

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 34

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte FRANCIS J. MAGUIRE

Appeal No. 99-2698
Application 08/560,108¹

ON BRIEF

Before HAIRSTON, FLEMING and GROSS, ***Administrative Patent Judges.***

FLEMING, ***Administrative Patent Judge.***

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 1-11, 13, and 15-21², all of the claims pending in the

¹ Application for patent filed November 17, 1995.

² The copy of claim 6 provided in Appellant's Appendix to the Brief contains the typographical errors of using "=" where "" is required. In claim 20, line 2, following the word

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present application. Claims 12 and 14 have been canceled. Dependent claim 22³ has not been addressed by the Examiner or Appellant after its entry, and, as it has not been rejected it is not before us.

The invention relates to a system and method for providing images of real and virtual objects in a head mounted display (specification, page 1, lines 1-2). A pair of cameras (figure 1, item numbered 10) are mounted on a viewer's head (figure 1, item numbered 12) to provide video signals on a line (figure 1, item numbered 14) to a computer and image processor (figure 1, item numbered 16). The video signals contain image information relating to real objects imaged by the cameras (specification, page 5, line 30 through page 6, line 2).

The computer and image processor have stored a computer model of an object space, which may be a room in a house, and the model may include furniture fixed at various points within the room (specification, page 6, lines 3-7). Viewer monitors

"plurality" the word "of" is missing.

³ Submitted by Appellant in paper No. 25, Amendment D.

(figure 1, item numbered 18) provide sensed signals indicative of viewer movements within the object space to the computer and image processor. In response to the sensed signals the computer and image processor provide virtual object selection signals on a line (figure 1, item numbered 20) to a virtual object image store (figure 1, item numbered 22) which contains a plurality of scenarios containing images of one or more virtual objects. The selected scenario is output on a line (figure 1, item numbered 24) to the computer and image processor where images of the virtual objects are integrated with the images of the real objects provided on line 14. The integrated image signal is provided on a line (figure 1, item numbered 26) to a head mounted display (figure 1, item numbered 28) worn by the viewer in the object space.

Disconcerting time lag between the viewer's actions in an empty virtual environment filled with virtual objects and the response of the imaging system (specification, page 2, lines 29-32) is minimized by using images from the head-mounted camera to be displayed on the head-mounted viewer, and by using images imitative of virtual objects moving in the object space which are retrieved from storage and are integrated with

the actual image. This is accomplished by prestoring the positions and geometric features of the real objects in a computer spatial model of the space (specification, page 3, lines 32-36), thus eliminating retrieval of stationary objects from storage.

Independent claim 1 is reproduced as follows:

1. Apparatus for providing a virtual reality environment with images of virtual objects provided in response to sensed actions of a viewer wherein the images of virtual objects lag after the sensed actions of the viewer, comprising:

a head mounted camera (10) for mounting on a head (12) of the viewer acting as a cameraman for gathering images of real objects from a moving perspective of the viewer, said camera responsive to reflected light from the real objects in an object space, for providing a real object image signal (14) indicative of the real objects;

an image store (22), responsive to a selection signal (20), for providing a prestored virtual object image signal (24) indicative of moving virtual objects;

a computer and image processor (16) having positions and geometric features of said real objects prestored in a computer spatial model of the object space, responsive to a plurality of monitor signals for providing the selection signal (20) and responsive to the real object image signal (14) and the virtual object image signal (24), for providing an integrated image signal (26) indicative of both said real objects and said virtual objects;

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one or more monitors (18), responsive to one or more corresponding actions of the viewer acting as a cameraman in the object space, for providing the plurality of monitor signals; and

a head mounted display (28) for mounting on the head of the viewer, responsive to the integrated image signal 26), for providing integrated images of the object space with real and virtual objects for viewing by the viewer with the images of the real objects in registration with the real objects from the moving point of view of the viewer and for viewing by the viewer with the images of the virtual objects integrated therewith, wherein the moving virtual objects move with respect to the real objects positioned in the spatial model for interacting with the viewer and whereby the lag of the images of virtual objects after the sensed actions of the viewer is reduced.

The Examiner relies on the following references:

Ritchey 1992	5,130,794	Jul. 14,
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Ruoff 1985	4,513,317	Apr. 23,
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Bajura Michael "Merging Virtual Objects with the Real World"
in: Computer Graphics (1992), pp 203-210.

Ivan Sutherland "A head-mounted three dimensional display"
(1968), pp 757-763.

M. Deering "High Resolution Virtual Reality" Computer Graphics
(1992), pp 195-202.

Claims 1, 4-7, 9, 13 and 19-20 stand rejected under
35 U.S.C. § 103 as being unpatentable over Bajura in view of

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Sutherland.

Claims 2-3, 8 and 21 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Sutherland and Ritchey.

Claims 10-11, 15 and 17-18 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Sutherland and Ruoff.

Claim 16 stands rejected under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Sutherland and Ritchey and Ruoff.

Claims 1, 4-7, 9, 13 and 19-20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Deering.

Claims 2-3, 8 and 21 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Deering and Ritchey.

Claims 10-11, 15 and 17-18 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Deering and Ruoff.

Claim 16 stands rejected under 35 U.S.C. § 103 as being

unpatentable over Bajura in view of Deering and Ritchey and Ruoff.⁴

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the Brief⁵, Reply Brief⁶, and the Examiner's Answer⁷ for the respective details thereof.

OPINION

We will not sustain the rejections of claims 1-11, 13 and 15-22 under 35 U.S.C. § 103.

The Examiner has failed to set forth a *prima facie* case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the express teachings or suggestions found

⁴ In the final rejection (paper no. 26) the Examiner rejected claims 1-5, 10, 13, 15, 18-19 and 21 under 35 U.S.C. § 112, first paragraph, for the specification failing to support specific limitations of claim 1. As the Examiner withdrew this rejection at section 14 of the Examiner's Answer this matter is no longer at issue.

⁵ The Brief was received June 4, 1998.

⁶ The Reply Brief was received October 16, 1998. The Examiner mailed a letter December 18, 1998 stating that Appellant's Reply Brief had been entered and considered but no further response by the Examiner was deemed necessary.

⁷ The Examiner's Answer was mailed August 11, 1998.

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in the prior art, or by implications contained in such teachings or suggestions. ***In re Sernaker***, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983). The Federal Circuit states that "[t]he mere fact that the prior art may be modified in the manner suggested by Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." ***In re Fritch***, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992), ***citing In re Gordon***, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). It is further established that "[s]uch a suggestion may come from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to that problem." ***Pro-Mold & Tool Co. v. Great Lakes Plastics***, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996) ***citing In re Rinehart***, 531 F.2d 1048, 1054, 189 USPQ 143, 149 (CCPA 1976) (considering the problem to be solved in a determination of obviousness). The Federal Circuit reasons in ***Para-Ordnance Mfg. v. SGS Importers Int'l Inc.***, 73 F.3d 1085, 1088-89, 37 USPQ2d 1237, 1239-40 (Fed. Cir. 1995), that for the determination of obviousness, the

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court must answer whether one of ordinary skill in the art who sets out to solve the problem and who had before him in his workshop the prior art, would have reasonably expected to use the solution that is claimed by Appellants. However, "[o]bviousness may not be established using hindsight or in view of the teachings or suggestions of the invention." **Par Ordnance Mfg. v. SGS Importers Int'l**, 73 F.3d at 1087, 37 USPQ2d at 1239, **citing W. L. Gore & Assocs., Inc. v. Garlock, Inc.** 721 F.2d 1551, 1553, 220 USPQ 311, 312-13. In addition, our reviewing court requires the PTO to make specific findings on a suggestion to combine prior art references. **In re Dembiczak**, 175 F.3d 994, 1000-01, 50 USPQ2d 1614, 1617-19 (Fed. Cir. 1999).

We will first consider the rejection of claims 1, 4-7, 9, 13 and 19-20 under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Sutherland.

On page 6 of the Appeal Brief (hereinafter "Brief"), Appellant agrees with the Examiner that Bajura shows a head mounted camera for mounting on the head of a viewer acting as a cameraman, an image processor for integrating these images

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with sensed images (but of a real fetus with ultrasound, not a virtual object), one or more monitors responsive to the actions of the viewer acting as the cameraman, and a head mounted display responsive to the integrated image signal for providing integrated images of the object space with the images of the fetus.

Furthermore, Appellant admits⁸ that Bajura suggests a non-real-time image, such as a building or addition before construction, in "other applications" under Section 6.2 on page 209. This non-real-time image would most likely be prestored and be of virtual objects. However, Appellant contends that Bajura fails to suggest prestoring positions and geometric features of real objects in a computer model.

Appellant then contends⁹ that a person of ordinary skill in this art in possession of both Bajura and Sutherland would not use the prestored images of Sutherland to modify Bajura to carry

⁸ Brief, page 7; Reply Brief, page 2.

⁹ Brief, page 8.

out the claimed invention as "neither reference has to do with presenting images of actual objects and images of moving virtual objects in conjunction" (Appellant's emphasis).

Appellant then differentiates Sutherland from Bajura, pointing out that Sutherland teaches "the use of an optical see-through display with prestored virtual objects" which appear to hang in space around the user, while Bajura discloses "a video see-through display" (Appellant's emphasis). Sutherland prestores wire frame line drawings¹⁰ and has nothing to do with prestoring positions and geometric features of real objects. Furthermore, Appellant notes¹¹ that although Sutherland teaches the use of a prestored virtual object, it teaches its use in a stationary way with an optical-see-through device, and one skilled in this art would not think of using Sutherland's prestored virtual objects with the video-see-through application of Bajura.

¹⁰ Page 758, line 9; figures 8-9.

¹¹ Brief, pages 9 and 10.

In addition, Appellant asserts that there is no motivation present in either reference, alone or in combination, to make such a modification to Bajura based on Sutherland, and that a person in possession of Bajura would not look to optical-see-through technology for solving video-see-through problems evident from these references. Furthermore, Appellant states that even if one looked to optical-see-through technology for solving video-see-through problems, it would merely suggest a prestored image of a stationary hanging virtual object, and there would be no prestored positions and geometrical features of real objects and no integration with moving virtual objects.

In regard to the "Other Applications" of Bajura¹² Appellant asserts that there is no need shown or suggested to replace any total virtual environment and there is no hint to except moving virtual objects (Appellant's emphasis).

Finally, Appellant argues¹³ that the preamble of claim 1 recites the "lag" problem to which Appellant's invention is

¹² Page 209, column 1.

¹³ Brief, pages 17 and 18.

directed, and the "whereby" clause in the last paragraph of claim 1 concludes with the "lag" being reduced, and these limitations are not disclosed by the applied references.

In the rejection¹⁴ the Examiner admits that Bajura does not explicitly disclose that the graphic image signal is a graphic prestored graphic image signal, and asserts that it is well known in the art to generate a prestored virtual image signal from a plurality of prestored virtual image signals as shown by Sutherland. In addition, the Examiner asserts that as Bajura suggests that the graphic image signal can be used to preview buildings on site before construction or visualize additions to existing architecture, it would have been obvious to one of ordinary skill in the art to substitute Sutherland's prestored virtual image signals for Bajura's real-time generated ultrasound image display.

In reply to Appellant's argument that Bajura does not show or suggest having positions and geometric features of real objects prestored in a computer spatial model the

¹⁴ Final rejection, page 3.

Examiner asserts¹⁵ that the positions and geometric features of the real objects in the computer spatial model have to be determined in order to display the real objects in the environment. The Examiner then points to Bajura at lines 6-7 of the first paragraph of section 4.2, section 4.4 and pages 206-207, as clearly suggesting determining and storing the positions and geometric features of the real objects in the computer spatial model.

In response to Appellant's argument directed to the combination of Sutherland's optical-see-through technology with Bajura's video-see-through technology, the Examiner notes that

the rejection only combined the prestoring means of Sutherland with Bajura's display apparatus.

As to Appellant's argument directed to the time lag aspects of the invention, the Examiner asserts that when Bajura is modified as set forth in the rejection, it would

¹⁵ Answer, page 7.

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inherently solve this problem because Bajura retrieves only the virtual world from storage, as it uses real time images and virtual images.

The Federal Circuit states that "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." ***In re Fritch***, 972 F.2d at 1266 n.14, 23 USPQ2d at 1783-84 n.14 (Fed. Cir. 1992), ***citing In re Gordon***, 733 F.2d at 902, 221 USPQ at 1127 (Fed. Cir. 1984). "Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor." ***Para-Ordnance***, 73 F.3d at 1087, 37 USPQ2d at 1239, ***citing W. L. Gore & Assocs.***, 721 F.2d at 1551, 1553, 220 USPQ at 311, 312-13. In addition, our reviewing court requires the PTO to make specific findings on a suggestion to combine prior art references. ***In re Dembiczak***, 175 F.3d 994, 1000-01, 50 USPQ2d 1614, 1617-19 (Fed. Cir. 1999).

As pointed out by our reviewing court, we must first determine the scope of the claim. "[T]he name of the game is the claim." *In re Hiniker Co.*, 150 F.3d 1362, 1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998).

Turning first to Appellant's claim 1¹⁶, we note that this claim¹⁷ calls for "a computer and image processor having positions and geometric features of said real objects prestored in a computer spatial model of the object space . . .". We agree with Appellant that this is not taught or suggested by Bajura. We have reviewed the sections¹⁸ of Bajura noted by the Examiner and find no such disclosure. The apposite section of lines 6 and 7 of the first paragraph of section 4.2 states "Images in the virtual environment are registered to the real world within the update-rate limit of the tracking and display system" Section 4.4 is directed to calibration of the system and provides for

¹⁶ Similar limitations are present in independent claims 6 and 7.

¹⁷ Lines 5-9.

¹⁸ Lines 6-7 of the first paragraph of section 4.2, section 4.4 and pages 206-207

transducer transformation and camera transformation to calibrate the test system and notes that the camera transformation relates the position and orientation of the head-mounted tracker to the HMD TV camera position, orientation and field of view. Pages 206 and 207 contain sections 4.2 and 4.4 and figures 4-6. Contrary to the Examiner's assertions, these sections of Bajura are devoid of disclosure of a computer and image processor having positions and geometric features of said real objects prestored in a computer spatial model of the object space.

We find that Sutherland prestores wire frame line drawings¹⁹ and has nothing to do with prestoring positions and geometric features of real objects. Although Sutherland teaches the use of a prestored virtual object, it teaches its use in a stationary way with an optical-see-through device.

We further find that as neither reference has to do with presenting images of actual objects in conjunction with images of moving virtual objects, a person of ordinary skill in this art in possession of both Bajura and Sutherland would not use

¹⁹ Page 758, line 9; figures 8-9.

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the prestored images of Sutherland to modify Bajura to carry out the claimed invention.

Therefore, we find that Bajura and Sutherland are directed to disparate teachings which address different problems and we find no reason or suggestion in either prior art reference to enable their combination in this obviousness analysis.

Furthermore, there is no objective teaching in either Bajura or Sutherland that would lead one of ordinary skill in this art to combine the references as proposed by the Examiner.

Therefore, we will not sustain the rejection of claims 1 and 4-7, 9, 13, and 19-20 under 35 U.S.C. § 103 as being unpatentable over Bajura and Sutherland.

In addition, we will not sustain the following rejections:

Claims 2-3, 8 and 21 under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Sutherland and Ritchey;

Claims 10-11, 15 and 17-18 under 35 U.S.C. § 103 as being unpatentable over Bajura in view of Sutherland and Ruoff;

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Claim 16 under 35 U.S.C. § 103 as being
unpatentable over Bajura in view of Sutherland and
Ritchey and Ruoff.

These rejections are all based upon Bajura and Sutherland as
discussed above and the Examiner has only applied the
additional references in these rejections to the specific
limitations added by these dependent claims.

Claims 1, 4-7, 9, 13 and 19-20 are also rejected under
35 U.S.C. § 103 as being unpatentable over Bajura in view of
Deering.

Appellant has adopted²⁰ the arguments previously made
pertaining to Bajura to this rejection.

In addition, Appellant asserts²¹ that Deering has nothing
to do with real objects, but is completely directed to virtual
objects, and does not suggest a computer and image processor
having positions and geometric features of real objects

²⁰ Brief, page 15.

²¹ Brief, page 16.

prestored in a computer spatial model of an object space within which images of virtual objects are integrated with images of the real objects acquired from a head mounted camera.

It is specifically noted by Appellant²² that Deering deals with the image lag problem by using a forward prediction, such as a linear interpolation or higher order interpolators based on Kalman filtering. This mode is entirely different from Appellant's mode of lag reduction which reduces the effect of latency by concentrating the computational power of the image processor on the moving virtual objects and substituting real objects for the stationary parts of the virtual environment which can be imaged by cameras mounted on the viewer's head.

In the rejection²³ the Examiner admits that Bajura does not explicitly disclose that the graphic image signal is a prestored graphic image signal, and asserts that it is well known in the art to generate a prestored virtual image signal

²² Brief, page 16.

²³ Final rejection, page 8.

from a plurality of prestored virtual image signals as shown by Deering. In addition, the Examiner asserts that as Bajura suggests that the graphic image signal can be used to preview buildings on site before construction or visualize additions to existing architecture, it would have been obvious to one of ordinary skill in the art to substitute Deering's prestored virtual image signals for Bajura's real-time generated ultrasound image display.

The Examiner also states,²⁴ "The use of Deering in the rejection is similar to Sutherland, Deering is not used to meet all the requirements of the claimed invention, it is used only to show that a virtual object can be generated from a prestoring means rather than from a real time generating means."

Turning again to Appellant's claim 1²⁵, we note that this claim²⁶ calls for "a computer and image processor having positions and geometric features of said real objects

²⁴ Answer, page 8.

²⁵ Similar limitations are present in independent claims 6 and 7.

²⁶ Lines 5-9.

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prestored in a computer spatial model of the object space . . .
. ." We agree with Appellant that this is not taught or
suggested by Bajura, and, as specifically discussed above,
find that it is not disclosed even by those sections of Bajura
cited by the Examiner.

We find that Bajura and Deering are directed to disparate
teachings which address different problems and find no reason
or suggestion in either prior art reference to enable their
combination in this obviousness analysis. Furthermore, there
is no objective teaching in either Bajura or Deering that
would lead one of ordinary skill in this art to combine the
references as proposed by the Examiner.

Therefore, we will not sustain the rejection of claims 1
and 4-7, 9, 13, and 19-20 under 35 U.S.C. § 103 as being
unpatentable over Bajura and Deering.

In addition, we will not sustain the following
rejections:

Claims 2-3, 8 and 21 under 35 U.S.C. § 103 as
being unpatentable over Bajura in view of Deering

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and Ritchey;

Claims 10-11, 15 and 17-18 under 35 U.S.C. § 103
as being unpatentable over Bajura in view of Deering
and Ruoff;

Claim 16 under 35 U.S.C. § 103 as being
unpatentable over Bajura in view of Deering and
Ritchey and Ruoff.

These rejections are all based upon Bajura and Deering as
discussed above and the Examiner has only applied the
additional references in these rejections to the specific
limitations added by these dependent claims.

We have not sustained the rejection of claims 1-11, 13
and 15-21 under 35 U.S.C. § 103. Accordingly, the Examiner's

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decision is reversed.

REVERSED

	KENNETH W. HAIRSTON)	
	Administrative Patent Judge)	
)	
)	
)	BOARD OF
PATENT)	
	MICHAEL R. FLEMING)	APPEALS AND
	Administrative Patent Judge)	
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