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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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*Ex parte* JAMES JOSEPH KUFFNER

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Appeal 2019-005983
Application 14/829,716
Technology Center 2600

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Before ERIC B. CHEN, JEREMY J. CURCURI, and JAMES B. ARPIN, *Administrative Patent Judges*.

ARPIN, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellant[1] appeals under 35 U.S.C. § 134(a), the Examiner's final rejections of claims 1, 6, 8–12, 16, 17, 19, and 20, all of the pending claims. Final Act. 2.[2] Claims 2–5, 7, 13–15, 18, and, 21–28 are canceled. *Id.* We

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[1] "Appellant" here refers to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party-in-interest as X Development LLC. Supp. Appeal Br. 1.

[2] In this Decision, we refer to Appellant's Response After Final Action ("Resp.," filed June 26, 2018), Appeal Brief ("Appeal Br.," filed October 16, 2018), Reply Brief ("Reply Br.," filed March 12, 2019), and Supplemental Appeal Brief ("Supp. Appeal Br.," filed August 20, 2019); the Final Office Action ("Final Act.," mailed May 4, 2018), the Advisory Action ("Adv. Act," mailed July 3, 2018), and the Examiner's Answer ("Ans.," mailed January 23, 2019); and the originally-filed Specification ("Spec.," filed August 19, 2015). Rather than repeat the Examiner's findings and

have jurisdiction under 35 U.S.C. § 6(b).

We reverse.

## STATEMENT OF THE CASE

Appellant's claimed invention relates to methods and computer-readable media "involving augmented reality to display virtual representations of robotic device actions or intents for performing a task." Spec. ¶ 4.

As noted above, claims 1, 6, 8–12, 16, 17, 19, and 20 stand rejected. Claims 1 and 19 are independent. Appeal Br. 12 (claim 1), 14–15 (claim 19) (Claims App.). Claims 6, 8–12, 16, and 17 depend directly from claim 1; and claim 20 depends directly from claim 19. *Id*. at 12–16.

Claim 1 recites "[a] computer-implemented method," and claim 19 recites "[a] non-transitory computer readable medium having stored thereon instructions that, upon execution by a computing device, cause the computing device to perform functions," substantially as recited in claim 1. *Id.* at 12, 14–15. The Examiner relies on the same references and substantially similar arguments in rejecting claims 1 and 19 (Final Act. 3–6, 10); and Appellant does not contest the rejection of claims 6, 8–12, 16, 17, and 20 separately from claims 1 and 19 (Appeal Br. 9). Therefore, we focus our analysis on independent claim 1 and the disputed and overlapping limitations recited in independent claim 19.

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determinations and Appellant's contentions in their entirety, we refer to these documents.

Claim 1, reproduced below with disputed limitations emphasized, is representative.

1. A computer-implemented method comprising:

receiving information that indicates an action or an intent of a robotic device to perform a task, wherein the action or the intent includes one or more of a planned trajectory of the robotic device to perform at least a portion of the task and an object to be handled by the robotic device to perform at least a portion of the task;

receiving a camera feed from a field of view of the robotic device;

displaying by a computing device on an augmented reality interface, a virtual representation of the action or the intent, wherein the virtual representation includes as annotations on the augmented reality interface at least a portion of the planned trajectory of the robotic device or highlighting the object to be handled by the robotic device overlaid onto the camera feed from the field of view of the robotic device;

*providing, by a device remote from the robotic device, a projection of light along a pathway to modify the action or the intent of the robotic device; and*

*in response to providing the projection of light, receiving from the robotic device one or more of an updated planned trajectory of the robotic device* and an updated object to be handled by the robotic device.

*Id*. at 12 (emphasis added).

## REFERENCES AND REJECTION

The Examiner relies upon the following references in rejecting the claims:

| Name[3] | Number | Published | Filed |
|---|---|---|---|
| Kobayashi | *Viewing and Reviewing How Humanoids Sensed, Planned and Behaved with Mixed Reality Technology*, 7th IEEE-RAS International Conference on Humanoid Robots, Pittsburgh, PA, USA | Nov. 29–Dec. 1, 2007 | NA |
| Chestnutt | *Interactive Control of Humanoid Navigation*, The 2009 IEEE/RSJ International Conference on Intelligent Robots and Systems, St. Louis, MO, USA | Oct. 11–15, 2009 | NA |
| Buehler | US 2013/0343640 A1 | Dec. 26, 2013 | Sept. 17, 2012 |

Specifically, claims 1, 6, 8–12, 16, 17, 19, and 20 stand rejected as unpatentable under 35 U.S.C. § 103 over the combined teachings of Kobayashi, Buehler, and Chestnutt. Final Act. 3–11.

Appellant contests the obviousness rejection of independent claims 1 and 19 (Appeal Br. 3–9) and relies on the alleged deficiencies in that rejection to overcome the rejection of the dependent claims (*id.* at 9). Because we determine that reversal of the rejection of independent claim 1 is dispositive; except for our ultimate decision, we do not discuss the merits of the rejections of claims 6, 8–12, 16, 17, 19, and 20 further herein. We review the appealed rejection of independent claim 1 for error based upon

[3] All reference citations are to the first named author or inventor only.

the issues identified by Appellant, and in light of the arguments and evidence produced thereon. *Ex parte Frye*, 94 USPQ2d 1072, 1075 (BPAI 2010) (precedential). We address the rejection of claim 1 below.

ANALYSIS

*1. Non-Obviousness of Claim 1 Over Kobayashi, Buehler, and Chestnutt*

As noted above, the Examiner rejects independent claim 1 as obvious over the combined teachings of Kobayashi, Buehler, and Chestnutt. Final Act. 3–6. In particular, claim 1 recites,

> providing, by a device remote from the robotic device, a projection of light along a pathway to modify the action or the intent of the robotic device; and
>
> in response to providing the projection of light, receiving from the robotic device one or more of an updated planned trajectory of the robotic device and an updated object to be handled by the robotic device.

Appeal Br. 12 (Claims App.). The Examiner finds that Kobayashi discloses a footstep planner that computes adaptive footsteps dynamically in order to avoid the obstacles, such that the planned data can be projected on the related physical position of a robot, and provides, by a laser projector mounted on the ceiling, trajectories of the robot on an actual workspace. *See* Final Act. 5–6 (citing Kobayashi, pg. 130, col. 1; pg. 131, col. 2.). Further, the Examiner explains that Kobayashi discloses, "[i]n the footstep planner example, we can see the interactive results by a change of the goal position." *Id.* at 6 (quoting Kobayashi, pg. 134, col. 2); *see* Kobayashi, Fig. 8. The Examiner finds that the disputed limitations merely describe "any device remote from the robotic deice, can project an updated path on the environment," and that "Kobayashi clearly discloses that it is well-known to

th[os]e skill[ed] in the art to use a laser projector placed on the ceiling (remote from the robotic device) to project information on the environment (Zach's [related] work)." Ans. 4–5 (citing Kobayashi, pg. 131, col. 1).

The Examiner also finds that Chestnutt discloses, "[t]he user simply draws the overall route that the robot should take using a pointing device. The robot then plans a footstep sequence along the indicated path and automatically generates motion which roughly follows the user's guide." Final Act. 6 (quoting Chestnutt, pg. 3519, col. 2). In addition, Chestnutt discloses, "[w]hile the robot is walking along a previously specified guide path, the user sketches out a new guide path to follow, ending at the top of the stairs. Once the new guide path is drawn, the robot generates a footstep path to walk along it and climb the stairs." *Id.* (quoting Chestnutt, pg. 3522, col. 2.); *see* Chestnutt, pg. 3521, Fig. 3; pg. 3522, Fig. 4.

The Examiner concludes:

> It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the invention of Kobayashi and Buehler with the teaching of Chestnutt so that it is easy for the user to intuitively specify a desired path directly onto the environment.

Final Act. 6 (citing Chestnutt, pg. 3519, col. 2).

Appellant challenges the proposed combination of the teachings of Kobayashi, Buehler, and Chestnutt. Appeal Br. 3–9; Reply Br. 1–4. We are persuaded that Appellant's challenges identify dispositive Examiner error.

First, Appellant contends that Kobayashi's footstep planner

> only illustrates that footsteps can be overlaid on the actual environment to show virtual obstacles and planned footprints avoiding the obstacles. In contrast, the claim language recites "providing, by a device remote from the robotic device, a projection of light along a pathway to modify the action or the

> intent of the robotic device," as in claims 1 and 19.

Reply Br. 1. The Examiner finds that:

> Kobayashi further discloses "the interactive results by a change of the goal position" in [Kobayashi's] col 2 of p. 134. Here, a user interaction from a projector on the ceiling can be used to modify the planned trajectory. It is well-known that a projector can provide a projection of light along a pathway on a projection plane (floor in [Kobayashi's] Fig 8).

Ans. 4. Nevertheless, we are persuaded the Examiner misinterprets Kobayashi as applied to the disputed limitations of claim 1.

Kobayashi explains:

> Recently, an approach that uses a laser projector to indicate industrial robot trajectories has been proposed. *In this approach, the trajectories of the end of the robot hand are displayed onto an actual workpiece by the laser projector placed on the ceiling.* This approach allows us to understand and confirm the trajectories easier than conventional ways,
>
> *However, there is a big limitation that this system can render graphics only onto physical surfaces.* In any case, we note that an industrial robot is significantly simple in comparison with a humanoid, which should move around autonomously.

Kobayashi, pg. 131, col. 1 (footnotes omitted; emphases added). Thus, Kobayashi teaches that use of a laser projector was known, but, because of significant limitations imposed by its use, Kobayashi does not use a laser projector in its described MR technology. *See* Appeal Br. 4; Reply Br. 2.

Instead, Kobayashi teaches using MR technology, in which a camera mounted in a head-mounted display on the humanoid robot, to image the robot's environment (*see* Kobayashi, pg. 131, col. 2) and to allow an overlay of "what the humanoid robot perceives, plans and controls to the real environment around it and on its body" (*id.* at pg. 130, col. 1).

Kobayashi's Figure 8 is reproduced below with our annotations.

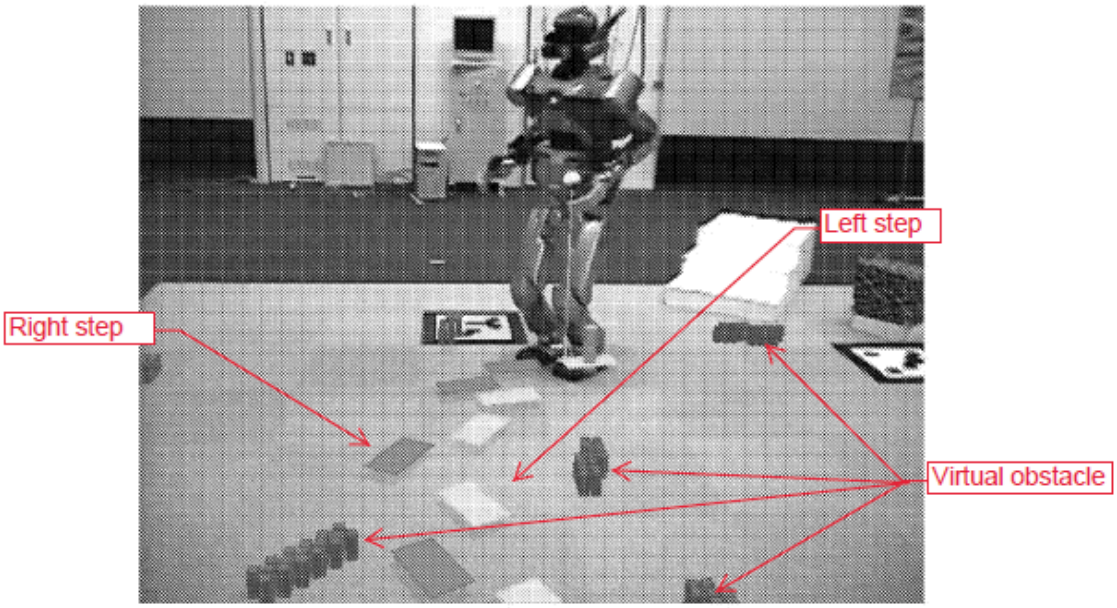


Fig. 8. Footstep result is overlaid on the actual environment. The latticed blocks are virtual obstacles. The rectangle array from the humanoid's feet represents the planned footprints avoiding the obstacles.

Thus, Kobayashi's "footstep planner" overlays footsteps and obstacles onto an image of the robot's "actual" environment. *See id.* at pg. 134, col. 1–2.

The Examiner finds:

> As to the first feature "providing, by a device remote from the robotic device, a projection of light along a pathway to modify the action or the intent of the robotic device", examiner notices that Kobayashi discloses "the footstep planner computes adaptive footsteps dynamically in order to avoid the obstacles... In principle, any type of sensed and planned data can be projected on the related physical position." in col [2] of p. 130; providing, by a laser projector on the ceiling, a trajectories of the robot onto an actual workpiece in col 1 of p.131. Here, Kobayashi discloses the planned data or modified data can be projected on the floor in Fig 8 (two different color for planned and modified trajectory" as reproduced below. Kobayashi further discloses "the interactive results by a change of the goal position" in col 2 of p. 134. *Here, a user interaction from a projector on the ceiling can be used to modify the planned trajectory. It is well-known that a*

> *projector can provide a projection of light along a pathway on a projection plane (floor in Fig 8).*

Ans. 3–4 (emphasis added). We disagree.

> Referring to Figure 10, the Specification describes
>
> a wand-like device 1014 may be used that includes an [inertial measurement unit (IMU)] to track gestures/positions of where a user is pointing or where the device is pointing, and because the computing device provides an illustration of future movement of the robotic device, a user may be able to take action to modify the movement before it has begun.

Spec., ¶ 117. Consequently, we are persuaded instead that Kobayashi teaches projecting virtual footsteps and obstacles on an image of the robot's actual environment, and does not teach "providing, by a device remote from the robotic device, a projection of light along a pathway [in the robot's physical environment] to modify the action or the intent of the robotic device," as recited in claim 1.

Second, the Examiner finds that Chestnutt's "pointing device" teaches or suggests "a device remote from the robotic device" providing "a projection of light." Ans. 7. Chestnutt does not describe the pointing device with specificity. However, Chestnutt discloses that the pointing device acts "as a kind of free-floating mouse." Chestnutt, pg. 3522, col. 2; *see* Resp. 9; Appeal Br. 9. According to Chestnutt, "[t]he augmented reality system operates by localizing cameras within the experimental environment, *and overlaying sensor data or planning information onto the camera image* to aid in debugging or visualizing the planning process." Chestnutt, pg. 3522, col. 2 (citing Kobayashi[4]; footnotes omitted; emphasis added). Referring to

[4] The Examiner incorrectly asserts that "Kobayashi cites Chestnutt as prior art." Ans. 7. Although Kobayashi cites a 2006 article by a different group

Chestnutt's Figures 3 and 4, guide paths, drawn by the operator using the pointing device, and the resulting robot footsteps are depicted. *Id.* at pg. 3521, col. 2 (Fig. 3); pg. 3522, col. 1 (Fig. 4). Thus, like Kobayashi, we are persuaded that Chestnut teaches generating a path in the image of the robot's environment. *See* (Appeal Br. 9 ("At best the cited 'guide paths' are drawn in response to a motion capture associated with the 'pointing device.'"); *see also* Resp. 9 ("The claimed features provide a 'projection of light', which is in contrast to a virtual pathway or virtual markings as shown in the primary reference."). Consequently, we are not persuaded that Chestnutt teaches or suggests the remote device providing a projection of light, as recited in claim 1.

Third, as noted above, the Examiner concludes a person of ordinary skill would have had reason to combine the teachings of Kobayashi, Buehler, and Chestnutt, "so that it is easy for the user to intuitively specify a desired path directly onto the environment." Final Act. 6. For the reasons given above, neither Kobayashi nor Chestnutt teaches or suggests the remote device providing a projection of light, as recited in claim 1. Further, the Examiner's reason for combining the teachings of the applied references fails to show why one of ordinary skill in the art would have found their combined teachings to teach or suggest the disputed limitations. In particular, although Kobayashi teaches that the use of a laser projector

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of authors including "J. Chestnutt" (Kobayashi, pg. 135, col. 2 (reference [10])), this is not the "Chestnutt" reference upon which the Examiner relies in this rejection. However, Chestnutt cites Kobayashi regarding debugging and visualizing the planning process achieved by Kobayashi's MR technology. Chestnutt, pg. 3523, col. 2 (reference [24]); *see, e.g.*, Kobayashi, pg. 131, col. 1–2.

involves "a big limitation" in the area of humanoid robot control, causing Kobayashi to pursue an alternative solution; the Examiner asserts that a person of ordinary skill in the art would have had reason to combine Chestnutt's alleged teaching of a remote light projection device – also in the area of humanoid robot control – with Kobayashi to achieve the disputed claim limitations. These references, however, appear to teach away from their combination to achieve the proposed result. *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1308 (Fed. Cir. 2006) ("[A] reference that 'teaches away' from a given combination may negate a motivation to modify the prior art to meet the claimed invention."); *see In re Gurley*, 27 F.3d 551 Fed. Cir. 1994) ("A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant."). Thus, we are not persuaded that the Examiner has shown that Kobayashi, Buehler, and Chestnutt together teach or suggest the disputed limitations. *See* Appeal Br. 9; Reply Br. 4.

Consequently, we are persuaded that the Examiner erred in rejecting claim 1, and we do not sustain the obviousness rejection of claim 1.

*2. The Remaining Claims*

As noted above, Appellant challenges the rejection of independent claim 19 for the same reasons as claim 1. *See* Final Act. 10; Appeal Br. 3. Each of claims 6, 8–12, 16, 17, and 20 depends directly from independent claim 1 or 19. *Id.* at 12–16 (Claims App.). Appellant does not challenge the rejection of the independent claim 19 or of the dependent claims separately from its challenge to the rejection of independent claim 1. *Id.* at 9; *see*

Reply Br. 4. Because we are persuaded the Examiner erred with respect to the obviousness rejection of claim 1, we also are persuaded the Examiner erred with respect to the obviousness rejection of claims 6, 8–12, 16, 17, 19, and 20. For this reason, we do not sustain the rejection of those claims.

## DECISIONS

1. The Examiner erred in rejecting claims 1, 6, 8–12, 16, 17, 19, and 20 under 35 U.S.C. § 103 as rendered obvious over the combined teachings of Kobayashi, Buehler, and Chestnutt.
2. Thus, on this record, claims 1, 6, 8–12, 16, 17, 19, and 20 are not unpatentable.

## CONCLUSION

For the above reasons, we reverse the Examiner's decision rejecting claims 1, 6, 8–12, 16, 17, 19, and 20.

In summary:

| Claims Rejected | 35 U.S.C. § | References | Affirmed | Reversed |
|---|---|---|---|---|
| 1, 6, 8–12, 16, 17, 19, 20 | 103 | Kobayashi, Buehler, Chestnutt | | 1, 6, 8–12, 16, 17, 19, 20 |
| **Overall Outcome** | | | | **1, 6, 8–12, 16, 17, 19, 20** |

REVERSED