

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today  
(1) was not written for publication in a law journal and  
(2) is not binding precedent of the Board.

Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte WILLIAM H. CUSHMAN, MOHSEN GHADERI,  
FEREIDOON SAMII AND JOSEPH P. DI VINCENZO

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Appeal No. 94-2081  
Application 07/809,984<sup>1</sup>

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ON BRIEF

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Before HAIRSTON, JERRY SMITH, and FLEMING, Administrative  
Patent Judges.

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<sup>1</sup> Application for patent filed December 18, 1991.

Appeal No. 94-2081  
Application No. 07/809,984

HAIRSTON, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1 through 53. After reconsideration of the non-statutory subject matter rejection, the examiner withdrew the 35 U.S.C. § 101 rejection, and indicated that claims 6, 7, 24, 25, 32, 33, 35 and 36 are now objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims (paper number 17, page 2). Accordingly, claims 1 through 5, 8 through 23, 26 through 31, 34 and 37 through 53 remain before us on appeal.

The disclosed invention relates to a method and apparatus for processing a digital image that includes subsampling the digital image to produce a reduced spatial resolution digital image, and quantizing the reduced spatial resolution digital image in accordance with plural quantizing thresholds to thereby reduce the digital data resolution of the digital image.

Claim 1 is illustrative of the claimed invention, and it

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reads as follows:

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Claim 1. A method of processing an image, comprising the steps of:

a) digitizing the image to produce a map of the image, said map containing pixels having a digital data resolution of  $2^n$  grey levels, wherein  $n$  is the number of bits per pixel;

b) downsampling the map of the image digitized in step a) to produce a dounsampld [sic, downsampled] map of the digitized image; and

c) reducing the digital data resolution of the digitized image by thresholding the downsampled map of the digitized image to reduce the number of bits per pixel from  $n$  bits per pixel to  $m$  bits per pixel, to thereby produce a reduced digital data resolution, thresholded downsampled map of the digitized image, where  $m$  is greater than one and is less than  $n$ .

The references relied on by the examiner are:

Kawamura et al. (Kawamura)	4,783,837	Nov. 8, 1988
Wang et al. (Wang)	4,847,786	July 11, 1989
El-Sherbini	4,879,753	Nov. 7, 1989
Le Gall et al. (Le Gall)	4,897,799	Jan. 30, 1990
Hirabayashi et al. (Hirabayashi)	5,138,672	Aug. 11, 1992
	(effective filing date Dec. 6, 1989)	
Morris et al. (Morris)	5,153,936	Oct. 6, 1992
	(effective filing date June 27, 1988)	

Claims 1, 2, 5, 9 through 13, 16, 20, 23, 27 through 31, 38, 39, 45 through 47, 52 and 53 stand rejected under 35 U.S.C. § 103 as being unpatentable over Le Gall in view of Hirabayashi.

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Claims 3, 8, 19, 21, 26, 40, 41, 48 and 49 stand rejected under 35 U.S.C. § 103 as being unpatentable over Le Gall in view of Hirabayashi and El-Sherbini.

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Claims 4, 8, 17, 22, 26, 34, 43 and 51 stand rejected under 35 U.S.C. § 103 as being unpatentable over Le Gall in view of Hirabayashi and Kawamura.

Claims 14, 15, 22 and 44 stand rejected under 35 U.S.C. § 103 as being unpatentable over Le Gall in view of Hirabayashi and Morris.

Claims 18, 37, 42 and 50 stand rejected under 35 U.S.C. § 103 as being unpatentable over Le Gall in view of Hirabayashi and Wang.

Reference is made to the briefs and the answers for the respective positions of the appellants and the examiner.

#### OPINION

We have carefully considered the entire record before us, and we will reverse the obviousness rejection.

Le Gall discloses a method of enabling format independent communication of visual information between otherwise incompatible display devices. In Figure 1, the conversion device 10 allows transmission of a raster display in a first native format from originating device 12 to a receiving device 15 which produces a raster display in a second native format. The conversion unit 10 receives headers 20 and 22 (Figure 2)

from formatting units 14 and 18, respectively, and, based upon the information contained in the headers, processes the originating raster so that "the data comprising the raster is in the target format, i.e. it has the characteristics indicated in the header 22 of FIG. 2, i.e. the data is in the universal format but it has the characteristics needed for display on the receiving device 15" (column 4, lines 6 through 14). Each of the headers 20 and 22 includes information pertaining to raster size and the number of bits per pixel. Le Gall indicates that algorithms may be used to effect changes in spatial resolution (i.e., convert from one raster size to another)<sup>2</sup> (column 2, lines 55 through 60, and column 4, lines 31 through 41), and that conversions involving a change in data resolution (i.e., the number of bits per pixel) may be carried out using conventional algorithms (column 4, lines 41 through 46). Although Le Gall is silent concerning the specifics of the algorithm for accomplishing changes in

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<sup>2</sup> The examiner is mistaken when he states that "Le Gall fails to specifically teach the step of downsampling the map of the digitized image to produce a downsampled map of the digitized image" (paper number 10, page 8). With respect to "downsampling," the teachings of Hirabayashi are merely cumulative to teachings present in Le Gall.

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spatial resolution, Figure 4 of Le Gall does, however, show a reduction in spatial resolution when the originating raster characteristics 100 are compared to the receiving raster characteristics 200. Other than the brief mention that the number of bits per pixel can be changed, Le Gall does not state how the change in bits per pixel is accomplished in conversion unit 10. More importantly, Le Gall does not describe the order in which the changes in spatial resolution and data resolution are performed in the conversion unit. The claims on appeal specifically state that changes in the data resolution are performed on the downsampled or spatially reduced image by (1) thresholding the downsampled image to produce a specific number of bits with respect to the originally digitized image or (2) quantizing in accordance with plural quantizing thresholds.

Hirabayashi discloses binarization of an image after subsampling (Figures 4, 10 and 14). The reduced pixel values from the subsampling unit are input to the binarization unit and are compared with the threshold value  $T=0.5$  (column 7, lines 18 through 23 and column 8, lines 58 through 60). The comparison of the pixel values with the single threshold value

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T=0.5 will not yield "m bits per pixel . . . where m is greater than one" as set forth in claims 1 and 20, or the "plural quantizing thresholds" of claims 38 and 45.

The obviousness rejection of claims 1, 2, 5, 9 through 13, 16, 20, 23, 27 through 31, 38, 39, 45 through 47, 52 and 53 is reversed because Le Gall and Hirabayashi neither teach nor would they have suggested the claimed invention.

The obviousness rejection of claims 3, 8, 19, 21, 26, 40, 41, 48 and 49 is reversed because El-Sherbini does not cure the noted shortcomings in the teachings of Le Gall and Hirabayashi. The obviousness rejection of claims 4, 8, 17, 22, 26, 34, 43 and 51 is reversed because Kawamura does not cure the noted shortcomings in the teachings of Le Gall and Hirabayashi. The obviousness rejection of claims 14, 15, 22 and 44 is reversed because Morris does not cure the noted shortcomings in the teachings of Le Gall and Hirabayashi. The obviousness rejection of claims 18, 37, 42 and 50 is reversed because Wang does not cure the noted shortcomings in the teachings of Le Gall and Hirabayashi.

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DECISION

The decision of the examiner rejecting claims 1 through 5, 8 through 23, 26 through 31, 34 and 37 through 53 under 35 U.S.C. § 103 is reversed.

REVERSED

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

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