IMAGE PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a color image reproducing apparatus such as color copiers, color facsimile machines and the like, specifically relating to an image segmentation technology for subjecting image areas to effective filtering and other processes.

(2) Description of the Related Art

In general, in a color image reproducing apparatus which performs area determination as to an original made up of characters, continuous dot images, screened halftone images etc., classifying it into character areas, continuous dot areas, screened halftone areas etc., so as to perform optimized processing in accordance with the characteristics of different image areas, a chromatic area is reproduced by a mixture of three color toners, i.e., C(cyan), M(magenta) and Y(yellow) while Bk(black) toner is used to reproduce sharp black character areas.

When the above color image reproducing apparatus is used, it is necessary to correctly determine black characters as belonging to achromatic areas. If a black character, especially, a blurred color portion around black characters, is mistaken as belonging to a chromatic area, the black character is reproduced by a mixture of the three colors of C, M and Y. Further, if these are then subjected to emphasis filtering or the like, the hues are emphasized so that the reproduction cannot be obtained as being black, resulting in failure to reproduce sharp black characters.

In order to reproduce sharp black characters, black characters, inclusive of blurred color portions need to be determined as belonging to achromatic areas without any misjudgment. When black characters are determined as belonging to achromatic areas, the area is usually reproduced with only the black toner, so that emphasis filtering and other processes can produce a beneficial result.

Conventionally, in order to distinguish black characters, Japanese Patent Application Laid-Open Hei 5 No.167,842 (prior art 1) discloses a method in which it was noticed that the greatest density difference and the sum of the density differences characterize black characters on a white background, so that the characteristic values, i.e., the greatest density difference and the sum of the density differences within a predetermined area including a target pixel are computed to determine that the area is a character area.

Japanese Patent Application Laid-Open Hie 5 No.56,287 (prior art 2) discloses a method in which the greatest density difference of each pixel is used to distinguish between chromatic and achromatic colors.

However, in the prior art 1, though judgment about character areas is made, but no color determination as to chromatic and achromatic colors is made. Therefore, the problem described above, that is, misjudgment of achromatic, black characters as chromatic color may incidentally occur.

In the prior art 2, since color judgement between chromatic and achromatic colors is made only based on the greatest density difference of each pixel, misjudgment will occur at a great number of points due to difference in density of the input image. Therefore, it is impossible for the noise removing circuit to completely remove the misjudged portions.

SUMMARY OF THE INVENTION

The present invention has been devised in order to solve the above problems, and it is therefore an object of the present invention to provide an image processing apparatus, which is able to avoid misjudgment as to color determination for area determination and can determine a blurred color portion around black characters as belonging to an achromatic area so as to produce a markedly beneficial output when black character areas are subjected to emphasis filtering and the like.

In order to achieve the above object, the present invention is configured as follows:

In accordance with the first aspect of the invention, an image processing apparatus wherein area determination as to an original having characters, continuous dot images, screened halftone images mixed therein is effected classifying the original into character areas, continuous dot areas, screened halftone areas for each pixel in order to perform optimized processing in accordance with the characteristics of different image areas, includes:

a parameter computing means which computes the maximum density value, the summation of density differences, the average density and the maximum density difference for each pixel in a mask containing a target pixel; and

an area determining means which determines an area in a mask, as being chromatic, achromatic or of the others, by comparing the computed results from the parameter computing means with selective thresholds.

In accordance with the second aspect of the invention, an image processing apparatus wherein area determination as to an original having characters, continuous dot images, screened halftone images mixed-therein is effected classifying the original into character areas, continuous dot areas, screened halftone areas for each pixel in order to perform optimized processing in accordance with the characteristics of different image areas, includes:

a parameter computing means which computes the maximum density value, the summation of density differences, the average density and the maximum density difference for each pixel in a mask containing a target pixel;

an area determining means which determines an area in a mask, as being chromatic, achromatic or of the others, by comparing the computed results from the parameter computing means with selective thresholds; and,

a color determining means which performs area determination of a target pixel based on the results from the area determining means and based on the number of pixels, having judged to be of achromatic, in the mask containing a target pixel and/or the chromatic color ratio in the mask, both determined from the area determining means.

In accordance with the third aspect of the invention, an image processing apparatus wherein area determination as to an original having characters, continuous dot images, screened halftone images mixed therein is effected classifying the original into character areas, continuous dot areas, screened halftone areas for each pixel in order to perform optimized processing in accordance with the characteristics of different image areas, includes:

a parameter computing means which computes the maximum density value, the summation of density differences, the average density and the maximum density difference for each pixel in a mask containing a target pixel;

an area determining means which determines an area in a mask, as being chromatic, achromatic or of the others, by comparing the computed results from the parameter computing means with selective thresholds;