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Inventor(s)	KONDO; Paru

INFORMATION PROCESSING APPARATUS, INFORMATION PROCESSING METHOD, AND NON-TRANSITORY RECORDING MEDIUM

Abstract

An information processing apparatus includes circuitry to obtain a measurement result of an amount of ink drop discharged from one or more nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop, create a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop, and restrict a total amount of ink drop corresponding to the gradation value using the table.

Inventors: **KONDO; Paru (Kanagawa, JP)**

Applicant: **KONDO; Paru** (Kanagawa, JP)

Family ID: **1000008379308**

Assignee: **Ricoh Company, Ltd. (Tokyo, JP)**

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application is based on and claims priority pursuant to 35 U.S.C. § 119(a) to Japanese Patent Application No. 2024-020081, filed on Feb. 14, 2024, in the Japan Patent Office, the entire disclosure of which is hereby incorporated by reference herein.

BACKGROUND

Technical Field

[0002] The present disclosure relates to an information processing apparatus, an information processing method, and a non-transitory recording medium.

Related Art

[0003] As one method for restricting the total amount of ink drop used in printing by an image forming apparatus such as an inkjet printer, a method has been developed in which the total amount of ink drop is restricted after the gradation value is converted into the amount of ink drop.

SUMMARY

[0004] In one aspect, an information processing apparatus includes circuitry to obtain a measurement result of an amount of ink drop discharged from one or more nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop, create a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop, and restrict a total amount of ink drop corresponding to the gradation value using the table.

[0005] In another aspect, an information processing includes obtaining a measurement result of an amount of ink drop discharged from one or more nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop, creating a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop, and restricting a total amount of ink drop corresponding to the gradation value using the table.

[0006] In another aspect, a non-transitory recording medium stores a plurality of program codes which, when executed by one or more processors, causes the one or more processors to perform a method including obtaining a measurement result of an amount of ink drop discharged from one or more nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop, creating a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop, and restricting a total amount of ink drop corresponding to the gradation value using the table.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] A more complete appreciation of embodiments of the present disclosure and many of the attendant advantages and features thereof can be readily obtained and understood from the following detailed description with reference to the accompanying drawings, wherein:

[0008] FIG. **1** is a graph illustrating a relationship between a gradation value and an amount of ink drop to reproduce the color of the gradation value;

[0009] FIG. **2** is a diagram illustrating an amount of ink drop when the total amount of ink drop is restricted based on a gradation value;
[0010] FIG. **3** is a diagram illustrating an amount of ink drop when the total amount of ink drop is restricted after a gradation value is converted into the amount of ink drop;
[0011] FIG. **4** is a diagram illustrating a configuration of an image forming system;
[0012] FIG. **5** is a schematic diagram illustrating the processing executed by a host computer and an information processing apparatus in an image forming system;
[0013] FIG. **6** is a diagram illustrating a configuration of a color conversion processing unit of an information processing apparatus;
[0014] FIG. **7** is a diagram illustrating a configuration of an amount of ink drop measurement result obtaining unit of an information processing apparatus;
[0015] FIG. **8** is a diagram illustrating a method for specifying a measurement gradation value and the number of times of measurement in an information processing apparatus; and
[0016] FIG. **9** is a diagram illustrating display of a change in ink amount in an information processing apparatus.
[0017] The accompanying drawings are intended to depict embodiments of the present disclosure and should not be interpreted to limit the scope thereof. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted. Also, identical or similar reference numerals designate identical or similar components throughout the several views.

DETAILED DESCRIPTION

[0018] In describing embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that have a similar function, operate in a similar manner, and achieve a similar result.
[0019] Referring now to the drawings, embodiments of the present disclosure are described below. As used herein, the singular forms “a,” “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise.
[0020] An information processing apparatus, an information processing method, and a non-transitory recording medium according to embodiments of the present disclosure are described in detail below with reference to the accompanying drawings.
[0021] FIG. **1** is a graph illustrating a relationship between a gradation value and an amount of ink drop to reproduce the color of the gradation value. In FIG. **1**, the vertical axis represents the amount of ink drop, and the horizontal axis represents the gradation value. As illustrated in FIG. **1**, the relationship between the gradation value and the amount of ink drop is not linear. Accordingly, if the total amount of ink drop is restricted based on the gradation value, the amount of ink smaller than the amount of ink that should originally be applied is applied.
[0022] FIG. **2** is a diagram illustrating the amount of ink drop when the total amount of ink drop is restricted based on the gradation value. It is assumed that the total amount of ink drop is restricted based on the gradation value without converting the amount of ink drop into the gradation value. For example, in the case where the total amount of ink drop is restricted at an ink limit value of 160% of mixed color, the amount of ink smaller than the amount of ink that should originally be applied is applied as illustrated in FIG. **2**. In FIG. **2**, the ink limit value of mixed color is the total value of the ink limit value of each of cyan, magenta, yellow, and black (CMYK) colors. The ink limit value is a numerical value that indicates the upper limit value of the amount of ink in percentage. The upper limit value may be set by an operator or automatically determined based on a measurement result.
[0023] FIG. **3** is a diagram illustrating the amount of ink drop when the total amount of ink drop is restricted after the gradation value is converted into the amount of ink drop. As illustrated in FIG. **3**, a greater amount of ink is applied to a sheet when the total amount of ink drop is restricted after

the gradation value is converted into the amount of ink drop, as compared with the case where the total amount of ink drop is restricted based on the gradation value. In the case where the amount of ink is small, the range of color reproduction is narrowed. Accordingly, as illustrated in FIG. **3**, the range of color reproduction is expanded to the maximum extent by restricting the total amount of ink drop (for example, restricting the total amount of ink drop in an amount of 180 pl of ink corresponding to the ink limit value of 160% of mixed color) after the gradation value is converted into the amount of ink drop.

[0024] According to the technique in the art, the gradation value is converted into the amount of ink drop based on a predetermined fixed value. However, the amount of ink drop with respect to the gradation value is not necessarily constant due to, for example, the environment such as air temperature, humidity, and atmospheric pressure, individual differences of nozzles of an inkjet head caused at the time of manufacturing, and changes over time. In the case where the predetermined fixed value is used, the factors described above are not addressed. As a result, a difference occurs between the amount of ink obtained based on the predetermined fixed value and the actual amount of ink.

[0025] The difference between the amount of ink drop in a look-up table (LUT) and the actual amount of ink directly affects the image quality when the total amount of ink drop is restricted. The smaller the difference between the amount of ink drop and the actual amount of ink, the wider the range of color reproduction that can be expanded. As a result, the image quality increases. When the amount of ink drop is smaller than the actual amount of ink, the range of color reproduction is narrowed because the total amount of ink drop is excessively restricted. When the actual amount of ink is greater than the amount of ink drop, the ink is excessively adhered to the sheet. As a result, the sheet is conveyed without the ink being dried, which causes a failure of the printer, or a degradation in image quality due to bleeding or bleed-through of the ink. With the technique in the art, the accuracy of the amount of ink drop (the difference between the amount of ink drop and the actual amount of ink) is insufficient, and thus the image quality is degraded.

[0026] FIG. **4** is a diagram illustrating a configuration of an image forming system. The image forming system includes an information processing apparatus **10**, an image forming apparatus **12**, and a host computer **16**. The host computer **16** and the image forming apparatus **12** are communicably connected to the information processing apparatus **10**.

[0027] The information processing apparatus **10** receives a rendering command including print data from the host computer **16**, converts the print data into print data in a format that can be processed by the image forming apparatus **12**, and outputs the converted print data to the image forming apparatus **12**. Multiple image forming apparatuses **12** may be connected to the information processing apparatus **10**. Further, the image forming apparatus **12** may be directly connected to the host computer **16**.

[0028] The information processing apparatus **10** includes a central processing unit (CPU) **10**A, a read-only memory (ROM) **10**B, a random-access memory (RAM) **10**C, an engine interface **10**D, a panel interface **10**E, a host interface **10**F, a hard disk drive (HDD) **10**H, and a user interface (UI) **10**J.

[0029] The CPU **10**A executes a control program stored in a storage device and controls the entire operation of the information processing apparatus **10**. The ROM **10**B, the RAM **10**C, and the HDD **10**H are examples of the storage device. The ROM **10**B stores fixed programs. The RAM **10**C has a storage area that serves as a work area for the CPU **10**A. The HDD **10**H stores, for example, various control programs, measurement data, and conversion tables.

[0030] The panel interface **10**E, which may be implemented by an interface circuit, is an interface for connection with the UI **10**J. The panel interface **10**E displays a screen instructed by the CPU **10**A on the UI **10**J, and transmits an operation instruction received on the UI **10**J to the CPU **10**A.

[0031] The UI **10**J (an example of a user interface (UI)) includes a display that displays a setting screen used for setting various settings for the image forming apparatus **12**, and an input receiving

device that receives input of various settings from the operator.
[0032] The host interface **10**F, which may be implemented by an interface circuit, is communicably connected to the host computer **16** and receives the rendering command from the host computer **16**.
[0033] The engine interface **10**D, which may be implemented by an interface circuit, outputs the converted print data to the image forming apparatus **12** in response to an output instruction from the CPU **10**A.
[0034] The image forming apparatus **12** includes an image forming section. The image forming apparatus **12** includes, for example, an image forming section employing an inkjet printing system. The image forming apparatus **12** forms an image on a medium with the image forming section using the print data generated by the information processing apparatus **10**. The image forming section includes the inkjet head.
[0035] FIG. **5** is a schematic diagram illustrating the processing executed by the host computer **16** and the information processing apparatus **10** in the image forming system. The host computer **16** includes, for example, various kinds of applications **21** for generating document data **20**. The host computer **16** also includes a printer driver **22**. In response to receiving an instruction to execute print processing of the document data **20** generated by the applications **21** from the operator, the host computer **16** executes a predetermined process on the document data **20** with the printer driver **22** and outputs the rendering command.
[0036] The information processing apparatus **10** includes a color conversion processing unit **60**, a rendering processing unit **61**, a buffer memory **62**, and a page memory **63**. The information processing apparatus **10** converts the rendering command received from the host computer **16** into print data that can be processed by the image forming apparatus **12**. The color conversion processing unit **60** will be described in detail later with reference to FIG. **6**. The rendering processing unit **61** converts the print data in a command format into image data in a raster format, and stores the image data in the buffer memory **62**. The image data in the raster format stored in the buffer memory **62** is output from the page memory **63** as the print data.
[0037] FIG. **6** is a diagram illustrating a configuration of the color conversion processing unit **60** of the information processing apparatus **10**. The color conversion processing unit **60** includes a color conversion unit **60***a*, a gamma conversion unit **60***b*, an amount of ink drop measurement result obtaining unit **60***c*, a total amount restriction unit **60***d*, and a gradation value and measuring times input unit **60***e*.
[0038] The color conversion unit **60***a* executes color conversion processing on color data included in the rendering command received from the host computer **16**. The gamma conversion unit **60***b* executes gamma conversion processing on the color data on which the color conversion processing has been executed by the color conversion unit **60***a*.
[0039] The gradation value and measuring times input unit **60***e* obtains information on a measurement gradation value and the number of times of measurement. The measurement gradation value is a gradation value designated to measure the amount of ink drop to reproduce the color of the gradation value. The gradation value and measuring times input unit **60***e* may obtain the information on the measurement gradation value and the number of times of measurement input on the UI **10**J.
[0040] The amount of ink drop measurement result obtaining unit **60***c* obtains a measurement result of the amount of ink drop based on the color data on which the gamma conversion processing has been executed before the total amount of ink drop is restricted, and the measurement gradation value and the number of times of measurement input by the gradation value and measuring times input unit **60***e*. In this way, the amount of ink drop that is addressed to the environment and changes over time is obtained with high accuracy. When a signal for starting a restriction on the total amount of ink drop is received, the amount of ink drop measurement result obtaining unit **60***c* instructs a measurement result obtaining unit included in, for example, the image forming apparatus **12** to measure the amount of ink drop, and obtains the measurement result of the amount

of ink drop.
[0041] The total amount restriction unit **60***d* (an example of a total amount restriction unit) restricts the total amount of ink drop corresponding to the gradation value using a conversion table created by a conversion and reverse conversion table calculation unit **703** (see FIG. **7**) described later. For example, a total amount of ink discharged from the ink head of the image forming apparatus **12** is controlled, according to a limit determined by the total amount restriction unit **60***d*.
[0042] A gradation processing unit **60***f* converts the amount of ink drop for which the total amount of ink drop has been restricted into a gradation value. In the present embodiment, the gradation processing unit **60***f* is provided outside the color conversion processing unit **60**. Alternatively, the gradation processing unit **60***f* may be provided inside the color conversion processing unit **60**.
[0043] FIG. **7** is a diagram illustrating a configuration of the amount of ink drop measurement result obtaining unit **60***c* of the information processing apparatus **10**. As illustrated in FIG. **7**, the amount of ink drop measurement result obtaining unit **60***c* includes a measurement condition determination unit **701**, a measurement result obtaining unit **702**, the conversion and reverse conversion table calculation unit **703**, and a change amount calculation unit **704**.
[0044] The measurement condition determination unit **701** obtains information on the measurement gradation value and the number of times of measurement from the gradation value and measuring times input unit **60***e*, and determines the measurement condition.
[0045] FIG. **8** is a diagram illustrating a method for specifying a measurement gradation value and the number of times of measurement in the information processing apparatus **10**. As illustrated in FIG. **8**, the measurement gradation value to be measured and the number of times of measurement are specified by the operator on the UI **10**J. After the measurement gradation value is read from a file or specified directly, the measurement gradation value may be displayed on the UI **10**J for confirmation. In FIG. **8**, a case where 1, 10, 50, 100, 150, 200, 250, and 255 are specified as measurement gradation values.
[0046] Referring back to FIG. **7**, the measurement result obtaining unit **702** (an example of a measurement result obtaining unit) obtains the measurement result of the amount of ink drop, and transmits the obtained measurement result (measurement data) of the amount of ink drop to the conversion and reverse conversion table calculation unit **703**, the change amount calculation unit **704**, and the storage device (e.g., the RAM **10**C, the HDD **10**H). As a method for measuring the amount of ink drop, for example, the following two methods are considered. One method is to detect the amount of ink drop discharged from each nozzle of an inkjet head with, for example, a sensor disposed at the nozzles of the inkjet head of the image forming apparatus **12**. The other method is to discharge ink to a tray containing a liquid that prevents the ink from evaporating and measure the weight of the ink in the tray. In the present embodiment, the amount of ink drop is measured in the image forming apparatus **12**.
[0047] The measurement result obtaining unit **702** obtains the measurement result of the amount of ink drop corresponding to any gradation value from 1 to 255. Alternatively, the measurement result obtaining unit **702** may obtain the measurement result of the amount of ink drop corresponding to a gradation value specified as the gradation value subjected to measuring on the UI **10**J. Thus, the operator is allowed to determine the balance between the time and accuracy in measuring the amount of ink drop. The gradation value subjected to measuring may be specified by reading a text file in which the gradation values are listed and separated with, for example, commas, tabs, and spaces, or may be specified by the operator specifying the gradation values on the UI **10**J.
[0048] Still alternatively, the measurement result obtaining unit **702** may obtain the measurement result of the amount of ink drop discharged from all the nozzles used in printing. In this way, the individual differences among the nozzles are reduced and the accuracy of the measurement result of the amount of ink drop increases. Due to individual differences of inkjet heads or nozzles of an inkjet head, even when ink is output in the same gradation, the same amount of ink is not necessarily discharged from all the nozzles. For this reason, taking into account variations among

the nozzles of the inkjet head or among the inkjet heads in amount of ink discharged from the nozzles, the amount of ink discharged from the nozzles of all the inkjet heads or all the nozzles of the inkjet head used in printing is measured. In this way, the variations among the nozzles of the inkjet head or among the inkjet heads in amount of ink discharged from the nozzles are absorbed.
[0049] The measurement result obtaining unit **702** may obtain the measurement result of the amount of ink drop multiple times. At this time, the measurement result obtaining unit **702** may obtain the measurement result of the amount of ink drop for the number of times of measurement specified on the UI **10**J (the number of times of measurement included in the measurement condition determined by the measurement condition determination unit **701**). Thus, the operator is allowed to determine the balance between the time and accuracy in measuring the amount of ink drop.
[0050] The change amount calculation unit **704** calculates a difference from the previous measurement data and displays the result on a display such as the UI **10**J.
[0051] FIG. **9** is a diagram illustrating display of the change in ink amount in the information processing apparatus **10**. In the present embodiment, after the amount of ink drop is measured, the change amount calculation unit **704** (an example of a display control unit) displays, on the UI **10**J, the change in ink amount, which is the difference between the measurement result of the amount of ink drop obtained this time and the measurement result of the amount of ink drop obtained previous time. In this way, the operator can experience the effect of measuring the amount of ink drop.
[0052] In this case, the change amount calculation unit **704** may display the color gamuts before and after measuring the amount of ink drop so that the change in ink amount can be visually recognized, or may indicate the change in ink amount of each color in a specific ratio. By informing the operator of the change in ink amount, the operator can experience the effect of measuring the amount of ink drop. In addition, the dates and times of the measurement of the previous measurement data and the current measurement data may be displayed.
[0053] Further, the change amount calculation unit **704** may display a message for determining the measurement condition for measuring the amount of ink drop next times on a display such as the UI **10**J based on the change in ink amount. In this way, the operator is guided to actions next times.
[0054] The change amount calculation unit **704** displays the message on the UI **10**J according to the magnitude of the change in ink amount and the time elapsed from the date and time of the measurement of the previous measurement data. For example, the change amount calculation unit **704** displays, on the UI **10**J, a message indicating one of the contents in Table 1 below. In FIG. **9**, a message in a case where the change in ink amount is small and the time elapsed from the date and time of the measurement of the previous measurement data is short is presented. The operator refers to the content of the message to determine, for example, the frequency of measurement, the measurement gradation value, and the number of times of measurement next times.
TABLE-US-00001 TABLE 1 TIME ELAPSED FROM CHANGE DATA AND TIME OF IN INK PREVIOUS AMOUNT MEASUREMENT CONTENTS IN MESSAGE GREAT LONG INCREASE FREQUENCY OF MEASUREMENT SMALL LONG DECREASE FREQUENCY OF MEASUREMENT GREAT SHORT MAINTENANCE REQUIRED FOR HEAD AND NOZZLES INCREASE NUMBER OF MEASUREMENT GRADATIONS INCREASE NUMBER OF TIMES OF MEASUREMENT SMALL SHORT DECREASE FREQUENCY OF MEASUREMENT
[0055] The conversion and reverse conversion table calculation unit **703** (an example of a creation unit) creates a conversion table used for converting a gradation value into an amount of ink and a reverse conversion table used for converting an amount of ink into a gradation value based on the measurement data. The conversion table and the reverse conversion table are used by the total amount restriction unit **60***d* to restrict the total amount of ink drop. Alternatively, in the case where the measurement result obtaining unit **702** obtains the measurement results of the amount of ink drop multiple times, the conversion and reverse conversion table calculation unit **703** may create a

conversion table based on the average value of the measurement result of the amount of ink drop obtained multiple times. In this way, the measurement error in amount of ink drop is prevented or minimized, and the accuracy of the measurement value of the amount of ink drop increases.
[0056] In the case where not all the gradation values from 1 to 255 are measured, the conversion and reverse conversion table calculation unit **703** interpolates the gradation values that are not measured to create a conversion table and a reverse conversion table. For example, it is assumed that the measurement results of the gradation values in increments of five, at 5, 10, 15, and so on are obtained. The conversion and reverse conversion table calculation unit **703** interpolates the gradation values at 1, 2, 3, 4, 6, and so on that have not been measured to calculate the amount of ink drop. As the interpolation method, for example, linear interpolation or spline interpolation may be used. The fewer the number of times of measuring the gradation value, the greater the difference between the actual amount of ink drop and the gradation value that has been measured may be. However, the advantage is that the time in measuring becomes shorter. Which one to prioritize depends on the situation.
[0057] As described above, according to the information processing apparatus **10** of the present embodiment, the amount of ink drop that is addressed to the environment and changes over time is obtained with high accuracy by actually measuring the amount of ink drop before the total amount of ink drop is restricted. Thus, the image quality greatly increases.
[0058] The program executed by the information processing apparatus **10** of the present embodiment is stored in advance in, for example, the ROM **10**B and provided. The program executed by the information processing apparatus **10** of the present embodiment may be configured to be recorded in any computer-readable recording medium, such as a compact disc-read-only memory (CD-ROM), a flexible disk (FD), a compact disc-recordable (CD-R), or a digital versatile disc (DVD), in an installable or executable file format and provided as a computer program product.
[0059] Alternatively, the program executed by the information processing apparatus **10** of the present embodiment may be stored in a computer connected to a network such as the Internet so that the program can be downloaded through the network and provided. Still alternatively, the program executed by the information processing apparatus **10** of the present embodiment may be configured to be provided or distributed via a network such as the Internet.
[0060] The program executed by the information processing apparatus **10** of the present embodiment has a module structure including at least one of the above-described functional units such as the color conversion processing unit **60** and the rendering processing unit **61**. As actual hardware, a processor such as the CPU **10**A reads the program from the ROM **10**B described above and executes the program to load the above-described functional units onto a main storage device and implements the color conversion processing unit **60** and the rendering processing unit **61**.
[0061] Aspects of the present disclosure are, for example, as follows.
[0062] According to Aspect 1, an information processing apparatus includes a measurement result obtaining unit that obtains a measurement result of an amount of ink drop discharged from nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop, a creation unit that creates a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop, and a total amount restriction unit that restricts the total amount of ink drop corresponding to the gradation value using the table.
[0063] According to Aspect 2, in the information processing apparatus of Aspect 1, the measurement result obtaining unit obtains the measurement result of the amount of ink drop discharged from all the nozzles used in printing.
[0064] According to Aspect 3, in the information processing apparatus of Aspect 1 or 2, the measurement result obtaining unit obtains the measurement result of the amount of ink drop corresponding to a desired gradation value.
[0065] According to Aspect 4, in the information processing apparatus of any one of Aspects 1 to 3,

the measurement result obtaining unit obtains the measurement result of the amount of ink drop multiple times, and the creation unit creates the table based on an average value of the measurement result of the amount of ink drop obtained multiple times.

[0066] According to Aspect 5, in the information processing apparatus of Aspect 1 or 2, the measurement result obtaining unit obtains the measurement result of the amount of ink drop corresponding to a gradation value specified as the gradation value subjected to measuring on a user interface (UI).

[0067] According to Aspect 6, in the information processing apparatus of any one of Aspects 1 to 3, the measurement result obtaining unit obtains the measurement result of the amount of ink drop for the number of times of measurement specified on the UI.

[0068] According to Aspect 7, the information processing apparatus of any one of Aspects 1 to 6 further includes a display control unit that, after the amount of ink drop is measured, displays, on a display, the change in ink amount, which is the difference between the measurement result of the amount of ink drop obtained this time and the measurement result of the amount of ink drop obtained previous time.

[0069] According to Aspect 8, in the information processing apparatus of Aspect 7, the display control unit displays, on the display, a message for determining the measurement condition for measuring the amount of ink drop next times based on the change in ink amount.

[0070] According to Aspect 9, an information processing method executed by an information processing apparatus includes obtaining a measurement result of an amount of ink drop discharged from nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop, creating a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop, and restricting the total amount of ink drop corresponding to the gradation value using the table.

[0071] According to Aspect 10, a non-transitory recording medium stores a plurality of program codes which, when executed by one or more processors, causes the one or more processors to perform a method including obtaining a measurement result of an amount of ink drop discharged from nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop, creating a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop, and restricting the total amount of ink drop corresponding to the gradation value using the table.

[0072] The above-described embodiments are illustrative and do not limit the present invention. Thus, numerous additional modifications and variations are possible in light of the above teachings. For example, elements and/or features of different illustrative embodiments may be combined with each other and/or substituted for each other within the scope of the present invention.

[0073] The functionality of the elements disclosed herein may be implemented using circuitry or processing circuitry which includes general purpose processors, special purpose processors, integrated circuits, application-specific integrated circuits (ASICs), field-programmable gate arrays (FPGAs), and/or combinations thereof which are configured or programmed, using one or more programs stored in one or more memories, to perform the disclosed functionality. Processors are considered processing circuitry or circuitry as they include transistors and other circuitry therein. In the disclosure, the circuitry, units, or means are hardware that carry out or are programmed to perform the recited functionality. The hardware may be any hardware disclosed herein which is programmed or configured to carry out the recited functionality.

[0074] The one or more memories include a memory that stores a computer program which includes computer instructions. These computer instructions provide the logic and routines that enable the hardware (e.g., processing circuitry or circuitry) to perform the method disclosed herein. This computer program can be implemented in known formats as a computer-readable storage medium, a computer program product, a memory device, a record medium such as a CD-ROM or DVD, and/or the memory of an FPGA or ASIC.

Claims

1. An information processing apparatus comprising circuitry configured to: obtain a measurement result of an amount of ink drop discharged from one or more nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop; create a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop; and restrict a total amount of ink drop corresponding to the gradation value using the table.
2. The information processing apparatus according to claim 1, wherein the circuitry is configured to obtain the measurement result of the amount of ink drop discharged from all nozzles used in printing.
3. The information processing apparatus according to claim 1, wherein the circuitry is configured to obtain the measurement result of the amount of ink drop corresponding to a desired gradation value.
4. The information processing apparatus according to claim 1, wherein the circuitry is configured to: obtain the measurement result of the amount of ink drop a plurality of times; and create the table based on an average value of the measurement results of the amount of ink drop.
5. The information processing apparatus according to claim 1, wherein the circuitry is configured to obtain the measurement result of the amount of ink drop corresponding to a specific gradation value specified on a user interface (UI).
6. The information processing apparatus according to claim 1, wherein the circuitry is configured to obtain the measurement result of the amount of ink drop for a number of times of measurement specified on a user interface (UI).
7. The information processing apparatus according to claim 1, wherein the circuitry is further configured to, after the amount of ink drop is measured, display, on a display, a change in ink amount, which is a difference between the measurement result of the amount of ink drop currently obtained and the measurement result of the amount of ink drop previously obtained.
8. The information processing apparatus according to claim 7, wherein the circuitry is configured to display, on the display, a message used for determining a measurement condition for measuring the amount of ink drop for a next time based on the change in ink amount.
9. An information processing method comprising: obtaining a measurement result of an amount of ink drop discharged from one or more nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop; creating a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop; and restricting a total amount of ink drop corresponding to the gradation value using the table.
10. A non-transitory recording medium storing a plurality of program codes which, when executed by one or more processors, causes the one or more processors to perform a method, the method comprising: obtaining a measurement result of an amount of ink drop discharged from one or more nozzles of an inkjet head in response to receiving a signal for starting a restriction on a total amount of ink drop; creating a table used for converting a gradation value into the amount of ink drop based on the measurement result of the amount of ink drop; and restricting a total amount of ink drop corresponding to the gradation value using the table.