petitioner