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NON-TRANSITORY COMPUTER-READABLE STORAGE MEDIUM STORING PROGRAM, AND METHOD

Abstract

A non-transitory computer-readable storage medium storing a program configured to cause a computer of an information processing apparatus to function as: a change unit configured to, in accordance with a signal that is based on a user operation on a colorimeter, change a measurement mode related to color measurement performed by the colorimeter in color verification; and a notification unit configured to provide a notification indicating the change in the measurement mode made by the change unit.

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Background/Summary

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a non-transitory computer-readable storage medium storing a program, and a method.

Description of the Related Art

[0002] In the field of commercial printing, the importance of and demands for a color verification process, which periodically verifies the color quality of an image forming apparatus, are increasing in recent years. In response to such demands, a system that executes a color verification process using a web browser has been disclosed. A color verification process that realizes a color verification system includes three steps: (1) printing of a color chart composed of a plurality of color patches; (2) color measurement of the color chart; and (3) color verification, in which a pass-fail inspection is performed by comparing the colorimetric result with a color criterion of the printing industry or a color criterion that has been uniquely set by a printing company.

[0003] Also, in a case where a user manually moves a colorimeter in (2), which is the step of color measurement of the color chart, the speed of movement of the colorimeter and the position thereof are critical, and the measurement could possibly fail. For this reason, a color verification system has a function of performing remeasurement. A technique has been disclosed that enables remeasurement by pressing a remeasurement button on a graphical user interface (GUI) of a color verification system via a mouse operation, and changing a measurement mode (Japanese Patent Laid-Open No. 2023-68990).

SUMMARY OF THE INVENTION

[0004] The present invention provides a technique to improve convenience for a case where color verification is performed.

[0005] The present invention in one aspect provides a non-transitory computer-readable storage medium storing a program configured to cause a computer of an information processing apparatus to function as: a change unit configured to, in accordance with a signal that is based on a user operation on a colorimeter, change a measurement mode related to color measurement performed by the colorimeter in color verification; and a notification unit configured to provide a notification indicating the change in the measurement mode made by the change unit.

[0006] The present invention can provide a technique to improve convenience for a case where color verification is performed.

[0007] Further features of the present invention will become apparent from the following description of exemplary embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a diagram for describing a configuration of a system.

[0009] FIG. 2 is a diagram showing a configuration of an information processing apparatus.

[0010] FIG. 3 is a diagram showing a configuration of an application.

[0011] FIG. 4 is a diagram showing a color chart.

[0012] FIG. 5 is a diagram showing a GUI displayed by the application.

[0013] FIG. 6 is a sequence diagram for describing a color verification process.

[0014] FIG. 7 is a flowchart showing processing executed by the application.

[0015] FIG. 8 is a diagram showing a color chart.

[0016] FIG. 9 is a diagram showing a GUI displayed by the application.

[0017] FIG. 10 is a flowchart showing processing executed by the application.

[0018] FIG. 11 is a flowchart showing processing executed by the application.

[0019] FIG. 12 is a diagram showing an external view of a colorimeter.

DESCRIPTION OF THE EMBODIMENTS

[0020] Hereinafter, embodiments will be described in detail with reference to the attached drawings. Note, the following embodiments are not intended to limit the scope of the claimed invention. Multiple features are described in the embodiments, but limitation is not made to an invention that requires all such features, and multiple such features may be combined as appropriate. Furthermore, in the attached drawings, the same reference numerals are given to the same or similar configurations, and redundant description thereof is omitted.

[0021] According to the conventional technique, in order to change a measurement mode of a colorimeter in the step of color measurement of a color chart, a user needs to perform an operation for changing the measurement mode by disengaging their hand from the colorimeter and then holding a mouse during a color measurement task using the colorimeter. In view of this, there have been demands for measures to improve convenience for a case where color verification is performed.

[0022] The present disclosure provides a technique to improve convenience for a case where color verification is performed.

First Embodiment

[0023] The present embodiment provides a description of a color verification system that verifies the color quality of a printed material generated by an image forming apparatus by causing a color measurement apparatus to measure the colors of a chart on which a plurality of verification patches have been printed, and comparing the colorimetric result with an industry standard or a criterion unique to a company. In the present embodiment, this verification is referred to as “color verification”.

<System Configuration>

[0024] FIG. 1 is a block diagram for describing an example of a configuration of a color verification system **100** according to the present embodiment. The color verification system **100** is a system related to color verification, and includes an information processing apparatus **101** and a colorimeter **102**. The color verification system **100** may include, for example, an image forming apparatus **103**. Note that the apparatuses shown in FIG. 1 may be wirelessly connected to one another via a network, such as a local area network (LAN) and a wide area network (WAN). Also, the apparatuses may be connected to one another by wire via a wired LAN cable, a USB cable, or the like. Communication in processing related to color measurement, which will be described later, may be performed while the apparatuses are connected wirelessly or by wire in the foregoing manner.

[0025] Although the information processing apparatus **101** will be described using a PC as one example, no limitation is intended by this. The information processing apparatus **101** may be, for example, a mobile terminal apparatus, such as a smartphone and a tablet. As will be described later, an application that can operate on the information processing apparatus **101** is installed on the information processing apparatus **101**. The application is, for example, an application program related to color verification.

[0026] The colorimeter **102** is a manual, portable colorimeter that meters and digitalizes the colors of a printed material and the like. That is to say, the colorimeter **102** can also be said to be a measurement apparatus that is, for example, capable of measuring a plurality of colors formed on a printed material and the like. Note that in the following description, metering (measuring) of colors by the colorimeter **102** may be referred to as color measurement. Also, for example, the colorimeter **102** is connected to the information processing apparatus **101** by wire via a USB cable.

Furthermore, the information processing apparatus **101** and the image forming apparatus **103** are mutually connected via a network **104**.

[0027] The image forming apparatus **103** is controlled under a group of programs that operate on the information processing apparatus **101**, processes print settings and print data received from the

information processing apparatus **101**, and generates a printed material. That is to say, in other words, the image forming apparatus **103** is a print apparatus.

<Colorimeter>

[0028] A description is now given of the colorimeter **102** according to the present embodiment with reference to FIG. **12**. FIG. **12** is a diagram showing an example of an external appearance of the colorimeter **102** according to the present embodiment. Also, FIG. **12** corresponds to a perspective diagram as viewed from the flat surface side and the bottom surface side of the colorimeter **102**.

[0029] As shown in FIG. **12**, the colorimeter **102** has a colorimeter button **1200**, a USB cable connection port **1201**, and the like on the side surface of the colorimeter **102**. Also, the colorimeter **102** has a light emitting unit **1202** and an opening **1203** on the top surface and the bottom surface of the colorimeter **102**, respectively.

[0030] The colorimeter button **1200** is, for example, a button used during color measurement of a color chart. Specifically, for example, the colorimeter button **1200** in the present embodiment is an interface capable of accepting an instruction for execution of color measurement. The colorimeter **102** executes color measurement while a user is depressing the colorimeter button **1200**, for example.

[0031] The light emitting unit **1202** is an indicator for conveying a device state by emitting light in white, green, red, or the like. Also, the light emitting unit **1202** is not limited to emitting light in the above-mentioned colors, and may be an indicator that emits light in another color, such as blue and yellow.

[0032] The opening **1203** is an opening for measuring colors with use of, for example, a color measurement unit (not shown) that measures colors.

[0033] The following describes an example of a method of color measurement of a color chart using the colorimeter **102**. For example, a user places the opening **1203** of the colorimeter **102** at a margin portion or the like of a color chart. Thereafter, while the user keeps depressing the colorimeter button **1200**, the user slides the colorimeter **102** in one direction along a predetermined row of patches for color verification printed on the color chart. Also, when the colorimeter **102** has finished passing through every color patch in one row, the user disengages their finger from the colorimeter button **1200** that has been depressed. The user repeatedly performs this operation for each row of patches for color verification.

[0034] Furthermore, for example, when the user has finished depressing the colorimeter button **1200**, the colorimeter **102** transmits a colorimetric value to an application related to color verification. Here, the colorimetric value transmitted by the colorimeter **102** is, for example, a CMYK signal value. Furthermore, in the following description, the colorimetric value transmitted by the colorimeter **102** may be referred to as a colorimetric result.

[0035] Note that the colorimeter **102** is not limited to having the above-described configuration, and where appropriate, has a hardware configuration corresponding to the functions that can be executed by a device applied as the colorimeter **102**. The colorimeter **102** may include, for example, a display unit, such as a touch panel and a display.

<Information Processing Apparatus>

[0036] FIG. **2** is a diagram showing an example of a hardware configuration of the information processing apparatus **101** according to the present embodiment.

[0037] The information processing apparatus **101** includes, for example, a CPU **201**, a RAM **202**, a ROM **203**, a bus **204**, a USB controller **205**, an operation control unit **206**, a display control unit **207**, a storage control unit **208**, an operation unit **210**, a display unit **211**, a storage unit **212**, an NIC **213**, and the like.

[0038] The CPU **201** is a system control unit, and controls the entirety of the information processing apparatus **101**. The CPU **201** executes each type of processing by reading out a program like an OS and an application stored in a storage medium, such as the ROM **203** and the storage unit **212**, into the RAM **202** that acts as a working area, and executing the program.

[0039] The RAM **202** is, for example, a volatile storage, and is used as a main memory, a working memory, and the like when executing various types of programs stored in the storage unit **212**. The ROM **203** is, for example, a nonvolatile storage, and stores programs executed by the CPU **201** and fixed data, such as an embedded operating system (hereinafter referred to as OS) program.

[0040] The USB controller **205** controls, for example, communication with the colorimeter **102**. The USB controller **205** is used in, for example, transmission of instructions from the information processing apparatus **101** to the colorimeter **102**, reception of the result of measurement performed by the colorimeter **102**, and reception of operation signals of the colorimeter **102** and the like.

[0041] The operation control unit **206** is connected to the operation unit **210**. The operation control unit **206** obtains information related to a user operation that has been accepted via the operation unit **210**, and transmits this information to the CPU **201**. The operation unit **210** may be, for example, a pointing device like a mouse, a keyboard, or the like.

[0042] The display control unit **207** is connected to the display unit **211**. The display control unit **207** controls display on the display unit **211**. The display unit **211** may be, for example, a display device like a liquid crystal display and an organic EL display. Also, the display unit **211** may be, for example, a touch panel or the like capable of accepting user operations.

[0043] The storage control unit **208** executes control intended to cause the storage unit **212** to store programs and data for making the information processing apparatus **101** operate, and to read out the same from the storage unit **212**. The storage unit **212** stores a boot program, various types of application, font data, other various types of data, and so forth. The storage unit **212** is, for example, a storage apparatus, such as a hard disk drive (HDD) and a solid state drive (SSD). Also, the storage unit **212** may include a large-capacity storage apparatus that replaces the HDD and SSD.

[0044] The network controller (NIC) **213** is connected to a network, and executes processing for controlling communication with other devices connected to this network. Furthermore, the internal configuration of the network controller **213** varies between a case where apparatuses included therein have a wired LAN or a wireless LAN and a case where they have both. Note that the network controller (NIC) **213** is configured so that such differences in the internal configuration are hidden therein, and the system can be controlled under the assumption that the internal configuration is the same to other modules shown in the figure.

[0045] The bus **204** connects the CPU **201**, the RAM **202**, the ROM **203**, various types of controllers, and the like, and carries data signals and control signals.

[0046] Note that the information processing apparatus **101** is not limited to having the above-described configuration, and where appropriate, has a hardware configuration corresponding to the functions that can be executed by a device applied as the information processing apparatus **101**.

<Color Verification Process>

[0047] The above-described color verification system **100** performs a color verification process for periodically verifying the color quality of the image forming apparatus **103**. The color verification process includes, for example, three steps: (1) printing of a color chart composed of a plurality of color patches; (2) color measurement of the color chart; and (3) color verification, in which a pass-fail inspection is performed by comparing the colorimetric result with a color criterion of the printing industry or a color criterion that has been uniquely set by a printing company.

[0048] Meanwhile, in a case where a user manually moves the colorimeter **102** in (2), which is the step of color measurement of the color chart, the speed of movement of the colorimeter **102** and the position thereof are critical, and the color measurement could possibly fail. For this reason, the color verification system has, for example, a function of performing remeasurement of colors. For example, the user changes a measurement mode by pressing, via a mouse operation or the like, a remeasurement button on a graphical user interface (hereinafter, GUI) displayed on the display unit **211** of the information processing apparatus **101** or the like by an application related to color verification.

[0049] In this way, in order to change the measurement mode of the colorimeter **102** in the step of color measurement of the color chart, the user needs to perform an operation for changing the measurement mode by disengaging their hand from the colorimeter and then holding a mouse or the like of the information processing apparatus **101** during a color measurement task using the colorimeter **102**. In view of this, there have been demands for measures to improve convenience for a case where color verification is performed.

[0050] In the present embodiment, an application program **300** (hereinafter referred to as an application **300**) related to color verification changes a measurement mode related to measurement performed by the colorimeter **102** in color verification in accordance with a signal that is based on a user operation on the colorimeter **102**. Then, the application **300** gives notice of the change in the measurement mode.

[0051] The foregoing aspect allows the user to, when they want to change the measurement mode during color measurement, change the measurement mode without switching from an operation on the colorimeter **102** to an operation on the information processing apparatus **101**. Also, for example, even in a case where the location where the user is performing color measurement of the color chart using the colorimeter **102** is distanced from the location of the information processing apparatus **101**, the user does not need to move to change the measurement mode. This can improve convenience for a case where color measurement is performed.

<Application>

[0052] The following describes the application **300** with reference to FIG. 3. FIG. 3 is a block diagram showing an example of a configuration of the application **300** according to the present embodiment. The application **300** is installed on, for example, the information processing apparatus **101**, and stored in a memory, such as the ROM **203** and the storage unit **212**. Also, the application **300** (hereinafter, application **300**) will be described as a color verification application program that executes the color verification process.

[0053] The application **300** includes a storage unit **301**, a color measurement setting reception unit **302**, a color chart generation unit **303**, a color measurement processing control unit **304**, a colorimeter information reception unit **305**, a measurement mode conversion table **306**, a GUI unit **307**, and the like. The functions of respective program modules are realized by, for example, the CPU **201** executing each program module.

[0054] The storage unit **301** stores each type of information related to the color verification process. Specifically, the storage unit **301** stores, for example, information of a signal value for generating the color chart, name information of color standards, sheet information, information of an image forming apparatus currently connected, and so forth. Also, the storage unit **301** stores information obtained by combining these pieces of information. Furthermore, the storage unit **301** stores, for example, a colorimetric value of the color chart whose colors have been measurement by the colorimeter **102**.

[0055] The color measurement setting reception unit **302** receives information of color measurement settings that have been input by the user from a graphical user interface (hereinafter, GUI) (not shown) displayed by the application **300**. The information of color measurement settings is, for example, content related to various types of settings for generating the color chart. The information of color measurement settings is, for example, information of the types of color standards, information of a sheet to be used, information of an image forming apparatus currently connected, and so forth. Also, the information of color measurement settings is not limited to the foregoing, and may include other types of information. The other types of information may be, for example, information of lighting conditions and the like. The application **300** stores the information of color measurement settings received by the color measurement setting reception unit **302** into the storage unit **301**.

[0056] Based on the information of color measurement settings received by the color measurement setting reception unit **302**, the color chart generation unit **303** refers to various types of information

stored in the storage unit **301** and generates a color chart. In the present embodiment, the color chart generation unit **303** generates data of a color chart **400** that includes color verification patches **402** and measurement mode change patches **401**. The color verification patches **402** are, for example, color patches corresponding to a color standard (color sample) that conforms with color specifications of a printing company, the industry, or the like. The measurement mode change patches **401** are, for example, color patches for changing a measurement mode related to color verification. The details of these patches **401** and **402** will be described later.

[0057] Also, for example, when generating the color chart **400**, the color chart generation unit **303** refers to the later-described measurement mode conversion table **306**, and generates the measurement mode change patches **401** corresponding to the color verification patches **402**. The measurement mode change patches **401** corresponding to the color verification patches **402** are the measurement mode change patches **401** that have different colors from the color verification patches **402** included in the color chart **400**, as will be described later. Furthermore, the color chart generation unit **303** generates data of the color chart **400** by arranging the measurement mode change patches **401** in a margin of the color chart **400**. That is to say, the color chart generation unit **303** generates data of the color chart **400** in which each of the patches **401** and **402** is arranged so that the color verification patches **402** and the measurement mode change patches **401** do not overlap one another on the color chart **400**.

[0058] The color measurement processing control unit **304** processes the colorimetric value (measurement result) that the colorimeter information reception unit **305** has received from the colorimeter **102**.

[0059] The measurement mode conversion table **306** is a table for determining whether the colorimetric value (colorimetric result) that the colorimeter information reception unit **305** has received from the colorimeter **102** is a signal value for changing the measurement mode.

[0060] Now, reference is made to table 1. Table 1 represents an example of the measurement mode conversion table **306** according to the present embodiment (hereinafter referred to as a measurement mode conversion table **3061** in the present embodiment).

TABLE-US-00001

TABLE 1	Patch Signal	Patch Signal	Color Value (1)	Value (2)	Measurement
Chart ID (C, M, Y, K)	(C, M, Y, K)	Mode ID	1111	100, 90, 0, 0	0, 0, 100, 0
Remeasurement ID	2222	0, 100, 30, 0	100, 0, 50, 0	Remeasurement

[0061] As shown in table 1, the measurement mode conversion table **3061** includes a color chart ID, a patch signal value (1), a patch signal value (2), and a measurement mode as items.

[0062] A plurality of color charts exist respectively for the color standards; thus, color chart IDs are IDs for managing the plurality of color charts. Specifically, for example, the color verification patches **402** exist for each color standard. Also, as described above, the color chart generation unit **303** generates the measurement mode change patches **401** corresponding to the color verification patches **402**. Therefore, a color chart ID is an identifier that is intended to manage, for each set of color verification patches **402**, color information (CMYK signal value) of the measurement mode change patches **401** in association with a measurement mode corresponding to that color information.

[0063] The patch signal value (1) and the patch signal value (2) are, for example, color information (CMYK signal values) corresponding to the measurement mode change patches **402**. The present embodiment will be described using an exemplary case where the measurement mode change patches **401** are formed of two colors as shown in FIG. 4, which will be described later. Therefore, the measurement mode conversion table **3061** has two items: the patch signal value (1), and the patch signal value (2). In a case where the application **300** has received the colorimetric result of the measurement mode change patches **401** from the colorimeter **102**, it cross-references the bicolor signal values acting as the colorimetric result with the patch signal value (1) and the patch signal value (2) in the measurement mode conversion table **3061**, and determines a measurement mode to which it should switch.

[0064] Note that the patch signal value is not limited to being listed under two items, but may be listed under two or more items. Using a plurality of patch signal values in this way makes it possible to prevent the measurement mode from being changed erroneously. Note that as the measurement mode change patches **401** and the color verification patches **402** are formed of different colors from one another, there may be one patch signal value.

[0065] Furthermore, a patch signal value in the measurement mode conversion table **3061** may be given a range of positive or negative allowable values. As one example, provided that a patch signal value in the measurement mode conversion table **3061** is (0, 0, 100, 0) and each CMYK value is given a permissible range of ± 5 , the application **300** executes processing while permitting the value of (0-5, 0-5, 95-100, 0-5). In this way, even in a case where there is a deviation between each patch signal value in the measurement mode conversion table **3061** and a colorimetric value of an actual printed material, the measurement mode can be changed if the colorimetric value is within the permissible range. The colorimetric value in the permissible range can also be said to be a permissible colorimetric error. Note that the permissible range is not limited to the above-described value, and may be, for example, set with a value larger than ± 5 or set with a value smaller than ± 5 for each CMYK value.

[0066] In the present embodiment, a remeasurement mode for performing remeasurement with respect to one row of color verification patches that have been measured once is stored under the measurement mode in the measurement mode conversion table **3061**. The remeasurement mode is, for example, an operation mode in which, each time the colorimetric value of one row of color verification color patches has been received from the colorimeter **102**, the colorimetric value of one row for which color verification has already been performed is overwritten. For example, as will be described later, in a case where the application **300** has received the colorimetric result of the color verification patches **402** from the colorimeter **102**, it determines whether there is a deviation between this colorimetric result and a predetermined target value (criterion value). That is to say, the application **300** performs color verification for verifying whether the color verification patches **402** on the printed color chart **400** have a value that satisfies a predetermined criterion. As described above, color measurement performed by the colorimeter **102** could possibly fail depending on, for example, the speed at which the user moves the colorimeter **102** or the position of color measurement. In this case, the user can perform remeasurement by reading the measurement mode change patches **402** using the colorimeter **102** and changing the measurement mode used in color verification to the remeasurement mode. Specifically, for example, in a case where the application **300** has received the colorimetric values of the measurement mode change patches **402** from the colorimeter **102**, it refers to the measurement mode conversion table **3061**, and changes the measurement mode to the remeasurement mode. Then, for example, when the application **300** has received the colorimetric value of the color verification patches **402** from the colorimeter **102** again, it operates so as to perform color verification again using this colorimetric value. That is to say, the remeasurement mode can also be said to be a mode that performs color verification with respect to a remeasured color value received from the colorimeter **102**. Also, the remeasurement mode can also be said to be a reverification mode.

[0067] The GUI unit **307** controls a GUI of the application **300** shown in FIG. 5, which will be described later.

<Color Chart>

[0068] Next, the color chart according to the present embodiment will be described with reference to FIG. 4. FIG. 4 is a diagram showing an example of a color chart **400** according to the present embodiment. For example, the application **300** instructs the image forming apparatus **103** to perform printing that is based on data of the color chart **400** generated by the color chart generation unit **303**. Then, based on the data of the color chart **400**, the image forming apparatus **103** executes printing; as a result, the color chart **400** is output.

[0069] The color chart **400** includes the measurement mode change patches **401** and the color

verification patches **402**. The following describes these patches **401** and **402**.

[0070] The measurement mode change patches **401** are patches for changing the measurement mode of the application **300**. Also, in the present embodiment, the measurement mode change patches **401** include two color patches. That is to say, the measurement mode change patches **401** are formed of two colors. For example, in a case where the application **300** has received the colorimetric values of the measurement mode change patches **401** as a colorimetric result from the colorimeter **102**, it changes the measurement mode to the remeasurement mode. In this way, the color chart **400** includes the measurement mode change patches **401** separately from the color verification patches **402**. As a result, when the user wants to change the measurement mode, they can change the measurement mode by reading the measurement mode change patches **401** using the colorimeter **102** without performing an operation on the information processing apparatus **101**. That is to say, convenience can be improved for the user in color verification.

[0071] Also, in the present embodiment, each color patch in the measurement mode change patches **401** has a different color from the color verification patches **402**. That is to say, the color patches in the measurement mode change patches **401** are a combination of colors that do not exist in the color verification patches **402**. For example, the color chart generation unit **303** generates patches representing a combination of two colors that do not exist in the color verification patches **402**. Specifically, for example, when generating the color chart **400**, the color chart generation unit **303** determines the colors to be used in the color verification patches **402** with reference to the storage unit **301**. Then, the color chart generation unit **303** generates the measurement mode change patches **401** using the colors that are not used in the color verification patches **402**. This can prevent the measurement mode from being changed as a result of performing color measurement of the color verification patches **402**.

[0072] Note that the color patches in the measurement mode change patches **401** may have the same color, or may have different colors. Also, although the measurement mode change patches **401** are composed of two color patches in the present example, no limitation is intended by this. The measurement mode change patches **401** may be, for example, composed of one color patch, or composed of two or more color patches.

[0073] Furthermore, information corresponding to the measurement mode change patches **401** is displayed around the measurement mode change patches **401**. The information corresponding to the measurement mode change patches **401** is a word indicating the measurement mode to switch to, and is also a word indicating the function of the measurement mode change patches. The present embodiment presents an example in which a character string Retry is presented as a word indicating a change to the remeasurement mode.

[0074] The color verification patches **402** are patches for color verification corresponding to a color standard (color sample). That is to say, the color verification patches **402** are patches that function as a color chart. The color verification patches **402** are composed of a plurality of color patches in accordance with, for example, a color standard selected by the user. Also, the plurality of color patches are arranged in predetermined rows and columns. Furthermore, at both ends of each row of the color verification patches **402**, for example, a frame of a color measurement start position is provided. This frame of the color measurement start position is white in color, for example. For example, the user places the colorimeter **102** on this frame, and slides the colorimeter **102** to the left or right, thereby measuring the color verification patches **402** on a row-by-row basis.

[0075] Note that in the present embodiment, as stated earlier, the color verification patches **402** are generated in accordance with a color standard; no limitation is intended by the number and the arrangement (rows and columns) of the color patches that compose the color verification patches **402** shown in the figures, and they may be changed as appropriate. Also, although the present embodiment has been described using an example in which the color patches in the measurement mode change patches **401** are arrayed in the horizontal direction, they may be arrayed in the vertical direction. Furthermore, although the present embodiment has been described using an

example in which the frame of the measurement start position is provided at both ends of each row of the color verification patches **402**, it may be provided at both ends of each column of the color verification patches **402**. Then, color measurement may be performed for each column of the color verification patches **402**.

<Application GUI>

[0076] FIG. **5** is a diagram showing an example of an application GUI that is displayed on the display unit **211** of the information processing apparatus **101** by the application **300** according to the present embodiment. The application GUI is a screen related to color verification.

[0077] The application GUI **500** includes, for example, a color chart colorimetry status **501**, a remeasurement button **502**, a message display unit **503**, and the like.

[0078] The color chart colorimetry status **501** shows a chart with a color scheme similar to that of the color verification patches **402**. Also, the color chart colorimetry status **501** shows information indicating a progress status of color measurement of the color chart **400** performed by the colorimeter **102**. The information indicating the progress status may be displayed by, for example, displaying, with emphasis, a row of color verification patches **402** for which color measurement has been performed by the colorimeter **102**. Furthermore, an icon, a mark, or the like indicating that color measurement has already been performed may also be displayed as the information indicating the progress status. In FIG. **5**, as one example, the color chart colorimetry status **501** shows a mark indicating that color measurement has been completed for the bottom row of color verification patches **402** in the color chart. This allows the user to recognize the status of color measurement for each row of color verification patches **402**.

[0079] The remeasurement button **502** is a button capable of accepting an instruction for changing the measurement mode. For example, when the user has pressed the remeasurement button **502**, the application **300** changes the measurement mode to the remeasurement mode.

[0080] The message display unit **503** displays, as a pop-up, a message that is in coordination with an operation of the application **300**. In the present embodiment, the message display unit **503** displays, for example, a warning message, a message about a change in the measurement mode, and the like.

[0081] The warning message is, for example, a message that suggests remeasurement of colors. The warning message is displayed on the message display unit **503** in a case where, for example, the application **300** has determined that there is a deviation equal to or larger than a threshold between a colorimetric value of the color verification patches **402** received from the colorimeter **102** and a preset target value. Note that the warning message may include a message indicating that there is a deviation between the colorimetric value of the color verification patches **402** and the target value.

[0082] The message about the change in the measurement mode is a message indicating that the measurement mode has been changed. The message about the change in the measurement mode is displayed on the message display unit **503** in a case where, for example, the application **300** has changed the measurement mode.

<Processing in Color Verification System>

[0083] FIG. **6** is a sequence diagram for describing the color verification system according to the present embodiment. Processing that is executed by each apparatus in the present sequence is realized when various types of programs stored in a memory included in each apparatus, such as a ROM, are read out to a RAM and executed by a CPU included in each apparatus. Note that the present sequence may be started based on, for example, acceptance of an instruction for starting the execution of color verification on the application **300**. For example, a screen (not shown) display by the application **300** may be provided with an interface (not shown) capable of accepting the instruction for starting the execution of color verification.

[0084] In step **S601**, the application **300** reads out the measurement mode conversion table **306**, and stores the same into the storage unit **301**.

[0085] In step S602, the application **300** receives information of color measurement settings, and generates data of the color chart **400** corresponding to the received information of color measurement settings. The information of color measurement settings is input via, for example, a user's GUI operation. That is to say, the application **300** accepts the input of the information of color measurement settings, and generates the data of the color chart **400** on the basis of the received color measurement settings.

[0086] In step S603, the application **300** instructs the image forming apparatus **103** to execute printing of the data of the color chart **400** generated in step S601. Specifically, for example, the application **300** transmits the data of the color chart **400** and a print instruction for the color chart **400** to the image forming apparatus **103**.

[0087] In step S604, based on the reception of the print instruction from the application **300**, the image forming apparatus **103** executes printing that is based on the data of the color chart **400**.

[0088] In step S605, based on the reception of an instruction for starting the color measurement function, the application **300** starts the color measurement function. Specifically, for example, based on the reception of the instruction for starting the color measurement function, the application **300** is placed in a state where it can issue a color measurement instruction to the colorimeter **102**. For example, the application **300** accepts the instruction for starting the color measurement function via a user's GUI operation (not shown).

[0089] Note, for example, the application **300** may start the color measurement function in a normal measurement mode as a default mode at the time of the start of the color measurement function. That is to say, the normal measurement mode may be set as an initial setting of the color measurement function of the application **300**. The normal measurement mode may be, for example, a mode for obtaining a colorimetric value corresponding to a single session. For example, in a case where the application **300** is operating in the normal measurement mode, if the application **300** receives a colorimetric value of the color verification patches **402** from the colorimeter **102**, the later-described color verification may be performed using the colorimetric value corresponding to a single session.

[0090] In step S606, the application **300** transmits a color measurement instruction to the colorimeter **102**. The color measurement instruction is, for example, an instruction for switching the colorimeter **102** from a standby state to a state for performing color measurement. That is to say, the color measurement instruction is also an instruction for activating the colorimeter **102**. Furthermore, the color measurement instruction may also be, for example, an instruction for executing calibration with respect to the colorimeter **102**.

[0091] In step S607, based on a user operation, the colorimeter **102** performs color measurement of the color chart **400**. Specifically, the colorimeter **102** performs color measurement of one row of color verification patches **402** on the color chart **400**.

[0092] In step S608, the colorimeter **102** transmits, to the application **300**, the colorimetric result (colorimetric value) of the color chart **400** for which color measurement has been performed in step S607. The colorimetric result is, for example, a CMYK signal value.

[0093] In step S609, the application **300** receives the colorimetric result from the colorimeter **102**. Also, the application **300** stores the colorimetric result received from the colorimeter **102** into the storage unit **301**. Furthermore, in a case where there is a deviation equal to or larger than a threshold between the colorimetric value and a target value (criterion value), the application **300** notifies the user of a warning. For example, the application **300** displays a warning message on message display unit **503**. Note that the application **300** may give notice of the warning message in the form of a sound with use of a speaker or the like (not shown) of the information processing apparatus **101**.

[0094] The following describes processing that is executed by the application **300** and the colorimeter **102** in a case where the measurement mode is changed. The case where the measurement mode is changed is, for example, a case where the measurement mode is changed by

the user who has recognized the warning message of which they have been notified by the application **300** in step **S608**.

[0095] In step **S610**, based on a user operation, the colorimeter **102** performs color measurement of the measurement mode change patches **401**.

[0096] In step **S611**, the colorimeter **102** transmits, to the application **300**, a colorimetric value of the measurement mode change patches **401** for which color measurement has been performed in step **S609**.

[0097] In step **S612**, the application **300** receives the colorimetric value transmitted from the colorimeter **102** in step **S611**. The application **300** refers to the measurement mode conversion table **306**, and determines a measurement mode corresponding to the received colorimetric value. Then, the application **300** changes the measurement mode.

[0098] In step **S613**, the application **300** provides a notification indicating the change in the measurement mode. Specifically, for example, the application **300** displays a message indicating that the measurement mode has been changed on the message display unit **503**, or displays the remeasurement button **502** with emphasis. The display with emphasis may be, for example, changing of the color of the remeasurement button **502** and the like. Furthermore, the notification indicating that the measurement mode has been changed is not limited to the aforementioned message or display of the button with emphasis, and may be, for example, provided in the form of a sound or the like with use of a speaker (not shown) or the like of the information processing apparatus **101**. By being notified of the change in the measurement mode in the foregoing manner, the user can recognize that the measurement mode has been changed.

[0099] Thereafter, in processing shown in FIG. **6**, processing of steps **S607** to **S609** and processing of steps **S610** to **S613** are repeated in accordance with the number of rows of color verification patches on the color chart.

<Processing Related to Changing of Measurement Mode>

[0100] With reference to FIG. **7**, a description is now given of an example of processing related to changing of the measurement mode according to the present embodiment. FIG. **7** is a flowchart showing examples of operations executed by the application **300** according to the present embodiment. Although the description will be provided under the assumption that the main executor of each type of processing in FIG. **7** is each program module in the application **300**, processing executed by each program module is realized when the application **300** stored in a memory, such as the ROM **203**, is deployed to the RAM **202** and executed by the CPU **201**.

[0101] In step **S701**, the colorimeter information reception unit **305** receives a colorimetric result corresponding to one row of color verification patches **402** from the colorimeter **102**. Also, in step **S701**, the colorimetric result received by the colorimeter information reception unit **305** is stored into the storage unit **301**, for example.

[0102] In step **S702**, the color measurement processing control unit **304** determines whether there is a deviation equal to or larger than a threshold between the colorimetric value received in step **S701** and a predetermined target value (criterion value). That is to say, the color measurement processing control unit **304** performs color verification with respect to the colorimetric result. In a case where it has been determined that there is a deviation in processing of step **S702**, processing proceeds to step **S703**. On the other hand, in a case where it has been determined that there is no deviation in processing of step **S702**, processing of FIG. **7** is ended.

[0103] In step **S703**, the GUI unit **307** provides a notification that suggests remeasurement. Specifically, the GUI unit **307** displays a message that suggests remeasurement as the pop-up message on the message display unit **503**. Note that although the present embodiment has been described using an aspect in which the message that suggests remeasurement is displayed as one example, an aspect thereof may be such that the notification that suggests remeasurement is provided in the form of a sound or the like.

[0104] Processing of steps **S701** to **S703** is equivalent to, for example, processing that has been

described in relation to step S609.

[0105] In step S704, the color measurement processing control unit 304 determines whether the colorimeter information reception unit 305 has received the colorimetric result. In a case where the color measurement processing control unit 304 has determined that the colorimetric result has been received, it proceeds to step S705. On the other hand, in a case where the color measurement processing control unit 304 has determined that the colorimetric result has not been received, it proceeds to step S709.

[0106] In step S705, the color measurement processing control unit 304 determines whether the colorimetric result that was determined to have been received in step S704 is the measurement result of the measurement mode change patches 401. In other words, in step S705, the color measurement processing control unit 304 determines whether the colorimetric result that was determined to have been received in step S704 is the colorimetric values of the measurement mode change patches 401 or the colorimetric value of the color verification patches 402. In a case where it has been determined that the colorimetric result is of the measurement mode change patches 401 in processing of step S705, processing proceeds to step S707. On the other hand, in a case where it has been determined that the colorimetric result is not of the measurement mode change patches 401 in processing of step S705, processing proceeds to step S706.

[0107] Specifically, the color measurement processing control unit 304 searches the measurement mode conversion table 3061 for a combination of CMYK signal values acting as the colorimetric result received from the colorimeter 102. Then, the color measurement processing control unit 304 determines whether the combination of the CMYK signal values received from the colorimeter 102 is included in the measurement mode conversion table 3061. In the present embodiment, as stated earlier, the measurement mode conversion table 3061 stores the patch signal values (1) and (2). Also, the measurement mode change patches 401 according to the present embodiment are composed of bicolor color patches. That is to say, in a case where the colorimetric values of the measurement mode change patches 401 have been received from the colorimeter 102, it is determined that the colorimetric result is of the measurement mode change patches 401 in step S705 because the measurement mode conversion table 3061 includes the patch signal values (1) and (2) corresponding to the bicolor color patches in the measurement mode change patches 401. On the other hand, in a case where the colorimetric value of the color verification patches 402 has been received from the colorimeter 102, it is determined that the colorimetric result is not of the measurement mode change patches 401 in step S705 because the measurement mode conversion table 3061 does not include the patch signal values (1) and (2) corresponding to the color verification patches 402.

[0108] In step S706, the color measurement processing control unit 304 determines whether the colorimetric value received in step S704 is a colorimetric value of a row that has already been measured. In a case where the color measurement processing control unit 304 has determined that the received colorimetric value is a colorimetric value of a row that has already been measured, it proceeds to step S707. On the other hand, in a case where the color measurement processing control unit 304 has determined that the received colorimetric value is not a colorimetric value of a row that has already been measured, processing of FIG. 7 is ended.

[0109] In step S706, specifically, for example, the color measurement processing control unit 304 refers to the storage unit 301, and determines whether it stores a colorimetric value that is the same as the colorimetric result received in step S704. Also, as stated earlier, in step S701, the colorimetric result received by the colorimeter information reception unit 305 is stored in the storage unit 301. For example, in step S706, in a case where the colorimetric result received in step S704 is the same as the colorimetric result stored in step S701, the color measurement processing control unit 304 determines that the received colorimetric result is a measured value of a row that has already been measured. On the other hand, in a case where the colorimetric result received in step S704 is different from the colorimetric result stored in step S701, it is determined that the

received colorimetric result is not the same as a measured value of a row that has already been measured. Note that in this determination, if the colorimetric result received in step **S704** and the colorimetric value stored in the storage unit **301** are within a predetermined permissible range, the received colorimetric result may be determined to be a measured value of a row that has already been measured.

[0110] Furthermore, in step **S706**, in a case where the same colorimetric value as a row that has already been measured has been received in step **S704**, it can be determined that remeasurement has been performed; thus, in this case, processing proceeds to step **S707**. Also, the case where the received colorimetric value is not the same as a colorimetric value of a row that has already been measured is, for example, a case where the colorimetric result of a row that has not been measured yet or a row that does not exist in the color verification patches **402** has been received and the like. In this case, as it can be determined that the measurement mode is not to be changed, processing of FIG. **7** is ended.

[0111] In step **S707**, the color measurement processing control unit **304** changes the measurement mode to the remeasurement mode.

[0112] In step **S708**, the GUI unit **307** provides a notification indicating the change in the measurement mode. Specifically, for example, the GUI unit **307** may display, as a pop-up, a message indicating that the measurement mode has been changed on the message display unit **503**. Also, the GUI unit **307** may provide a notification indicating that the measurement mode has been changed by displaying the remeasurement button **502** with emphasis. The display with emphasis may be, for example, changing of the color of the remeasurement button **502**. Furthermore, the notification indicating that the measurement mode has been changed may be provided in the form of a sound or the like with use of a speaker (not shown) or the like of the information processing apparatus **101**.

[0113] In step **S709**, the color measurement processing control unit **304** determines whether the remeasurement button **502** has been pressed. In a case where the color measurement processing control unit **304** has determined that the button has been pressed in processing of step **S709**, it proceeds to step **S707**. On the other hand, in a case where the color measurement processing control unit **304** has determined that the button has not been pressed, processing of FIG. **7** is ended.

[0114] As described above, in the present embodiment, the application **300** generates data of the color chart **400** that includes the measurement mode change patches **401** and the color verification patches **402**. Also, in a case where the application **300** has received the colorimetric result of the measurement mode change patches **401** as a signal that is based on a user operation on the colorimeter **102**, it changes the measurement mode. In this way, for example, in a case where the user wants to change from the measurement mode to the remeasurement mode during a color measurement task for the color chart **400**, the user can change to the remeasurement mode merely by operating the colorimeter **102** without performing an operation on the information processing apparatus **101**. This can improve convenience for a case where color verification is performed.

Second Embodiment

[0115] The following describes a second embodiment with a focus on the differences from the first embodiment. The first embodiment has been described using the remeasurement mode as the measurement mode as one example. The present embodiment will be described in relation to a case where a plurality of measurement modes exist.

<Color Chart>

[0116] FIG. **8** shows an example of a color chart generated by the color chart generation unit **303** according to the present embodiment. A color chart **800** includes a plurality of measurement mode change patches **801a** to **801c** and color verification patches **802**.

[0117] The measurement mode change patches **801a** are patches for changing the measurement mode to a remeasurement mode.

[0118] The measurement mode change patches **801b** are patches for changing the measurement

mode to an average measurement mode. The average measurement mode is a mode for performing measurement with higher accuracy. The average measurement mode is, for example, a mode for obtaining an average value of colorimetric values corresponding to multiple sessions. For example, in a case where the application **300** has changed to the average measurement mode, it receives a colorimetric value multiple times from the colorimeter **102** with respect to one row of color verification patches **802**. Then, the application **300** may determine whether there is a deviation between the average value of the received colorimetric values corresponding to multiple sessions and a target value (color verification). Note, for example, multiple sessions may be two sessions, or may be larger than two sessions.

[0119] The measurement mode change patches **801c** are patches for changing the measurement mode to a normal measurement mode.

[0120] Note that in the present embodiment, it is assumed that the application **300** starts the color measurement function in the normal measurement mode as a default mode at the time of the start of the color measurement function. That is to say, it is assumed that the normal measurement mode is set as an initial setting of the color measurement function of the application **300**.

[0121] Similarly to the first embodiment, words indicating the roles of patches are provided around the measurement mode change patches **801a** to **801c**. Also, the measurement mode change patches **801a** to **801c** include two color patches. Note that they are not limited to including two color patches, and may include one patch or more than two patches. Note that the color patches in the measurement mode change patches **801a** to **801c** are composed of a single color or a combination of multiple colors that do not match the colors of other color patches.

<Measurement Mode Conversion Table>

[0122] Using Table 2, a description is now given of a measurement mode conversion table according to the present embodiment. Table 2 represents an example of a measurement mode conversion table **3062** according to the present embodiment. The measurement mode conversion table **3062** includes a normal mode and an average mode, in addition to a remeasurement mode, as measurement modes. Also, in the present embodiment, the measurement mode conversion table **3062** stores three types of measurement modes for each single type of color chart ID. That is to say, patch signal values (1) and (2) and three types of measurement modes corresponding to the patch signal values (1) and (2) are stored for each type of color verification patch.

TABLE-US-00002

TABLE 2	Patch Signal	Patch Signal	Color Value (1)	Value (2)	Measurement
Chart ID (C, M, Y, K)	(C, M, Y, K)	Mode ID	1111	100, 90, 0, 0	0, 0, 100, 0 Normal
ID 1111	0, 100, 30, 0	100, 0, 50, 0	Average	ID 1111	100, 60, 0, 0
0, 0, 100, 0	Remeasurement	ID 2222	100, 50, 0, 0	0, 0, 80, 0	Normal
ID 2222	0, 100, 70, 0	100, 0, 30, 0	Average	ID 2222	60, 60, 0, 0
0, 0, 60, 0	Remeasurement			

<Application GUI>

[0123] An application GUI according to the present embodiment is now described with reference to FIG. 9. FIG. 9 is a diagram showing an example of an application GUI that is displayed on the display unit **211** of the information processing apparatus **101** by the application **300** according to the present embodiment. The application GUI is a screen related to color verification.

[0124] An application GUI **900** includes a color chart colorimetry status **901**, a measurement mode change interface **902**, a message display unit **903**, and the like. Note that as the color chart colorimetry status **901** and the message display unit **903** are similar to those of FIG. 5, a description thereof is omitted.

[0125] The measurement mode change interface **902** is an interface for changing the measurement mode. The measurement mode change interface **902** represents buttons that respectively correspond to the normal measurement mode, the average measurement mode, and the remeasurement mode. Each button is an interface capable of accepting an instruction for changing the measurement mode. Also, the application **300** may, for example, display a button pressed by the user with emphasis. For example, the application **300** may display other unpressed buttons in gray, display a

button pressed by the user in a color different from colors of other unpressed buttons, or display a button pressed by the user in such a manner that it flashes. FIG. 9 shows an example in which the Average button corresponding to the average measurement mode has been pressed, and the unpressed buttons are displayed in gray.

[0126] Note that also in a case where the application **300** has received the colorimetric result of the measurement mode change patches **801a** to **801c** from the colorimeter **102**, it may perform control so that the measurement mode change interface **902** is displayed with emphasis in accordance with the received measurement mode change patches, similarly to the case where each button has been pressed by the user. Controlling display of the measurement mode change interface **902** on the application GUI **900** allows the user to recognize the state of the current measurement mode.

<Processing Related to Changing of Measurement Mode>

[0127] With reference to FIG. 10, a description is now given of an example of processing related to changing of the measurement mode according to the present embodiment. FIG. 10 is a flowchart showing examples of operations executed by the application **300** according to the present embodiment. Although the description will be provided under the assumption that the main executor of each type of processing in FIG. 10 is the application **300** or each program module in the application **300**, processing executed by the application **300** or each program module is realized when the application **300** stored in a memory, such as the ROM **203**, is deployed to the RAM **202** and executed by the CPU **201**.

[0128] In step **S1001**, the application **300** starts the color measurement function in the state of the normal measurement mode. For example, the application **300** may transmit a color measurement instruction to the colorimeter **102** in the state of the normal measurement mode.

[0129] In step **S1002**, the colorimeter information reception unit **305** receives a colorimetric result from the colorimeter **102**. Also, in step **S1002**, the colorimetric result received by the colorimeter information reception unit **305** is stored into the storage unit **301**, for example.

[0130] In step **S1003**, the color measurement processing control unit **304** determines whether the colorimetric result received from the colorimeter **102** in step **S1002** is the colorimetric values of the measurement mode change patches **801b**. In a case where the color measurement processing control unit **304** has determined that the colorimetric result is the colorimetric values of the measurement mode change patches **801b** in step **S1003**, it proceeds to step **S1004**. On the other hand, in a case where the color measurement processing control unit **304** has determined that the colorimetric result is not the colorimetric values of the measurement mode change patches **801b** in step **S1003**, it proceeds to step **S1006**.

[0131] In step **S1003**, specifically, for example, the color measurement processing control unit **304** searches the measurement mode conversion table **3062** for a combination of bicolor signal values of the received measured values. Also, if the measurement mode conversion table **3062** includes a combination corresponding to the measurement mode change patches **801b**, the color measurement processing control unit **304** determines that the average measurement mode patches have been measured. On the other hand, if the measurement mode conversion table **3062** does not include a combination corresponding to the measurement mode change patches **801b**, it is determined that the measurement mode change patches **801b** have not been measured.

[0132] In step **S1004**, the color measurement processing control unit **304** changes the measurement mode to the average measurement mode.

[0133] In step **S1005**, the GUI unit **307** provides a notification indicating that the measurement mode has been changed. Specifically, for example, the GUI unit **307** displays a message indicating that the measurement mode has been changed as the pop-up message on the message display unit **903**. Also, the GUI unit **307** displays a button which is in the measurement mode change interface **902** and which corresponds to the average measurement mode with emphasis. Note that the notification indicating that the measurement mode has been changed may be provided in the form of a sound or the like.

[0134] In step S1006, the color measurement processing control unit 304 determines whether the colorimetric values received from the colorimeter information reception unit 305 are of the measurement mode change patches 801a. In a case where the colorimetric values have been determined to be of the measurement mode change patches 801a in step S1006, processing proceeds to step S1007; otherwise, processing proceeds to step S1010. Specifically, for example, the color measurement processing control unit 304 determines whether the colorimetric values are of the measurement mode change patches 801a by searching the measurement mode conversion table 3061 for a combination of bicolor signal values of the received measured values.

[0135] In step S1007, the color measurement processing control unit 304 refers to the storage unit 301, and determines whether remeasurement can be performed in the current state. In a case where the color measurement processing control unit 304 has determined that remeasurement can be performed in the current state, it proceeds to step S1008. On the other hand, in a case where the color measurement processing control unit 304 has determined that remeasurement cannot be performed in the current state, it proceeds to step S1009. The state where remeasurement can be performed is, for example, a case where the measurement result of the color verification patches 802 has already been stored in the storage unit 301 through processing of step S1002. Meanwhile, the state where remeasurement cannot be performed is, for example, a case where the colorimetric result of the color verification patches 802 has not been stored in the storage unit 301. In this case, the colorimetric result of the color verification patches 802 cannot be overwritten, and thus whether remeasurement can be performed is determined in step S1007.

[0136] In step S1008, the color measurement processing control unit 304 changes the measurement mode to the remeasurement mode.

[0137] In step S1009, the GUI unit 307 provides a notification indicating that the measurement mode cannot be changed. Specifically, the GUI unit 307 displays a warning message indicating that the measurement mode cannot be changed on the message display unit 903. Note that the notification indicating that the measurement mode cannot be changed may be provided in the form of a sound or the like with use of a speaker (not shown) or the like of the information processing apparatus 101.

[0138] In step S1010, the color measurement processing control unit 304 determines whether the colorimetric value received in step S1002 is a colorimetric value of a row that has already been measured. In a case where the color measurement processing control unit 304 has determined that the received colorimetric value is a colorimetric value of a row that has already been measured, it proceeds to step S1005. On the other hand, in a case where the color measurement processing control unit 304 has determined that the received colorimetric value is not a colorimetric value of a row that has already been measured, processing of FIG. 10 is ended.

[0139] As described above, according to the present embodiment, the color chart 800 includes a plurality of measurement mode change patches 801a to 801c. Also, the measurement mode conversion table stores a plurality of measurement modes for each color chart ID. Even in a case where there are a plurality of measurement modes, the foregoing aspect allows the user to change the measurement mode of the colorimeter 102 without switching from an operation on the colorimeter 102 to an operation on the application GUI 900 displayed on the information processing apparatus 101. This can improve convenience for a case where color measurement is performed.

Third Embodiment

[0140] The first embodiment and the second embodiment have been described in relation to an aspect in which the application 300 changes the measurement mode in a case where it has received a colorimetric result of measurement mode change patches as a signal that is based on a user operation on the colorimeter 102. The present embodiment will be described in relation to an aspect in which the application 300 changes the measurement mode in a case where it has received a signal that is based on a predetermined operation on a button or the like of the colorimeter 102

from the colorimeter **102** as a signal that is based on a user operation on the colorimeter **102**.

[0141] The present embodiment will be described under the assumption that the colorimeter **102** shown in FIG. **12** includes a user interface, such as the colorimeter button **1200**. As described above, the colorimeter button **1200** is an interface capable of accepting an instruction for executing color measurement. In the present embodiment, the colorimeter button **1200** also functions as an interface capable of accepting an instruction for transmitting a signal that is based on a user operation performed on the colorimeter button **1200**. For example, in a case where the user has double-clicked or long-pressed the colorimeter button **1200**, the colorimeter **102** transmits a signal that is based on such a user operation to the application **300**.

<Measurement Mode Conversion Table>

[0142] Now, reference is made to table 3. Table 3 shows an example of a measurement mode conversion table included in the application **300** according to the present embodiment. In the present embodiment, a measurement mode conversion table **3063** includes a user operation (button operation) on the colorimeter **102** and a measurement mode as items. Also, the measurement mode conversion table **3063** stores signal values that are based on user operations on the colorimeter **102** in association with measurement modes corresponding to the signal values that are based on the user operations. A user operation is, for example, a button operation performed on the colorimeter button **1200**, which is provided on the colorimeter **102** as stated earlier. In the present example, as shown in the measurement mode conversion table **3063**, a signal value that is based on long-pressing acting as a button operation corresponds to the remeasurement mode. Also, a signal value that is based on a double-click acting as a button operation corresponds to the normal mode and the average mode.

TABLE-US-00003 TABLE 3 Button Operation Measurement Mode {Signal Value of Double-Click} Change Mode (Normal .Math. Average) {Only Signal Value of Remeasurement Long-Pressing}

[0143] In the present embodiment, in a case where the colorimeter information reception unit **305** has received a signal value that is based on a button operation such as a double-click and long-pressing, the color measurement processing control unit **304** refers to the measurement mode conversion table **3063**. In a case where the measurement mode conversion table **3063** stores the measurement mode corresponding to the received signal value, the color measurement processing control unit **304** controls changing of the measurement mode. For example, each time the colorimeter information reception unit **305** receives a signal value that is based on a double-click, the color measurement processing control unit **304** performs control to change the measurement mode of the application **300** between the normal mode and the average mode. That is to say, the signal value that is based on the double-click can also be said to be in correspondence with a switch mode for switching between the normal mode and the average mode.

[0144] Note that the measurement mode conversion table **3063** is not limited to the combinations of signals that are based on button operations and measurement modes corresponding to the signals that are based on the button operations shown in Table 3. For example, the measurement mode conversion table **3063** may store a signal value that is based on long-pressing acting as a button operation in association with the normal mode and the average mode, and store a signal value that is based on a double-click acting as a button operation in association with the remeasurement mode. Also, for example, it is permissible to adopt a configuration in which only a double-click switches among the three measurement modes (the normal measurement mode, the average measurement mode, and the remeasurement mode).

<Processing Related to Changing of Measurement Mode>

[0145] With reference to FIG. **11**, a description is now given of an example of processing related to changing of the measurement mode according to the present embodiment. FIG. **11** is a flowchart showing examples of operations executed by the application **300** according to the present embodiment. Although the description will be provided under the assumption that the main

executor of each type of processing in FIG. 11 is the application 300 or each program module in the application 300, processing executed by the application 300 or each program module is realized when the application 300 stored in a memory, such as the ROM 203, is deployed to the RAM 202 and executed by the CPU 201.

[0146] In step S1101, the application 300 starts the color measurement function in the state of the normal measurement mode. For example, the application 300 may transmit a color measurement instruction to the colorimeter 102 in the state of the normal measurement mode.

[0147] In step S1102, the colorimeter information reception unit 305 receives a signal value from the colorimeter 102.

[0148] In step S1103, the color measurement processing control unit 304 determines whether the signal value received by the colorimeter information reception unit 305 in step S1102 is a signal value that is based on long-pressing acting as a user operation. In a case where the color measurement processing control unit 304 has determined that the received signal value is the signal value that is based on long-pressing, it proceeds to step S1106. On the other hand, in a case where the received signal value has not been determined to be the signal value that is based on long-pressing, processing proceeds to step S1104.

[0149] In step S1103, specifically, the color measurement processing control unit 304 refers to the measurement mode conversion table 3063. Then, the color measurement processing control unit 304 determines whether the signal value received in step S1102 includes a signal value which is stored in the measurement mode conversion table 3063 and which corresponds to the remeasurement mode. In a case where the color measurement processing control unit 304 has determined that the signal value received in step S1102 includes the signal value which is stored in the measurement mode conversion table 3063 and which corresponds to the remeasurement mode, it proceeds to step S1106. On the other hand, in a case where the color measurement processing control unit 304 has determined that the signal value received in step S1102 does not include the signal value which is stored in the measurement mode conversion table 3063 and which corresponds to the remeasurement mode, it proceeds to step S1104.

[0150] Step S1104 determines whether the signal value received by the colorimeter information reception unit 305 in step S1102 is a signal value that is based on a double-click acting as a user operation. In a case where the color measurement processing control unit 304 has determined that the received signal value is the signal value that is based on the double-click, it proceeds to step S1105. On the other hand, in a case where the received signal value has not been determined to be the signal value that is based on the double-click, processing of FIG. 11 is ended.

[0151] In step S1104, specifically, the color measurement processing control unit 304 refers to the measurement mode conversion table 3063. Then, the color measurement processing control unit 304 determines whether the signal value received in step S1102 is a signal value which is stored in the measurement mode conversion table 3063 and which corresponds to a mode for switching between the normal mode and the average measurement mode. In a case where the color measurement processing control unit 304 has determined that the signal value received in step S1102 includes the signal value which is stored in the measurement mode conversion table 3063 and which corresponds to the switch mode, it proceeds to step S1105. On the other hand, in a case where the color measurement processing control unit 304 has determined that the signal value received in step S1102 does not include the signal value which is stored in the measurement mode conversion table 3063 and which corresponds to the switch mode, processing of FIG. 11 is ended.

[0152] In step S1105, the color measurement processing control unit 304 changes the measurement mode of the application 300 from the normal mode to the remeasurement mode.

[0153] In step S1106, the color measurement processing control unit 304 determines whether the signal value received in step S1102 includes a colorimetric value of a color chart (not shown). In a case where the color measurement processing control unit 304 has determined that the received signal value includes the colorimetric value of the color chart, it can be regarded that the

colorimeter button **1200** has been long-pressed for color measurement of the color chart, and thus processing of FIG. **11** is ended. On the other hand, in a case where the color measurement processing control unit **304** has determined that the received signal value does not include the colorimetric value of the color chart, it can be regarded that the colorimeter button **1200** has been long-pressed to change the measurement mode, and thus processing proceeds to step **S1107**. That is to say, in a case where the signal value received from the colorimeter **102** in step **S1102** includes only the signal value that is based on long-pressing acting as the button operation, the color measurement processing control unit **304** proceeds to step **S1107**.

[0154] In step **S1107**, the color measurement processing control unit **304** determines whether remeasurement can be performed in the current state. In a case where the color measurement processing control unit **304** has determined that remeasurement can be performed in the current state, it proceeds to step **S1108**. On the other hand, in a case where the color measurement processing control unit **304** has determined that remeasurement cannot be performed in the current state, it proceeds to step **S1110**. For example, the color measurement processing control unit **304** refers to the storage unit **301**, and determines whether a colorimetric result of color verification patches has already been stored therein. In a case where the color measurement processing control unit **304** has determined that the colorimetric result of color verification patches has already been stored, it proceeds to step **S1108**. On the other hand, in a case where the color measurement processing control unit **304** has determined that the colorimetric result of color verification patches has not been stored, it proceeds to step **S1111**.

[0155] In step **S1108**, the color measurement processing control unit **304** changes the measurement mode of the application **300** from the normal mode to the remeasurement mode.

[0156] Processing of step **S1109** is similar to processing of step **S1005**, and processing of step **S1110** is similar to processing of step **S1009**; therefore, a description thereof is omitted.

[0157] As described above, according to the present embodiment, the application **300** changes the measurement mode in accordance with a signal that is based on an operation on the colorimeter button **1200**. In this way, in a case where the user who performs color verification changes the measurement mode to the remeasurement mode, the user can change to the remeasurement mode merely by operating the colorimeter **102** without performing an operation on the information processing apparatus **101**. This can improve convenience for a case where color verification is performed.

OTHER EMBODIMENTS

[0158] Embodiment(s) of the present invention can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions (e.g., one or more programs) recorded on a storage medium (which may also be referred to more fully as a ‘non-transitory computer-readable storage medium’) to perform the functions of one or more of the above-described embodiment(s) and/or that includes one or more circuits (e.g., application specific integrated circuit (ASIC)) for performing the functions of one or more of the above-described embodiment(s), and by a method performed by the computer of the system or apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s) and/or controlling the one or more circuits to perform the functions of one or more of the above-described embodiment(s). The computer may comprise one or more processors (e.g., central processing unit (CPU), micro processing unit (MPU)) and may include a network of separate computers or separate processors to read out and execute the computer executable instructions. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc (BD)TM), a flash memory device, a memory card, and the like.

[0159] While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

[0160] This application claims the benefit of Japanese Patent Application No. 2024-018843, filed Feb. 9, 2024, which is hereby incorporated by reference herein in its entirety.

Claims

1. A non-transitory computer-readable storage medium storing a program configured to cause a computer of an information processing apparatus to function as: a change unit configured to, in accordance with a signal that is based on a user operation on a colorimeter, change a measurement mode related to color measurement performed by the colorimeter in color verification; and a notification unit configured to provide a notification indicating the change in the measurement mode made by the change unit.
2. The non-transitory computer-readable storage medium storing the program according to claim 1, wherein the computer is further caused to function as a reception unit configured to receive the signal, and the change unit changes the measurement mode in a case where the reception unit has received a signal value for changing the measurement mode as the signal.
3. The non-transitory computer-readable storage medium storing the program according to claim 2, wherein a color chart in the color verification includes a first patch for changing the measurement mode and a second patch for color verification, and the change unit changes the measurement mode in a case where a colorimetric result of the color chart received by the reception unit is a first colorimetric value of the first patch.
4. The non-transitory computer-readable storage medium storing the program according to claim 3, wherein the change unit changes the measurement mode in a case where the colorimetric result of the color chart received by the reception unit is a second colorimetric value of the second patch for color verification and the second colorimetric value is a colorimetric value that has already been measured.
5. The non-transitory computer-readable storage medium storing the program according to claim 3, wherein the computer is further caused to function as a first storage unit configured to store a first conversion table in which a first signal value corresponding to a color of the first patch is associated with a measurement mode corresponding to the first signal value.
6. The non-transitory computer-readable storage medium storing the program according to claim 5, wherein the computer is further caused to function as a determination unit configured to, in a case where the reception unit has received the colorimetric result, determine whether the colorimetric result is the first colorimetric value with use of the first conversion table stored in the first storage unit, and the change unit changes the measurement mode in a case where the determination unit has determined that the colorimetric result is the first colorimetric value.
7. The non-transitory computer-readable storage medium storing the program according to claim 3, wherein the computer is further caused to function as a generation unit configured to generate data of the color chart.
8. The non-transitory computer-readable storage medium storing the program according to claim 7, wherein the generation unit generates the first patch using a color different from a color of the second patch.
9. The non-transitory computer-readable storage medium storing the program according to claim 7, wherein the computer is further caused to function as an acceptance unit configured to accept information of a setting for generating the color chart, and the generation unit generates the data of the color chart, on the basis of the information accepted by the acceptance unit.
10. The non-transitory computer-readable storage medium storing the program according to claim

7, wherein the computer is further caused to function as a print instruction unit configured to instruct an image forming apparatus to print the color chart, on the basis of the data generated by the generation unit.

11. The non-transitory computer-readable storage medium storing the program according to claim 2, wherein the change unit changes the measurement mode in a case where the reception unit has received an operation signal that is based on a predetermined operation performed on a user interface of the colorimeter.

12. The non-transitory computer-readable storage medium storing the program according to claim 11, wherein the computer is further caused to function as a third storage unit configured to store a second conversion table in which a second signal value corresponding to the operation signal is associated with a measurement mode corresponding to the second signal value, and the change unit changes the measurement mode in a case where the operation signal received by the reception unit is a signal corresponding to the second conversion table stored in the third storage unit.

13. The non-transitory computer-readable storage medium storing the program according to claim 11, wherein the change unit changes the measurement mode in a case where the operation signal received by the reception unit does not include a measurement result of a color chart for which color measurement has been performed by the colorimeter.

14. The non-transitory computer-readable storage medium storing the program according to claim 1, wherein the measurement mode includes a first mode that performs color verification with respect to a colorimetric value of a color chart obtained through a single session of color measurement performed by the colorimeter, a second mode that performs color verification with respect to a colorimetric value of the color chart obtained through remeasurement of colors performed by the colorimeter, and a third mode that performs color verification with respect to an average value of colorimetric values of the color chart obtained through a plurality of sessions of color measurement performed by the colorimeter.

15. The non-transitory computer-readable storage medium storing the program according to claim 1, wherein the computer is further caused to function as a display unit configured to display the notification by the notification unit.

16. A method executed by an information processing apparatus, the method comprising: in accordance with a signal that is based on a user operation on a colorimeter, changing a measurement mode related to measurement performed by the colorimeter in color verification; and providing a notification indicating the change in the measurement mode made by the changing.
