

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.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. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte LEON C. WILLIAMS,
JENG-NAN SHIAU,
and DAVID J. METCALFE

Appeal No. 1998-0671
Application 08/285,328¹

ON BRIEF

Before THOMAS, BARRETT, and BARRY, Administrative Patent Judges.
BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

¹ Application for patent filed August 3, 1994, entitled "Method And System For Processing Image Information Using Screening and Error Diffusion."

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This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 1-14 and 17-19.

We reverse, but enter a new ground of rejection.

BACKGROUND

The invention is directed to an image processing method and system that uses screening and error diffusion as described in the Summary of the Present Invention (Brief, pp. 2-3).

Claim 1 is reproduced below.

1. A method of reducing a number of levels in a multi-level grey scale pixel value representing a pixel and diffusing an error generated from reducing the number of levels, comprising the steps of:

(a) receiving the multi-level grey scale pixel value of a first resolution;

(b) generating a screened multi-level grey scale pixel value;

(c) reducing the number of levels in the screened multi-level grey scale pixel value;

(d) generating an error value as a result of the reduction process in said step (c); and

(e) diffusing the error value to multi-level grey scale pixel values of adjacent pixels.

THE PRIOR ART

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The examiner's answer relies on the admitted prior art (APA²) shown in Appellants' figure 1 and the following prior art:

Eschbach 5,258,854 November 2, 1993

J.C. Stoffel and J.F. Moreland, A Survey of Electronic Techniques for Pictorial Reproduction, IEEE Trans. on Comm., Vol. COM-29, No. 12, Dec. 1981, pp. 1898-1925 (hereinafter "Survey").³

Since the Survey article was not mentioned in any rejection prior to the examiner's answer, it technically raises a new ground of rejection. Nevertheless, we consider the Survey article as applied by the Examiner.

The APA of Appellants' figure 1 discloses screening. A screen value, normalized to the threshold, is added to the image signal at the modulator of element 1 to produce a screened multi-level gray scale value, followed by thresholding the multi-level gray scale value against a fixed threshold in the comparator of element 3 to reduce the number of number of gray scale levels. The portion of the Survey article relied upon by the Examiner, page 295 and figure 15,

² The APA relied upon by the Examiner should be listed in the prior art of record section of the examiner's answer.

³ Since the Survey article is mentioned in the rejection (examiner's answer, p. 8), it should be listed in the prior art of record section of the examiner's answer.

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discloses the same two stage screening method and apparatus as disclosed in the APA.

Eschbach discloses a method of scaling bitmapped images by small amounts to compensate for erosion or dilation effects of an imaging process. In "write-white" electrophotographic systems, a laser dissipates charge on the photoconductive surface in areas where printing is not desired; thus, it might be said that white pixels are written to the photoconductive surface. In "write-black" electrophotographic systems, a laser dissipates charge on the photoconductive surface in areas where printing is desired; thus, it might be said that black pixels are written to the photoconductive surface. "Write-white systems tend to shrink or erode black lines, while write-black systems tend to expand black lines." (Col. 1, lines 38-40.) A bitmap to be prepared for printing is initially increased in resolution by a selected factor; e.g., if a half pixel size compensation is required to account for the erosion or dilation effects of the printer, an increase in resolution of 2 is chosen as shown in figure 3. Next, the bitmapped image is increased or decreased in size to compensate for the erosion or dilation of the printing process; e.g., to account for a half pixel erosion, a pixel at the higher resolution is added to the image as shown in figure 4.

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This higher resolution image cannot be printed by the printer and, so, is rescanned to the original resolution of the image. The rescanned image will include a number of gray level pixels, as shown in figure 5. Prior to printing, the pixel values are subjected to a quantizing process where gray level pixel values are reduced to binary values, preferably through an error diffusion process which operates only on gray pixels.

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THE REJECTIONS

Claims 1-14 and 17-19 stand rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-15 of Application 08/285,324 ('324 application), now abandoned (refiled as continuation Application 08/979,320), and claims 1-13 of Application 08/285,326 ('326 application), now U.S. Patent 5,608,821 ('821 patent), issued March 4, 1997.

Claims 1 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eschbach and the APA.

We refer to the second Office action (Paper No. 8), the final rejection (Paper No. 12) (pages referred to as "FR__"), and the examiner's answer (Paper No. 20) (pages referred to as "EA__") for a statement of the Examiner's position and to the appeal brief (Paper No. 19) (pages referred to as "Br__") for a statement of Appellants' arguments thereagainst.

OPINION

Double patenting

Initially, we note that the Examiner should have provided copies of the two sets of application claims as part of the provisional obviousness-type double patenting rejection. Obviousness-type double patenting is based on the claims. In the

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case of obviousness-type double patenting involving a patent, the patent claims are fixed and are readily available from the patent. However, in the case of provisional obviousness-type double patenting involving the claims of an application, the application claims are subject to amendment at any time. Thus, unless the Examiner provides a copy of the claims in the applications over which the present claims are rejected, someone would have to track down the application files and determine the state of the claims in those applications at the time of the rejection. It is the Examiner's responsibility to provide the evidence for the rejection. Nevertheless, since the examiner's answer in this case was entered April 14, 1997, which is after the March 4, 1997, issue date of the '821 patent, we use the claims of the '821 patent for comparison, i.e., the provisional rejection becomes a regular rejection. Similarly, the examiner's answer in this case was entered after the January 24, 1997, date of the appeal brief in the '324 application and we use the appealed claims of the '324 application, which was decided by this panel. That is, we assume the Examiner maintained the obviousness-type double patenting rejection in the examiner's answer over the latest sets of claims in the '324 application and the '326 application ('821 patent).

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The test for obviousness-type double patenting is whether the claimed subject matter of the application is obvious over what is covered by the patent claims (or the application claims in the case of a provisional obviousness-type double patenting rejection). "[T]he disclosure of a patent cited in support of a double patenting rejection cannot be used as though it were prior art, even where the disclosure is found in the claims." General Foods v. Studiengesellschaft Kohle mbH, 972 F.2d 1272, 1281, 23 USPQ2d 1839, 1846 (Fed. Cir. 1992). "[P]atent claims are looked to only to see what has been patented, the subject matter which has been protected, not for something one may find to be disclosed by reading them." Id. at 1281, 23 USPQ at 1846, citing In re Aldrich, 398 F.2d 855, 859, 158 USPQ 311, 314 (CCPA 1968). What has been patented is the subject matter covered by the claims. The question to be asked in the analysis is whether the subject matter covered by the present claims would have been obvious over the subject matter covered by the claims of either the '821 patent or the '324 application.

We are not aware of any legal support for the Examiner's use of a hypothetical "claim" of the type found at EA4-5. Although the Examiner states that the limitations are merely a summary of the common subject matter drafted as a series of method steps, not a

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hypothetical claim (EA8), since the Examiner judges the obviousness-type double patenting over these limitations, rather than actual claims, it is fair to say that the Examiner has drafted a hypothetical claim. The hypothetical claim does not represent the actual claims of the present application, the '324 application, or the '821 patent. Obviousness-type double patenting analysis must use the actual claims. Therefore, the Examiner's analysis based on common disclosure is in error.

It appears that the Examiner's rejection may be based on an improper application of In re Schneller, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). Schneller is a very special case of obviousness-type double patenting. Schneller applies to those situations where: (1) the subject matter recited in the claims of the application is fully disclosed and covered by a claim in the patent (i.e., there has been no improvement or modification invented after filing and the application claim reads on subject matter which has been protected by a patent claim); and (2) there is no reason why appellant was prevented from presenting the same claims for examination in the issued patent (i.e., there is no justification for extending the protection, such as the existence of a restriction requirement). The U.S. Patent and Trademark Office has applied the term

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"non-'obviousness-type'" (as opposed to "obviousness-type") double patenting to the factual situation in Schneller in the past, MPEP § 804 (6th ed. Jan. 1995), pages 800-15, -16, but does not now use this label, MPEP § 804 (7th ed. July 1998), pages 800-21 through 800-23.

The second Schneller condition is not met because the present application, the '324 application, and the '326 application were filed on the same day. That is, there is no issue here about Appellants filing an application, getting protection for an invention, and then some years down the road filing another application claiming subject matter that was clearly covered by the claims of the first application (e.g., a best mode embodiment) for the purpose of improperly extending the right to exclude. Because the second condition is not met, it is not necessary to address the first condition.

To prove obviousness-type double patenting, the Examiner must show why the presently claimed subject matter would have been obvious over claimed subject matter of the '324 application or the '326 application ('821 patent). This has not been done since the Examiner does not analyze the claims of the '324 application or the '326 application ('821 patent). Appellants' claim analysis (e.g.,

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Table 1, Br8) shows that independent claim 1 of this application contains the limitation "generating a screened multi-level grey scale pixel value," which is not found in either claim 1 of the '324 application or claim 1 of the '326 application ('821 patent). The Examiner has not provided any reasoning why this limitation would have been obvious. Appellants' claim analysis (e.g., Table 2, Br11) also shows that independent claim 7 of this application contains the limitation "screening means for generating a screened multi-level grey scale pixel value," which is not found in either claim 9 of the '324 application or claim 5 of the '326 application ('821 patent). Again, the Examiner has not provided any reasoning why this limitation would have been obvious. Because the Examiner has not addressed the obviousness of the limitations of "generating a screened multi-level grey scale pixel value" (claim 1) or "screening means for generating a screened multi-level grey scale pixel value" (claim 7), and has not attempted to show why the limitations of the dependent claims would have been obvious, the Examiner has failed to establish a prima facie case of obviousness-type double patenting over the claimed subject matter of the '821 patent and the '324 application. The rejection of claims 1-14 and 17-19 is reversed.

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Obviousness

In the final rejection, the Examiner found that Eschbach does not disclose screening the multi-level grey scale pixel value, but concluded that "[i]t would have been obvious to one of ordinary skill in the art at the time of the invention for Eschbach to screen the pixel because screening is disclosed by the applicant as being prior art, figure 1, and thus obvious substitution for reducing the levels" (emphasis added) (FR8-9).

Appellants note that the screening function is the combination of modulator and comparator for thresholding. Appellants argue that the fact that one process, (screening), can be substituted for another, (thresholding with error diffusion), does not teach one of ordinary skill in the art that error diffusion would be carried out after screening as claimed (Br18).

Since "substitute" means "to put in the place of another," the Examiner's reasoning in the final rejection seems to propose putting screening in place of the method of reducing levels in Eschbach, which does not make sense. It is the Examiner's final rejection that is being reviewed in this appeal under 35 U.S.C. § 134. See In re Webb, 916 F.2d 1553, 1556, 16 USPQ2d 1433, 1435 (Fed. Cir.

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1990). Accordingly, care should be taken in expressing the rejection in the final rejection.

In the examiner's answer, the Examiner finds that "Eschbach does not explicitly disclose 'generating a screened multi-level grey scale pixel value'" (EA7), but finds that screening before thresholding was well known in the art as shown in the APA of Appellants' figure 1 and the Survey article. The Examiner concludes that it would have been obvious to one of ordinary skill in the art for Eschbach to screen the pixel in view of the APA and the Survey article "because adding a screening function prior to thresholding is the common practice in image processing for generating an intensity modulating the image, so the image can be detected" (EA8). In response to Appellants' argument that the Examiner's final rejection proposed to substitute screening for thresholding, the Examiner states (EA12):

In reply, the Examiner is not substituting the screening for thresholding, which is reducing the number of levels. The screening is substituted before the reduction of levels. This is exactly what the applicant's admitted prior art is illustrating in figure 1. The screening is preformed [sic] is step 1 and is followed by the reduction of levels in step[] 3 (see figure 1).

In the examiner's answer, it becomes clear that the Examiner uses the term "screening" to refer to adding a screen value and a

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pixel value (the modulating step 1 in Appellants' figure 1), rather than the overall screening process of modulating followed by thresholding. What the Examiner apparently intends to say is that it would have been obvious to insert a step of adding a screen value to the gray level pixel values before the step of reducing the number of gray scale levels using an error diffusion process in Eschbach. However, the only reason stated is that it was known in the APA of Appellants' figure 1 and the Survey article, to add a screen value to a pixel value. This is not persuasive motivation to modify. Moreover, we fail to see why it would have been obvious to modify Eschbach to add a screen value to the gray scale values before the error diffusion step. Screening is a technique for transforming a continuous tone image, such as a picture, to binary (black/white) gray tone levels. Eschbach is not concerned with converting a continuous tone image to binary levels, (it is already a binary bitmap), but is only concerned with eliminating the gray levels where the image has been increased in size. We find no motivation to modulate the whole bitmap in Eschbach with a screen. The Examiner has failed to establish a prima facie case of obviousness. The rejection of claims 1 and 7 is reversed.

NEW GROUND OF REJECTION UNDER 37 CFR § 1.196(b)

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Claims 1 and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over the Survey article, Eschbach et al. (Eschbach '653), U.S. Patent 5,317,653, issued May 31, 1994, effective filing date September 5, 1991, (incorporated by reference into the specification at p. 3), and the admitted prior art (APA) at figure 1 and pages 2-3 of the specification (which appears to be discussing Eschbach '653).

The Survey article describes an electronic screening process for converting a continuous tone image to binary gray scale pixel values. With respect to claim 1, referring to figure 15(a) of the Survey article, the pixel input to the adder performs the step of "(a) receiving the multi-level grey scale pixel value of a first resolution"; the adder performs the step of "(b) generating a screened multi-level grey scale pixel value"; and the fixed threshold comparator performs the step of "(c) reducing the number of levels in the screened multi-level grey scale pixel value." The APA of Appellants' figure 1 also shows the same limitations.

It was known that "screening can take place in one of two different ways; [1] the way illustrated in Figure 1 where a screen value, normalized to the threshold, is added to the image signal before thresholding and then thresholded, or [2] in a process where

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the image signal is directly thresholded, (no modulator 1), using varying threshold values formulated from a screen" (numbers in brackets added) (Br18). The second screening process (referred to as dithering or halftoning) is discussed in the specification (pp. 2-3) and in Eschbach '653 (col. 1, lines 44-57) and also satisfies limitations (a)-(c) of claim 1.

Now we address the question of motivation for modifying the screening process of the APA (figure 1 and the direct thresholding at p. 2 of the specification), the Survey article, and the background of Eschbach '653 to add error diffusion. In the background of the invention, Eschbach '653 discloses a problem with screening (col. 1, line 58 to col. 2, line 10):

Dithering presents problems, however, in that the amount of gray within an original image is not maintained exactly over an area, because the finite number of elements inside each halftone cell only allows the reproduction of a finite number of gray levels. The error arising from the difference between the threshold value and the actual gray level value at any particular cell is simply thrown away. This results in loss of image information. Dithering creates significant image artifacts because it ignores this error completely. A well known example is the banding or false contour artifact that can be seen in smooth image areas. Here, the image input gray level varies smoothly over an area while the halftone image has to make a transition from one halftone dot (gray level) to another. This transition can clearly be seen as a band running through smooth image parts.

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Algorithms that convert gray images to binary or other number of gray levels attempting to preserve gray density exist, and include among them error diffusion

See also specification, p. 2, last paragraph, which essentially repeats the first paragraph above. Thus, Eschbach '653 discloses that a problem with screening is that the amount of gray within an original image is not maintained exactly over an area and that throwing away the error caused by thresholding causes a loss of image information and that it was known to use error diffusion to preserve gray density. There is no dispute that error diffusion performs the steps of "(d) generating an error value as a result of the reduction process . . ." and "(e) diffusing the error value to multi-level grey scale pixel values of adjacent pixels."

The Survey article also discloses that error diffusion would be used to provide gray scale rendition where there is coarse gray scale quantization (p. 298): "The fundamental strategy is simply that of direct spatial distribution of the errors created by coarse gray scale quantization, and it can be applied to two or more gray level marking processes." The Examiner did not rely on this teaching of the Survey article.

In our opinion, it would have been obvious to one of ordinary skill in the art to use error diffusion to distribute the error

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arising from the difference between the threshold value and the actual gray level value in the thresholding step of the screening process disclosed in the Survey article, the APA, and the direct thresholding in the background of Eschbach '653 in view of the teaching in Eschbach '653 that it was known to use error diffusion to preserve gray density caused by thresholding in a screening process. In addition, because Eschbach '653 and the APA (at p. 2 of the specification, describing Eschbach '653) disclose that it was known that throwing away the error during thresholding results in a loss of image information, one of ordinary skill in the art would have been motivated to incorporate error diffusion to prevent this loss of information. Still further, the teaching in the Survey article of using error diffusion to provide gray scale rendition when there is coarse gray scale quantization would have suggested to one of ordinary skill in the art that error diffusion could be used to distribute the error caused by the coarse quantization of the fixed threshold comparator in the Survey article, the APA of figure 1, or the direct thresholding of Eschbach '653. While we have discussed the rejection with respect to the steps of method claim 1, the same reasoning applies to the system claim 7, which is the apparatus counterpart of claim 1.

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CONCLUSION

The rejections of claims 1-14 and 17-19 are reversed.

A new ground of rejection is entered as to claims 1 and 7 pursuant to 37 CFR § 1.196(b).

This decision contains a new ground of rejection pursuant to 37 CFR § 1.196(b) (amended effective Dec. 1, 1997, by final rule notice, 62 Fed. Reg. 53,131, 53,197 (Oct. 10, 1997), 1203 Off. Gaz. Pat. & Trademark Office 63, 122 (Oct. 21, 1997)). 37 CFR § 1.196(b) provides that, "[a] new ground of rejection shall not be considered final for purposes of judicial review."

37 CFR § 1.196(b) also provides that the Appellants, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, must exercise one of the following two options with respect to the new ground of rejection to avoid termination of proceedings (37 CFR § 1.197(c)) as to the rejected claims:

(1) Submit an appropriate amendment of the claims so rejected or a showing of facts relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the application will be remanded to the examiner. . . .

(2) Request that the application be reheard under § 1.197(b) by the Board of Patent Appeals and Interferences upon the same record. . . .

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

REVERSED - 37 CFR § 1.196(b)

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Administrative Patent Judge)	
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)	BOARD OF PATENT
LEE E. BARRETT)	APPEALS
Administrative Patent Judge)	AND
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