METHOD AND COMPUTER PROGRAM PRODUCT FOR REMOVING MICRODOTS FROM PHOTOGRAPHIC IMAGES

FIELD OF THE INVENTION

The invention relates generally to the field of image processing, and more specifically, to efficiently removing yellow microdots from photographic images.

BACKGROUND OF THE INVENTION

Currently, in the photographic industry, microdots are placed on professional-grade photographic paper for identifying the image captured thereon as copyrighted. U.S. patent application Ser. No. 08/598,778 discloses such copyrighted images having microdots. The microdots are typically yellow in color before an image is printed on the document, and after an image is printed thereon, the color of each microdot is a combination of the original yellow color and the particular color of the image at the location of the microdot.

Under normal viewing conditions the microdots in the document are invisible to the unaided human eye. However, when a digital image of the document is made by a digital copying apparatus, the presence of the microdots can be detected by means of presently known image processing for indicating to the user that the image is copyrighted and should not be reproduced without the photographer's authorization. Upon this detection, the copying apparatus is precluded from making a copy.

In some situations, however, there is a legitimate reason to make a copy of the copyrighted document, and it becomes necessary to remove the microdots from the digital image of the documents. This is especially true if the image is enlarged so that the microdots become readily visible to the human eye.

The current solution to this problem is to use a "dust and scratch" removal algorithm that is commercially available.

Although the presently known and utilized method for removing microdots is satisfactory, it is not without drawbacks. While the above-described method will remove most or all of the microdots from the digital image, it will also slightly degrade a portion of or the whole image.

Consequently, a need exists for overcoming the above-described drawback.

SUMMARY OF THE INVENTION

The present invention is directed to overcoming one or more of the problems set forth above. Briefly summarized, according to one aspect of the present invention, the invention resides in a method for removing microdots from a color image, the method comprising the steps of: (a) comparing the blue code value at a location in the color image with an estimate of the blue code value at the location; (b) comparing a second code value at the location in the color image with an estimate of the second code value at the location; and (c) replacing the blue and second code values at the location with the estimated code values based on the results of steps (a) and (b).

It is the object of this invention to produce a method of microdot removal which removes substantially all of the microdots from the digital image without causing image degradation.

These and other aspects, objects, features and advantages of the present invention will be more clearly understood and appreciated from a review of the following detailed description of the preferred embodiments and appended claims, and by reference to the accompanying drawings.

ADVANTAGEOUS EFFECT OF THE INVENTION

The present invention has the advantage of microdot removal which removes substantially all of the microdots from the digital image without causing image degradation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a computer system for implementing the present invention;

FIG. **2** is a front view of an image captured on photographic paper having microdots; and

FIG. **3** is a flowchart of a software program of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, the present invention will be described in the preferred embodiment as a software program. Those skilled in the art will readily recognize that the equivalent of such software may also be constructed in hardware.

Still further, as used herein, computer-readable storage medium may comprise, for example; magnetic storage media such as a magnetic disk (such as a floppy disk) or magnetic tape; optical storage media such as an optical disc, optical tape, or machine readable bar code; solid state electronic storage devices such as random access memory (RAM), or read only memory (ROM); or any other physical device or medium employed to store a computer program.

Referring to FIG. **1**, there is illustrated a computer system **10** for implementing the present invention. Although the computer system **10** is shown for the purpose of illustrating a preferred embodiment, the present invention is not limited to the computer system **10** shown, but may be used on any electronic processing system. The computer system **10** includes a microprocessor-based unit **20** for receiving and processing software programs and for performing other processing functions. A display **30** is electrically connected to the microprocessor-based unit **20** for displaying user related information associated with the software. A keyboard **40** is also connected to the microprocessor-based unit **20** for permitting a user to input information to the software. As an alternative to using the keyboard **40** for input, a mouse **50** may be used for moving a selector **52** on the display **30** and for selecting an item on which the selector **52** overlays, as is well known in the art.

A compact disk-read only memory (CD-ROM) **55** is connected to the microprocessor-based unit **20** for receiving software programs and for providing a means of inputting the software programs and other information to the microprocessor based unit **20** via a compact disc **57**, which typically includes a software program. In addition, a floppy disk **61** may also include a software program, and is inserted into the microprocessor based unit **20** for inputting the software program. Still further, the microprocessor-based unit **20** may be programmed, as is well know in the art, for storing the software program internally. A printer **56** is connected to the microprocessor based unit **20** for printing a hardcopy of the output of the computer system **10**.

Images may also be displayed on the display **30** by placing an original image on a scanner **60** that is electrically connected to the microprocessor-based unit **20**. The scanner digitizes the image into a digital representation having a plurality of pixels each typically having three chrominance code values, usually red, green, and blue code values. For an eight bit-based computer system, each chrominance band typically has a code value between 0–255.

Referring to FIG. **2**, there is illustrated an image **70** captured on photographic paper **80**, usually professional-