

ART33SG

High Quality Image
Copier with Exact
Reproduction of
Digitally Halftoned
Images



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The claims defining the invention are as follows:

1. A method of generating print data from a printed image produced by a printing device operating at a first dots per inch (dpi) value, so that the image is composed of a plurality of dots, the image incorporating defects resulting during printing of the image, such as rotation of a print medium and blemishes of the image, the method comprising the steps of:
 - scanning the printed image, at a sampling rate which corresponds to a second dpi value that exceeds the first dpi value by a predetermined factor, which is such that each dot of the image results in the generation of a set of at least two markers;
 - generating data relating to the position and colour value of each marker;
 - detecting the defects in the image and assigning a data value to such defects;
 - processing said data and applying the data value assigned to the defects to determine which of each of the markers generated for a respective dot should be recorded as a centre for that dot; and
 - generating print data as a result of the processing step, the print data relating to the position and print value of the markers determined as a result of processing the data.
2. A method as claimed in claim 3, which includes scanning the image at a sampling rate which corresponds to the second dpi value that exceeds the first dpi value by a factor of three, so that each dot of the image results in the generation of a set of three markers.
3. A method as claimed in claim 3, which includes carrying out the scanning step at a point upstream of a printing step carried out by the apparatus.

4. A method as claimed in claim 3, which includes the step of detecting the defects by determining the degree of rotation of the printed image, during the printing step.
5. A method as claimed in claim 3, in which the step of processing the data and applying the data value assigned to the defects includes the steps of:
 - (a) selecting data relating to an initial group of sets of markers and applying the defect value to the selected data to determine which marker of each selected set is to be recorded as related to the centre associated with that set;
 - (b) determining which marker of each set of at least one further set should be recorded as a centre of a corresponding dot by using a relationship existing between the positions of the recorded markers of the initial group of sets;
 - (c) adding data related to the position of the, or each, marker, recorded as a result of the determination, to the data relating to recorded markers of the initial group of sets of markers; and
 - (d) repeating steps (b) and (c) until print data for a further, substantially identical image is obtained.
6. A method as claimed in claim 3, which includes the step of printing an image with said apparatus, using said generated print data.
7. An apparatus for generating print data from a printed image, the apparatus comprising
 - a printing device that operates at a first dots per inch (dpi) value to generate the printed image, so that the image is composed of a plurality of dots, the image incorporating defects resulting during printing of the image, such as rotation of a print medium and blemishes of the image;
 - a scanning device positioned downstream of the printing device for scanning the printed image, the scanning device being configured to operate at a sampling rate which corresponds to a second dpi value that exceeds the first dpi value by a predetermined factor, which is such that

each dot of the image results in the generation of a set of at least two markers, the scanning device being configured to generate data relating to the position and colour value of each marker; and
a processor that is connected to the scanning device and is configured to receive said data from the scanning device, the processor being capable of analysing said data for the defects, applying a data value to the defects, and processing said data together with the data value to determine which of each of the markers generated for a respective dot should be recorded as a centre for that dot, and generating print data relating to the position and colour value of the markers so determined.

8. An apparatus as claimed in claim 9, in which the printing device is in the form of an inkjet printer.
9. An apparatus as claimed in claim 9, in which the scanning device is configured to operate at a sampling rate which corresponds to the second dpi value that exceeds the first dpi value by a factor of three, so that each dot of the image results in the generation of a set of three markers.
10. An apparatus as claimed in claim 9, in which the scanning device includes a series of staggered charge-coupled device (CCD) arrays to achieve the sampling rate corresponding to the second dpi value.
11. An apparatus as claimed in claim 9, in which the processor is operatively connected with the printing device so that the processor can generate said defect value while the image is printed.
12. An apparatus as claimed in claim 13, in which the processor is operatively connected with the printing device so that the processor can assign said defect value to a degree of rotation of the image while the image is printed.

13. An apparatus as claimed in claim 14, in which the processor is pre-programmed to carry out the following steps:
 - (a) selecting data relating to an initial group of sets of markers and applying the defect value to the selected data to determine which marker of each selected set is to be recorded as related to the centre associated with that set;
 - (b) determining which marker of each set of at least one further set should be recorded as a centre of a corresponding dot by using a relationship existing between the positions of the recorded markers of the initial group of sets;
 - (c) adding data related to the position of the, or each, marker, recorded as a result of the determination, to the data relating to recorded markers of the initial group of sets of markers; and
 - (d) repeating steps (b) and (c) until print data for a further, substantially identical image is obtained.
14. An apparatus as claimed in claim 15, which includes a memory arrangement that is connected to the processor to store the print data.
15. An apparatus as claimed in claim 15, in which the processor and the memory arrangement are operatively connected to the printing device so that the printing device can print, on demand, said further, substantially identical image.
16. A digital camera which includes an apparatus as claimed in claim 9.
17. A digital camera as claimed in claim 18, in which the processor is defined by a processor unit of a digital camera and the memory arrangement is defined by a memory device of the digital camera.

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5 **HIGH QUALITY IMAGE COPIER WITH EXACT REPRODUCTION OF DIGITALLY HALFTONED IMAGES**

Field of the Invention

The present invention relates to an image processing method and apparatus and, in particular, discloses a Digital Instant Camera with Image Processing Capability.

10 The present invention further relates to the field of digital camera technology and, particularly, discloses a digital camera having an integral color printer.

Background of the Invention

Traditional camera technology has for many years relied upon the provision of an optical processing system which relies on a negative of an image which is projected onto a photosensitive film which is subsequently chemically processed so as to "fix" the film and to allow for positive prints to be produced which reproduce the original image. Such an image processing technology, although it has become a standard, can be unduly complex, as expensive and difficult technologies are involved in full color processing of images. Recently, digital cameras have become available. These cameras normally rely upon the utilization of a charged coupled device (CCD) to sense a particular image. The camera normally includes storage media for the storage of the sensed scenes in addition to a connector for the transfer of images to a computer device for subsequent manipulation and printing out.

20 Such devices are generally inconvenient in that all images must be stored by the camera and printed out at some later stage. Hence, the camera must have sufficient storage capabilities for the storing of multiple images and, additionally, the user of the camera must have access to a subsequent computer system for the downloading of the images and printing out by a computer printer or the like.

Further, Polaroid™ type instant cameras have been available for some time which allow for the production of instant images. However, this type of camera has limited utility producing only limited sized images and many problems exist with the chemicals utilised and, in particular, in the aging of photographs produced from these types of cameras.

When using devices and other image capture devices it will be desirable to be able to suitably deal with audio and other environmental information when taking a picture.

30 Further, the creation of stereoscopic views, with a first image being presented to the left eye and second image being presented to the right eye, thereby creating an illusion of a three dimensional surface is well known. However, previous systems have required complex preparation and high fidelity images have generally not been possible. Further, the general choice of images has been limited with the images normally only being specially prepared images.

35 There is a general need for being able to produce high fidelity stereoscopic images on demand and in particular for producing images by means of a portable camera device wherein the stereoscopic image can be taken at will.

Further, it would be highly convenient if such a camera picture image production system was able to create automatic customised postcards which, on a first surface contained the image captured by the camera device and, on a second surface, contains pre-paid postage marks and address details.

Recently, it has become more and more popular in respect of photographic reproduction techniques to produce longer and longer "panoramic" views of a image. These images can be produced on photographic paper or

