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Inventor(s)	HAYASHI; Ryotaro

INFORMATION PROCESSING APPARATUS, STORAGE MEDIUM, AND TEST CHART

Abstract

An information processing apparatus includes a generator configured to generate test chart image data for causing a printing apparatus ejecting ink to print a test chart image including a plurality of braille patches, the plurality of braille patches including a first braille patch and a second braille patch, and a transmitter configured to transmit the test chart image data to the printing apparatus. The generator is configured to cause a first parameter related to a first dot included in the first braille patch to differ from a second parameter related to a second dot included in the second braille patch.

Inventors: **HAYASHI; Ryotaro (SHIOJIRI-SHI, JP)**

Applicant: **SEIKO EPSON CORPORATION** (TOKYO, JP)

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Background/Summary

[0001] The present application is based on, and claims priority from JP Application Serial Number 2024-021805, filed Feb. 16, 2024, the disclosure of which is hereby incorporated by reference herein in its entirety.

BACKGROUND

1. Technical Field

[0002] The present disclosure relates to an information processing apparatus, a storage medium, and a test chart.

2. Related Art

[0003] Ink jet printers for printing braille characters are known. The printer described in JP-A-2004-249684 performs recording operations in a braille forming mode. In the braille forming mode, the printer ejects ink onto the surface of the recording paper, thereby forming small protrusions. The printer forms braille characters on the recording paper by forming small protrusions on the surface of the recording paper. The printer prints braille characters based on braille formation data transmitted from the host computer.

[0004] When braille characters are printed by the ink jet printer, a printing result varies depending on, for example, the type of recording paper. Therefore, braille characters may not be printed in a manner that is not desired by the user.

SUMMARY

[0005] According to an aspect of the present disclosure, an information processing apparatus includes a generator configured to generate test chart image data for causing a printing apparatus ejecting ink to print a test chart image including a plurality of braille patches, the plurality of braille patches including a first braille patch and a second braille patch; and a transmitter configured to transmit the test chart image data to the printing apparatus. The generator is configured to cause a first parameter related to a first dot included in the first braille patch to differ from a second parameter related to a second dot included in the second braille patch.

[0006] According to another aspect of the present disclosure, a non-transitory computer-readable storage medium storing an information processing program that, when executed, causes a computer to execute a generator configured to generate test chart image data for causing a printing apparatus to print a test chart image including a plurality of braille patches including a first braille patch and a second braille patch, and a transmitter configured to transmit the test chart image data to the printing apparatus. The generator is configured to cause a first parameter related to a first dot included in the first braille patch to differ from a second parameter related to a second dot included in the second braille patch.

[0007] According to another aspect of the present disclosure, a test chart includes a first braille patch and a second braille patch. A first shape of a first dot included in the first braille patch differs from a second shape of a second dot included in the second braille patch.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. **1** is a diagram showing a schematic configuration of a printing system.

[0009] FIG. **2** is a diagram showing a schematic configuration of a printer.

[0010] FIG. **3** is a diagram showing a sectional structure of a printing unit.

[0011] FIG. **4** is a diagram showing a structure of a braille character.

[0012] FIG. **5** schematically shows the shape of a dot.

[0013] FIG. **6** schematically shows a structure of the dot.

[0014] FIG. **7** is a diagram showing a schematic configuration of a printing system.
[0015] FIG. **8** shows an exemplary braille pattern setting screen.
[0016] FIG. **9** shows an exemplary braille test chart.
[0017] FIG. **10** shows an exemplary braille test chart.
[0018] FIG. **11** shows an exemplary braille test chart.
[0019] FIG. **12** shows an exemplary braille test chart.
[0020] FIG. **13** shows an exemplary braille pattern setting screen.

DESCRIPTION OF EMBODIMENTS

[0021] FIG. **1** shows a schematic configuration of a printing system **1**. The printing system **1** generates a printed material based on print data. The printing system **1** includes a printer **100**, a printing control apparatus **200**, an input device **310**, and a display **320**. The printer **100** and the printing control apparatus **200** are communicatively connected to each other via a communication network NW.
[0022] The printer **100** performs printing on print media M by ejecting ink onto the print media M. The printer **100** is an ink jet printer. The printer **100** is capable of printing a braille character **400** on the print media M. The printer **100** corresponds to an example of a printing apparatus.
[0023] The printing control apparatus **200** controls printing performed by the printer **100**. The printing control apparatus **200** generates print data. The printing control apparatus **200** transmits the print data to the printer **100**. The printing control apparatus **200** causes the printer **100** to perform printing based on the print data. The printing control apparatus **200** corresponds to an example of an information processing apparatus.
[0024] The printing control apparatus **200** is coupled to the input device **310** and the display **320**. The printing control apparatus **200** receives data input by a user from the input device **310**. The printing control apparatus **200** generates display data and transmits the display data to the display **320**. The printing control apparatus **200** causes the display **320** to display various setting screens and other items based on the display data.
[0025] The printing control apparatus **200** is a computer. The printing control apparatus **200** shown in FIG. **1** is, but not limited to, a desk-top computer. The printing control apparatus **200** may be a notebook computer or a tablet computer. When the printing control apparatus **200** is a notebook computer or a tablet computer, the printing control apparatus **200**, the input device **310**, and the display **320** are integrally constructed.
[0026] The input device **310** receives an operation input by a user. The input device **310** is coupled to the printing control apparatus **200** via a Universal Serial Bus (USB) cable, for example. The input device **310** outputs input data, based on an operation input by a user, to the printing control apparatus **200**. The input device **310** includes a keyboard, a mouse, and other peripherals.
[0027] The display **320** displays various images based on display data transmitted from the printing control apparatus **200**. The display **320** is coupled to the printing control apparatus **200** via, for example, a High-Definition Multimedia Interface (HDMI) cable. HDMI is a registered trademark. The display **320** is constituted by a liquid crystal panel, an organic electro luminescence (EL) panel, or other panel. The display **320** may have a touch input function. When the display **320** has the touch input function, the display **320** functions as the input device **310**.
[0028] The communication network NW communicatively connects the printer **100** and the printing control apparatus **200**. The communication network NW may be a local area network (LAN) constructed in an office or a floor, or may be a wide area network (WAN). As shown in FIG. **1**, the printer **100** and the printing control apparatus **200** are communicatively connected to each other via, not limited to, the communication network NW. The printer **100** and the printing control apparatus **200** may be coupled to each other with a USB cable, for example.
[0029] FIG. **2** shows a schematic configuration of the printer **100**. FIG. **2** shows the configuration of the printer **100** the outer housing of which is removed. FIG. **2** is a perspective view showing the internal configuration of the printer **100**.

[0030] FIGS. **2** and **3** are shown using the XYZ coordinate system. The X-axis, Y-axis, and Z-axis are perpendicular to each other. The Z-axis is an axis perpendicular to an installation surface (not shown) of the printer **100**. The X-axis and the Y-axis are parallel to the installation surface. The X-axis is an axis along a carriage guide shaft **84** shown in FIG. **2**. The Y-axis is an axis perpendicular to the carriage guide shaft **84**. A +Z direction is a direction upward from the installation surface along the Z-axis. A −Z direction is a direction downward from the installation surface along the Z-axis. A +X direction is a direction from the right to the left of the carriage guide shaft **84** shown in FIG. **2**. A −X direction is a direction from the left to the right of the carriage guide shaft **84** shown in FIG. **2**. A +Y direction is a direction from the rear to the front of the printer **100** shown in FIG. **2**. A −Y direction is a direction from the front to the rear of the printer **100** shown in FIG. **2**.
[0031] The printer **100** includes a main body section **10** and a moving section **70**. The main body section **10** is a pedestal fixed to the installation surface of the printer **100**. The moving section **70** moves along the Y-axis with respect to the main body section **10**.
[0032] The main body section **10** movably supports the print media M. The main body section **10** moves the print media M along the Z-axis. The main body section **10** includes a base portion **11**, a media support mechanism **30**, and a drive mechanism **50**.
[0033] The base portion **11** is mounted on the installation surface of the printer **100**. The base portion **11** supports components of the printer **100**, such as the media support mechanism **30** and the drive mechanism **50**. The base portion **11** shown in FIG. **2** includes a first base member **11***a*, a second base member **11***b*, and a main body pulley **13**. The first base member **11***a* and the second base member **11***b* are arranged along the Y-axis.
[0034] The media support mechanism **30** supports the print media M. The media support mechanism **30** adjusts the print media height of the supported print media M along the Z-axis. The media support mechanism **30** includes a table **31** and a height movement mechanism **32**.
[0035] The table **31** is configured to allow for mounting of the print media M. The print media M is mounted on the table **31**. The table **31** is a base that does not move along the X-axis and the Y-axis. The table **31** includes a media support portion **31***m* and a table leg portion **31***n*.
[0036] The media support portion **31***m* is a member on which the print media M is mounted. The media support portion **31***m* is a rectangular flat plate. The print media M is mounted on a media support surface **31***s* of the media support portion **31***m*. The media support surface **31***s* is a surface in the +Z direction of the media support portion **31***m*. A support surface length W of the media support surface **31***s* along the X-axis is equal to or substantially equal to the length of the print media M with the maximum size along the X-axis. The length of the media support surface **31***s* along the Y-axis may be longer or shorter than the length of the print media M with the maximum size along the Y-axis.
[0037] The table leg portion **31***n* supports the media support portion **31***m*. The table **31** shown in FIG. **2** includes a plurality of table leg portions **31***n*. The plurality of table leg portions **31***n* are disposed at ends of the media support portion **31***m*. The number and positions of the table leg portions **31***n* may be appropriately set.
[0038] The height movement mechanism **32** moves the media support portion **31***m* along the Z-axis. The height movement mechanism **32** adjusts the height of the print media M mounted on the media support portion **31***m*. The height movement mechanism **32** includes a lifting motor **33**, a lifting belt **37**, and a plurality of lifting mechanisms **39**.
[0039] The lifting motor **33** produces a driving force for moving the table **31** along the Z-axis. The lifting motor **33** includes an output shaft (not shown). The output shaft of the lifting motor **33** rotates in a direction for moving the table **31** in the +Z direction or in a direction for moving the table **31** in the −Z direction. The printer **100** causes the lifting motor **33** to operate, thereby moving the table **31** in the +Z direction or in the −Z direction.
[0040] The lifting belt **37** is a circular belt extending between the output shaft of the lifting motor **33** and the plurality of lifting mechanisms **39**. The lifting belt **37** is circularly driven by rotation of

the output shaft of the lifting motor **33**. The lifting belt **37** transmits the rotation of the output shaft of the lifting motor **33** to the plurality of lifting mechanisms **39**.

[0041] The lifting mechanism **39** moves the table **31** along the Z-axis. Each of the plurality of table leg portions **31***n* is provided with the lifting mechanism **39**. The lifting mechanism **39** includes, by way of example, a ball screw, a nut, and a lifting pulley. The ball screw, the nut, and the lifting pulley are not shown in the drawings. The ball screw is disposed along the Z-axis. The ball screw is rotatably supported by the base portion **11**. The nut is screwed onto the ball screw. The nut is fixed to the table leg portion **31***n*. The lifting pulley is fixed to an upper portion of the ball screw. The lifting pulley is engaged with the lifting belt **37**. The lifting pulley receives the rotation of the output shaft of the lifting motor **33** via the lifting belt **37**. In response to rotation of the lifting pulley, the ball screw rotates. Rotation of the ball screw causes the nut and the table leg portion **31***n* to move along the Z-axis.

[0042] The drive mechanism **50** moves the moving section **70** along the Y-axis. The drive mechanism **50** includes a first guide shaft **51***a*, a second guide shaft **51***b*, and a frame drive portion **60**.

[0043] The first guide shaft **51***a* and the second guide shaft **51***b* guide the movement of the moving section **70** along the Y-axis. The first guide shaft **51***a* and the second guide shaft **51***b* extend between the first base member **11***a* and the second base member **11***b*. The first guide shaft **51***a* and the second guide shaft **51***b* are axial members disposed along the Y-axis. The first guide shaft **51***a* is fixed to an end position of the base portion **11** in the −X direction. The second guide shaft **51***b* is fixed to an end position of the base portion **11** in the +X direction.

[0044] The frame drive portion **60** includes a frame movement motor **61**, a drive belt **63**, a speed change mechanism **65**, and a transmission belt **67**. The frame drive portion **60** shown in FIG. **2** is disposed at a position in the −X direction of the base portion **11**, but may be disposed at a position in the +X direction. The frame drive portion **60** is desirably disposed at a position in the −X direction.

[0045] The frame movement motor **61** produces a driving force for moving the moving section **70** along the Y-axis. The frame movement motor **61** includes a rotation shaft **61***a*. The rotation shaft **61***a* of the frame movement motor **61** rotates in a direction for moving the moving section **70** in the +Y direction and in a direction for moving the moving section **70** in the −Y direction. The printer **100** causes the frame movement motor **61** to operate, thereby moving the moving section **70** in the +Y direction or in the −Y direction.

[0046] The drive belt **63** transmits the driving force produced by the frame movement motor **61** to the speed change mechanism **65**. The drive belt **63** is a circular belt extending between the rotation shaft **61***a* of the frame movement motor **61** and the speed change mechanism **65**.

[0047] The speed change mechanism **65** changes the speed of rotation caused by the rotation shaft **61***a*. The speed change mechanism **65** includes, for example, a first pulley and a second pulley. The details of the first pulley and the second pulley are not shown in the drawings. The drive belt **63** is wound around the first pulley. The transmission belt **67** is wound around the second pulley. The speed change mechanism **65** rotates the second pulley by means of the driving force transmitted from the drive belt **63** to the first pulley. The second pulley drives the transmission belt **67**. The speed change mechanism **65** transmits the driving force, produced by the frame movement motor **61**, to the transmission belt **67** at a speed reduction ratio corresponding to the ratio of the diameter of the first pulley to the diameter of the second pulley.

[0048] The transmission belt **67** transmits the driving force to the moving section **70**. The transmission belt **67** is a circular belt extending between the speed change mechanism **65** and the main body pulley **13**. The main body pulley **13** is disposed on the second base member **11***b*. The main body pulley **13** is placed rotatably about the second base member **11***b*. The transmission belt **67** is disposed along the first guide shaft **51***a*.

[0049] The moving section **70** moves with respect to the print media M. The moving section **70**

moves along the Y-axis with respect to the print media M. The moving section **70** includes a main frame **71** and a recording section **90**.

[0050] The main frame **71** is a plate-shaped member disposed along the X-axis. The main frame **71** moves along the Y-axis. The length of the main frame **71** along the X-axis is longer than the length of the base portion **11** along the X-axis. The main frame **71** includes a first leg **73***a*, a second leg **73***b*, a carriage support frame **81**, a carriage drive motor **82**, a transmission mechanism **83**, the carriage guide shaft **84**, and a carriage drive belt **85**.

[0051] The first leg **73***a* and the second leg **73***b* fixedly support the main frame **71**. The first leg **73***a* and the second leg **73***b* support the main frame **71** at positions in the −Z direction of the main frame **71**.

[0052] The first leg **73***a* is disposed at a position in the −X direction of the main frame **71**. The first leg **73***a* is fitted to the first guide shaft **51***a*. The first leg **73***a* is movable along the first guide shaft **51***a*. The first leg **73***a* includes a first belt connect portion **79***a*. The first leg **73***a* is fixed to the transmission belt **67** via the first belt connect portion **79***a*. When the transmission belt **67** is circularly driven, a driving force is transmitted to the first leg **73***a* via the first belt connect portion **79***a*. The moving section **70** moves along the Y-axis by means of the driving force transmitted by the first leg **73***a*.

[0053] The second leg **73***b* is disposed at a position in the +X direction of the main frame **71**. The second leg **73***b* is fitted to the second guide shaft **51***b*. The second leg **73***b* is guided by the second guide shaft **51***b*. The second leg **73***b* is movable in the +Y direction and −Y direction along the second guide shaft **51***b*.

[0054] The carriage support frame **81** supports a carriage **91** described later. The carriage support frame **81** is a plate-shaped member disposed along the X-axis. The carriage support frame **81** is supported by the main frame **71**.

[0055] The carriage drive motor **82** produces a driving force for moving the carriage **91**. The carriage drive motor **82** is supported by the carriage support frame **81**. The carriage drive motor **82** shown in FIG. **2** is disposed at a position in the −X direction of the carriage support frame **81**.

[0056] The transmission mechanism **83** transmits the driving force produced by the carriage drive motor **82** to the carriage drive belt **85**. The transmission mechanism **83** includes a transmission pulley **83***a*, a two-step transmission pulley **83***b*, and a transmission belt **83***c*. The transmission pulley **83***a* is fixed to the drive shaft of the carriage drive motor **82**. The transmission belt **83***c* is a circular belt extending between the transmission pulley **83***a* and the two-step transmission pulley **83***b*. The two-step transmission pulley **83***b* includes a small pulley and a large pulley having a diameter larger than that of the small pulley. The transmission belt **83***c* is wound around the large pulley. The carriage drive belt **85** is wound around the small pulley. The transmission belt **83***c* is circularly driven by rotation of the carriage drive motor **82**. The transmission belt **83***c* rotates the large pulley. The transmission belt **83***c* rotates the small pulley by rotating the large pulley. The small pulley circularly drives the carriage drive belt **85**. The rotation of the carriage drive motor **82** is transmitted to the carriage drive belt **85** at a speed reduction ratio corresponding to the ratio of the diameter of the large pulley to the diameter of the small pulley.

[0057] The carriage guide shaft **84** guides the carriage **91**. The carriage guide shaft **84** is fixed to the carriage support frame **81**. The carriage guide shaft **84** is disposed along the X-axis. The carriage guide shaft **84** guides the carriage **91** along the X-axis.

[0058] The carriage drive belt **85** moves the carriage **91**. The carriage drive belt **85** is a circular belt extending between the transmission mechanism **83** and a carriage drive pulley (not shown). The transmission mechanism **83** is disposed at a position in the −X direction of the carriage support frame **81**. The carriage drive pulley is disposed at a position in the +X direction of the carriage support frame **81**. The carriage drive belt **85** is disposed along the carriage guide shaft **84**.

[0059] The printer **100** may include a height detection portion **88**. The height detection portion **88** detects the height of the print media M mounted on the table **31**. The height detection portion **88**

includes a contact plate **89** disposed to protrude downward from the lower end of the main frame **71**. The contact plate **89** is a plate-like member. The contact plate **89** is attached to the main frame **71** so as to be rotatable about a virtual rotation axis parallel to the X-axis. The contact plate **89** rotates upon contacting the print media M or the media support portion **31***m*. An arm (not shown) is formed on the contact plate **89**. The arm is displaced with the rotation of the contact plate **89**. The displacement of the arm is detected by a displacement sensor (not shown). The displacement sensor is provided in the height detection portion **88**. The displacement sensor is a magnetic sensor, a reflective optical sensor, or a transmissive optical sensor. When the displacement sensor detects the displacement of the arm, the height detection portion **88** detects the rotation of the contact plate **89**. The height detection portion **88** detects the height of the print media M by detecting the rotation of the contact plate **89**.

[0060] The recording section **90** performs printing on the print media M. The recording section **90** is supported by the moving section **70**. The recording section **90** includes a carriage **91** and a printing unit **93**.

[0061] The printing unit **93** is mounted on the carriage **91**. The carriage **91** links to the carriage drive belt **85**. In response to circulation driving of the carriage drive belt **85**, the carriage **91** moves. The carriage **91** is supported by the carriage guide shaft **84**. The carriage **91** is movable along the carriage guide shaft **84**. The carriage **91** is movable in the +X direction or the −X direction along the X-axis. The carriage **91** moves between the end position in the −X direction and the end position in the +X direction along the X-axis. Due to the driving of the carriage drive motor **82**, the carriage drive belt **85** moves the carriage **91** between the end position in the −X direction and the end position in the +X direction.

[0062] The end position in the −X direction is referred to as a home position. The home position is a position different from the position on the print media M. The home position is a position offset in the −X direction or +X direction from the print media M. In the case of the printer **100** shown in FIG. **2**, the home position is a position offset in the −X direction from the print media M and the media support portion **31***m* that supports the print media M. The carriage **91** located at the home position may face a maintenance mechanism that performs maintenance such as flushing and cleaning of the printing unit **93**. The maintenance mechanism is not shown in the drawings. The maintenance mechanism is disposed at a facing position facing the carriage **91** located at the home position or a position adjacent to the facing position. In FIG. **2**, the recording section **90** located at the home position is indicated by a broken line.

[0063] The end position in the +X direction is a return position. The carriage **91** stops at the return position. The carriage **91** moves in the +X direction from the home position. The carriage **91** starts from the home position, passes over the print media M, and stops at the return position. The return position is a position in the +X direction relative to the home position. The carriage **91** stops at the return position and then moves in the −X direction. The carriage **91** starts from the return position, passes over the print media M, and moves to the home position.

[0064] The printing unit **93** performs printing on the print media M. With the carriage **91** moving in the X-axis, the printing unit **93** moves in the +X direction or in the −X direction. With the main frame **71** moving in the Y-axis, the printing unit **93** moves in the +Y direction or in the −Y direction. The printer **100** is capable of moving the printing unit **93** relative to the table **31** along the X-axis and the Y-axis. The printing unit **93** is capable of ejecting ink onto the entire print media M supported by the table **31**.

[0065] FIG. **3** shows a cross-sectional structure of the printing unit **93**. FIG. **3** shows an X-Z cross section. The printing unit **93** includes a print head unit **94** and an ultraviolet (UV) lamp **96**. The printing unit **93** includes a first UV lamp **96***a*, the print head unit **94**, and a second UV lamp **96***b* in order from a location in the −X direction along the X-axis.

[0066] The print head unit **94** includes one or more print heads **95**. The print head unit **94** shown in FIG. **3** includes a first print head **95***a*, a second print head **95***b*, a third print head **95***c*, and a fourth

print head **95***d*. The print head unit **94** shown in FIG. **3** includes, but not limited to, four print heads **95**. The print head unit **94** includes one or more print heads **95**. The print head unit **94** desirably includes a plurality of print heads **95**.

[0067] The print head **95** ejects ink as a liquid onto the print media M. The print head **95** includes a plurality of nozzles (not shown) that eject ink. The nozzles open on the surface of the print head **95** in the −Z direction. When the print head **95** ejects ink from the nozzles, the ejected ink flies from the surface of the print head **95** in the −Z direction to the print media M mounted on the table **31**. The ink lands on the print media M.

[0068] The ink ejected by the print head **95** is ultraviolet (UV) curing ink. The UV curing ink contains a resin material, a photopolymerization initiator, and a solution as the main materials.

[0069] The resin material is a material for forming a resin film. The resin material is in a liquid state at room temperature. The resin material has a crosslinkable group. The resin material is desirably a material that becomes a polymer by polymerization. The resin material is desirably in the form of an oligomer. More desirably, the resin material is in the form of a monomer.

[0070] The photopolymerization initiator functions as a curing agent. The photopolymerization initiator acts on a crosslinkable group of the resin material to promote a crosslinking reaction. The photopolymerization initiator is, for example, benzyl dimethyl ketal.

[0071] The solution is a solvent or a dispersion medium. The solution adjusts the viscosity of the resin material. By adding the solution to the UV curing ink, the UV curing ink is adjusted to a predetermined viscosity.

[0072] The UV curing ink may contain a coloring matter and a functional material. The UV curing ink that contains the coloring matter and the functional material has a unique function. The coloring matter is, for example, a pigment or a dye. Examples of the coloring matter included in the UV curing ink include cyan, magenta, yellow, and white pigments. The functional material is, by way of example, a lyophilic or liquid-repellent surface modification material.

[0073] Each of the plurality of print heads **95** ejects the UV curing ink onto the print media M. In the print head unit **94**, it is desirable that the plurality of print heads **95** eject a plurality of types of UV curing ink onto the print media M. The plurality of inks differ from each other in at least one of a resin material, a photopolymerization initiator, and a solution. The plurality of inks may differ from each other in the coloring matter and functional material added.

[0074] The plurality of types of UV curing ink ejected in the print head unit **94** may include clear ink. The clear ink contains a photopolymerization initiator and a polymerizable compound. The clear ink is used for protection of a coating film formed with another ink, adjustment of glossiness of a printed material, and other purposes. The proportion of the content of the coloring matter contained in clear ink in the total amount of the clear ink is desirably less than or equal to 0.2% by mass. It is more desirable that the clear ink contain no coloring material.

[0075] By way of example, the first print head **95***a*, the second print head **95***b*, the third print head **95***c*, and the fourth print head **95***d* eject respectively different types of UV curing ink. The first print head **95***a* ejects cyan ink containing cyan pigment. The second print head **95***b* ejects magenta ink containing magenta pigment. The third print head **95***c* ejects clear ink. The fourth print head **95***d* ejects yellow ink containing yellow pigment.

[0076] The UV lamp **96** photo-cures the UV curing ink ejected onto the print media M. UV is an abbreviation for ultraviolet. The UV lamp **96** applies ultraviolet rays to the print media M. The UV lamp **96** cures the UV curing ink ejected onto the print media M by applying ultraviolet rays to the print media M.

[0077] The UV lamp **96** is constituted by, for example, a metal halide lamp, a xenon lamp, a carbon arc lamp, a chemical lamp, a low pressure mercury lamp, or a high pressure mercury lamp. The UV lamp **96** may be configured with, for example, a UV light emitting diode or UV light emitting semiconductor laser. The UV lamp **96** emits ultraviolet rays having wavelengths greater than or equal to 365 nm and less than or equal to 410 nm. The irradiation peak intensity of the UV lamp **96**

is desirably greater than or equal to 200 mW/cm.sup.2, and more desirably greater than or equal to 800 mW/cm.sup.2.

[0078] The printing unit **93** shown in FIG. **3** includes the first UV lamp **96***a* and the second UV lamp **96***b*, which are the UV lamps **96**. The printing unit **93** includes, but not limited to, the second UV lamp **96***b*. The printing unit **93** may not include the second UV lamp **96***b*. It is desirable that the printing unit **93** include the second UV lamp **96***b*.

[0079] The printing unit **93** is capable of printing the braille character **400**. The print head unit **94** ejects the UV curing ink onto the print media M. The print head unit **94** ejects the UV curing ink onto the print media M, thereby forming a raised portion on the print media M. The formed raised portions function as the dots **403** of the braille character **400**. The printer **100** is capable of printing the braille character **400**.

[0080] FIG. **4** shows the structure of the braille character **400**. FIG. **4** schematically shows the structure of one braille character **400**. The braille character **400** is represented by one or more dots **403** arranged in one braille cell **401**. The number of locations for the dots **403** arranged in one braille cell **401** is six. The six locations are arranged in two columns and three rows.

[0081] The braille cell **401** is a predetermined virtual region. The size of the braille cell **401** is directly or indirectly determined by, for example, the standards of Japanese Industrial Standards (JIS). One braille character, such as one letter, is represented by the one or more dots **403** arranged in one braille cell **401**.

[0082] The dot **403** is a raised portion that is printed by the printer **100**. The dot **403** is configured in the three-dimensional shape. The shape of the dot **403** is determined within a range predetermined by, for example, the JIS standards. The shape of the dot **403** varies by country and varies by standards. The shape of the dot **403** includes the size of the dot **403**.

[0083] A non-raised dot **405** virtually indicates a position at which the dot **403** may be placed to be printed. There is no raised portion in the non-raised dot **405**. One braille character, such as one letter, is represented using the one or more dots **403** and one or more non-raised dots **405** arranged in one braille cell **401**.

[0084] FIG. **5** schematically shows the shape of the dot **403**. FIG. **5** schematically shows the structure of the dot **403** on the print media M. The dot **403** is a raised portion formed on the print media M. The shape of the dot **403** is represented by a diameter D, a height H, and a radius of curvature R.

[0085] The diameter D is the outer diameter of the dot **403**. The dot **403** is printed in a circular or substantially circular shape when viewed in a plan view of the print media M. The diameter D may vary depending on the penetration state of ink into the print media M. The diameter D may be adjusted based on print data.

[0086] The height H is the dimension in a direction in which the dot **403** protrudes upward from the print media M. The height H may vary depending on the penetration state of ink into the print media M. The height H may be adjusted depending on the ejection amount of ink and the number of layers of ink.

[0087] The radius of curvature R indicates the shape of a shoulder portion of the dot **403** protruding upward. The radius of curvature R may be adjusted depending on the ejection amount of ink at each location in the dot **403**. The radius of curvature R may be adjusted based on print data.

[0088] FIG. **6** schematically shows the structure of the dot **403**. The dot **403** is formed by ejection of ink performed by the printer **100**. The printer **100** prints the dot **403** by stacking ink layers **407** that are formed by ejection of ink.

[0089] FIG. **6** schematically shows the ink layers **407** constituting the dot **403**. The printer **100** stacks the plurality of ink layers **407** to form the dot **403** having the predetermined height H. The height H of the dot **403** corresponds to the number of layers of the ink layers **407**. Additionally, the printer **100** adjusts the widths of the ink layers **407** along the surface of the print media M to form the dot **403** having the predetermined radius of curvature R.

[0090] FIG. **7** shows a block configuration of the printing system **1**. In FIG. **7**, the block configuration of the printing control apparatus **200** included in the printing system **1** is shown. The printing control apparatus **200** includes a communication unit **210**, a storage unit **220**, an input unit **230**, a display control unit **240**, and a control unit **250**.
[0091] The communication unit **210** is an interface circuit communicatively connected to the printer **100** and other devices. The communication unit **210** is connected to the printer **100** and other devices in a wired or wireless manner according to predetermined communication protocols. The communication unit **210** includes at least one of a wired connector and a wireless communication port. The wired connector is a USB connector, a LAN connector, or another connector. The wireless communication port is a Wi-Fi communication port, a Bluetooth communication port, or another port. Wi-Fi and Bluetooth are registered trademarks. The communication unit **210** is communicatively connected to the printer **100** via the communication network NW. The communication unit **210** transmits print data to the printer **100** via the communication network NW. The communication unit **210** receives various types of data such as status data from the printer **100** via the communication network NW.
[0092] The storage unit **220** stores various types of data, programs, and other resources. The storage unit **220** is constituted by a volatile semiconductor memory such as a random access memory (RAM), a nonvolatile memory such as a read only memory (ROM) or a flash memory, among others. The storage unit **220** may include a magnetic storage medium such as a hard disk drive (HDD). The storage unit **220** stores a print control program PG.
[0093] The print control program PG is software for controlling the printer **100**. The print control program PG causes the control unit **250** to execute various functional sections. The print control program PG corresponds to an example of an information processing program.
[0094] The input unit **230** is an interface circuit that receives data input by a user. The input unit **230** is connected in a wired or wireless manner to the input device **310**. The input unit **230** includes a USB port, a Bluetooth communication port, and other ports. The input unit **230** uses the input device **310** to receive data input by a user. The input data includes various setting values. The input unit **230** transmits the received input data to the control unit **250**. The input unit **230** corresponds to an example of a receiving section.
[0095] The display control unit **240** is a display control circuit that transmits display data for displaying, for example, a setting screen on the display **320**. The display control unit **240** is connected to the display **320** in a wired or wireless manner. The display control unit **240** includes an HDMI connection port, for example. The display control unit **240** is coupled to the display **320** via, for example, a High-Definition Multimedia Interface (HDMI) cable. The display control unit **240** transmits display data to the display **320** via, for example, the HDMI cable. The display control unit **240** causes the display **320** to display various setting screens and other items by transmitting display data to the display **320**. When the display **320** has a touch input function, the display control unit **240** may function as the input unit **230**.
[0096] The control unit **250** is a controller that controls components of the printing control apparatus **200**. The control unit **250** is, by way of example, a processor including a central processing unit (CPU). The control unit **250** includes one or more processors. The control unit **250** functions as various functional sections by causing various programs to operate. The control unit **250** functions as a display controller **251**, a data generator **253**, and a communication controller **255** by causing the print control program PG to operate. The printing control apparatus **200** including the control unit **250** functions as the display controller **251**, the data generator **253**, and the communication controller **255**. The control unit **250** may operate as functional sections other than the display controller **251**, the data generator **253**, and the communication controller **255**.
[0097] The display controller **251** controls the display of the display **320** via the display control unit **240**. The display controller **251** generates various types of display data. The display controller **251** generates setting screen display data for causing the display **320** to display various setting

screens. The setting screen display data includes braille pattern setting screen data for causing the display **320** to display a braille pattern setting screen **500**. The braille pattern setting screen **500** displays various setting values. The braille pattern setting screen **500** will be described later. The display controller **251** transmits the braille pattern setting screen data to the display **320** via the display control unit **240**. The display controller **251** causes the display **320** to display the braille pattern setting screen **500** based on the braille pattern setting screen data. The display **320** displays the braille pattern setting screen **500** based on the braille pattern setting screen data.

[0098] The display controller **251** receives input data from the input unit **230**. The input data includes a setting value change command, a setting value determination command, and other data. The display controller **251** changes a setting value included in the braille pattern setting screen **500** based on the setting value change command. The display controller **251** generates correction data for displaying the braille pattern setting screen **500** including the changed setting value. The display controller **251** transmits the corrected data to the display **320** via the display control unit **240**. The display controller **251** causes the display **320** to display the braille pattern setting screen **500** including the changed setting value.

[0099] Upon receiving the setting value determination command, the display controller **251** transmits setting data to the data generator **253**. The setting data includes various setting values included in the braille pattern setting screen **500** displayed on the display **320**. Upon receiving the setting value determination command, the display controller **251** changes the braille pattern setting screen **500** displayed on the display **320** to another screen.

[0100] The data generator **253** generates print data to be printed by the printer **100**. The print data includes braille test chart print data. The braille test chart print data causes the printer **100** to print a braille test chart **410**. The braille test chart **410** corresponds to an example of a test chart image. The braille test chart **410** includes a plurality of braille patch images **411**. The braille patch image **411** is the braille character **400** included in the braille test chart **410**. The braille patch image **411** corresponds to an example of a braille patch. The braille test chart **410** will be described later. The braille test chart print data is generated based on the setting data. The braille test chart print data corresponds to an example of test chart image data. The data generator **253** corresponds to an example of a generator.

[0101] The communication controller **255** controls communication performed by the communication unit **210**. The communication controller **255** transmits print data to the printer **100** via the communication unit **210**. The communication controller **255** transmits braille test chart print data to the printer **100** via the communication unit **210**. The communication controller **255** corresponds to an example of a transmitter.

[0102] The printer **100** receives print data transmitted via the communication unit **210**. The printer **100** performs printing based on the print data to generate a printed material. The printer **100** receives braille test chart print data. Based on the braille test chart print data, the printer **100** prints the braille test chart **410** on the print media M.

[0103] FIG. **8** shows an exemplary braille pattern setting screen **500**. FIG. **8** shows a first braille pattern setting screen **500***a*, which is an example of the braille pattern setting screen **500**. The first braille pattern setting screen **500***a* is displayed on the display **320** under control of the display controller **251**. The first braille pattern setting screen **500***a* receives an operation input by a user with the input device **310**.

[0104] The first braille pattern setting screen **500***a* includes a standard setting field **510**, a first reference dot setting field **520***a*, a first interval setting field **530***a*, a patch number setting field **540**, and a decision button icon **550**.

[0105] The standard setting field **510** receives a standard setting value according to the braille standards for the braille character **400**. The standard setting value sets a reference parameter, which is a parameter corresponding to the printed shape of a reference dot **403***a*. The printed shape is a shape of the dot **403** printed by the printer **100** and is, for example, the diameter D, the height H,

the radius of curvature R and so on. The reference parameter corresponds to an example of a first parameter. The reference dot **403***a* is the dot **403** printed on the print media M based on the reference parameter. The reference dot **403***a* corresponds to an example of a first dot. The reference dot **403***a* is formed in a reference braille patch image **411***a* among a plurality of braille patch images **411** included in the braille test chart **410**. The reference braille patch image **411***a* corresponds to an example of a first braille patch. The standard setting value corresponds to an example of type information of standards related to the reference dot **403***a*. The standard setting field **510** displays a standard setting value set by a user's input operation. The standard setting field **510** shown in FIG. **8** displays a standard setting value in a pull-down menu. When the user selects a standard setting value included in the pull-down menu, the standard setting field **510** displays the selected standard setting value. The braille standards represented by the standard setting value are the JIS standards, the Americans with Disabilities Act (ADA) standards, or other standards.

[0106] The first reference dot setting field **520***a*, which is an example of the reference dot setting field **520**, receives a reference setting value group for setting the reference parameter for the reference dot **403***a*. The reference setting value group corresponds to the shape of the reference dot **403***a*. The reference setting value group includes one or more setting values. The reference setting value group corresponds to an example of shape information of the first dot. The first reference dot setting field **520***a* includes a diameter setting field **521**, a height setting field **523**, and a curvature radius setting field **525**.

[0107] The diameter setting field **521** receives a diameter setting value corresponding to the diameter D of the reference dot **403***a*. The diameter setting value is an exemplary setting value and is included in the reference setting value group. The diameter setting value corresponds to an example of diameter information. The diameter setting field **521** displays a diameter setting value set by a user using the input device **310**.

[0108] The height setting field **523** receives a height setting value corresponding to the height H of the reference dot **403***a*. The height setting value is an exemplary setting value and is included in the reference setting value group. The height setting value corresponds to an example of height information. The height setting field **523** displays a height setting value set by a user using the input device **310**.

[0109] The curvature radius setting field **525** receives a curvature radius setting value corresponding to the radius of curvature R of the reference dot **403***a*. The curvature radius setting value is an exemplary setting value and is included in the reference setting value group. The curvature radius setting value corresponds to an example of curvature radius information. The curvature radius setting field **525** displays a curvature radius setting value set by a user using the input device **310**.

[0110] The first braille pattern setting screen **500***a* shown in FIG. **8** displays the standard setting field **510** and the first reference dot setting field **520***a*, but the present disclosure is not limited thereto. On the first braille pattern setting screen **500***a*, either the standard setting field **510** or the first reference dot setting field **520***a* may be displayed to be settable.

[0111] The first interval setting field **530***a*, which is an example of an interval setting field **530**, receives an adjustment value group related to each setting value. The adjustment value group is used when an adjustment parameter, which is a parameter corresponding to the printed shape of an adjustment dot **403***b*, is generated. The adjustment value group includes one or more adjustment values. The adjustment dots **403***b* are the dots **403** that form an adjustment braille patch image **411***b* included in the braille test chart **410**. The adjustment dot **403***b* corresponds to an example of a second dot. The adjustment dot **403***b* is printed on the print media M based on the adjustment parameter. The adjustment parameter is set using a setting value included in the reference setting value group and an adjustment value included in the adjustment value group. Based on the adjustment parameter, the adjustment braille patch image **411***b* included in the braille test chart **410** is printed. The adjustment braille patch image **411***b* corresponds to an example of a second braille

patch. The adjustment parameter corresponds to an example of a second parameter. The adjustment value group includes a value representing a difference between the reference parameter and the adjustment parameter. The first interval setting field **530***a* includes a diameter interval setting field **531**, a height interval setting field **533**, and a curvature radius interval setting field **535**.

[0112] The diameter interval setting field **531** receives a diameter adjustment value related to the diameter D that is used when generating the shape of the adjustment dot **403***b*. The diameter adjustment value is an exemplary adjustment value and is included in the adjustment value group. The diameter interval setting field **531** displays a diameter adjustment value set by a user using the input device **310**.

[0113] The height interval setting field **533** receives a height adjustment value related to the height H that is used when generating the shape of the adjustment dot **403***b*. The height adjustment value is an exemplary adjustment value and is included in the adjustment value group. The height interval setting field **533** displays a height adjustment value set by a user using the input device **310**.

[0114] The curvature radius interval setting field **535** receives a curvature radius adjustment value related to the radius of curvature R that is used when generating the shape of the adjustment dot **403***b*. The curvature radius adjustment value is an exemplary adjustment value and is included in the adjustment value group. The curvature radius interval setting field **535** displays a curvature radius adjustment value set by a user using the input device **310**.

[0115] The patch number setting field **540** receives a number setting value, which is the number of images in the braille patch images **411** to be printed according to adjustment of each setting value. The number of images corresponds to an example of the number of braille patch images **411**. The braille patch image **411** is used when the user evaluates the readability of the braille character **400**. The number setting value is the total number of the braille patch images **411** among which one setting value differs from each other and the other setting values are the same. For example, when the reference setting value group includes three setting values, the diameter setting value, the height setting value, and the curvature radius setting value, the number setting value is the total number of the braille patch images **411** among which the diameter setting value differs and the height setting value and curvature radius setting value are the same. Using the number setting value, the number of images in the braille patch images **411** included in the braille test chart **410** is set. The patch number setting field **540** displays a number setting value set by a user using the input device **310**. The number setting value corresponds to an example of number specification information.

[0116] The decision button icon **550** receives an operation input by a user. The decision button icon **550** receives an input operation indicating that the input operation on each setting field is complete. The user performs an input operation on each setting field displayed on the first braille pattern setting screen **500***a*, and then performs an input operation on the decision button icon **550**.

[0117] The first braille pattern setting screen **500***a* shown in FIG. **8** includes, but not limited to, the interval setting field **530** and the patch number setting field **540**. The first braille pattern setting screen **500***a* may not include at least one of the interval setting field **530** and the patch number setting field **540**. The first braille pattern setting screen **500***a* desirably includes at least one of the interval setting field **530** and the patch number setting field **540**. Inclusion of at least one of the interval setting field **530** and the patch number setting field **540** allows the user to generate the braille test chart **410** in detail.

[0118] In response to the user performing an input operation on the decision button icon **550**, the input unit **230** receives a setting value or another option input to each setting field. The input unit **230** receives reference dot setting information related to each setting value and braille character interval information.

[0119] The reference dot setting information includes at least one of the standard setting value set in the standard setting field **510** and/or a reference setting value group set in the first reference dot setting field **520***a*. The reference setting value group includes at least one or more of the diameter setting value, the height setting value, and/or the curvature radius setting value. The reference dot

setting information corresponds to an example of setting information.
[0120] The braille character interval information is an adjustment value group set in the first interval setting field **530***a*. The adjustment value group includes at least one of the diameter adjustment value, the height adjustment value, and the curvature radius adjustment value. The braille character interval information corresponds to a difference between the reference parameter and the adjustment parameter. When the first braille pattern setting screen **500***a* does not include the interval setting field **530**, the input unit **230** obtains predetermined braille character interval information from the storage unit **220**. The storage unit **220** stores the braille character interval information predetermined in advance. The braille character interval information corresponds to an example of interval information.
[0121] When the first braille pattern setting screen **500***a* includes the patch number setting field **540**, the input unit **230** receives a number setting value. When the first braille pattern setting screen **500***a* does not include the patch number setting field **540**, the input unit **230** obtains a predetermined number setting value from the storage unit **220**. The storage unit **220** stores the number setting value predetermined in advance.
[0122] The printing control apparatus **200** includes the input unit **230** that receives the reference dot setting information for setting the reference parameter. The reference dot setting information includes at least one of the reference setting value group and/or the standard setting value.
[0123] The user may set the shape of the reference dot **403***a* of the reference braille patch image **411***a* included in the braille test chart **410**. The user may set the braille character **400** having any size or according to any of various standards as the reference braille patch image **411***a*.
[0124] The input unit **230** desirably receives a number setting value specifying the number of images in the plurality of braille patch images **411** included in the braille test chart **410**.
[0125] The user may adjust the number of braille patch images **411** included in the braille test chart **410**.
[0126] After receiving the reference dot setting information, the braille character interval information, and the number setting value, the input unit **230** transmits the reference dot setting information, the braille character interval information, and the number setting value to the data generator **253**.
[0127] The data generator **253** receives the reference dot setting information and the braille character interval information as setting data. The data generator **253** generates the braille test chart print data using the reference dot setting information, the braille character interval information, and the number setting value. The braille test chart print data includes the reference parameter and the adjustment parameter. The data generator **253** generates the reference parameter and the adjustment parameter.
[0128] The data generator **253** generates the reference parameter using the reference dot setting information. The data generator **253** determines whether the reference dot setting information is at least one of the standard setting value and the reference setting value group.
[0129] If it is determined that the reference dot setting information is the standard setting value, the data generator **253** reads a standard value data group corresponding to the standard setting value from the storage unit **220**. The standard value data includes a diameter standard value, a height standard value, and a curvature radius standard value. The standard value data group is stored in the storage unit **220** in advance. The data generator **253** generates a reference parameter including the standard value data. The data generator **253** generates a reference parameter in which the diameter standard value, the height standard value, and the curvature radius standard value are a diameter setting value, the height setting value, and the curvature radius setting value, respectively.
[0130] If it is determined that the reference dot setting information is the reference setting value group, the data generator **253** generates a reference parameter using the reference setting value group. The data generator **253** generates a reference parameter including the diameter setting value, the height setting value, and the curvature radius setting value.

[0131] The data generator **253** may convert the height setting value to an ink layer number setting value. The ink layer number setting value corresponds to the number of layers of the ink layers **407** shown in FIG. **6**. The data generator **253** generates a reference parameter including the ink layer number setting value instead of the height setting value. The ink layer number setting value represents the number of layers of the ink layers **407** corresponding to the height setting value. The ink layer number setting value corresponds to an example of a first layer number setting value.
[0132] If it is determined that the reference dot setting information is the standard setting value and the reference setting value group, the data generator **253** reads the standard value data group corresponding to the standard setting value from the storage unit **220**. The data generator **253** compares the reference setting value group with the standard value data group. The data generator **253** replaces a setting value different from the setting value included in the reference setting value group, among the plurality of setting values included in the standard value data group, with the setting value included in the reference setting value group. The data generator **253** generates a modified reference setting value group. The data generator **253** generates a reference parameter including the modified reference setting value group.
[0133] After generating the reference parameter, the data generator **253** generates a plurality of adjustment parameters using the reference parameter, the interval information, and the number setting value.
[0134] The data generator **253** determines the number of images in the braille patch images **411** for each setting value from the number setting value. The braille test chart **410** consists of one reference braille patch image **411***a* and a plurality of adjustment braille patch images **411***b*. The data generator **253** determines the number of images in the adjustment braille patch images **411***b* using the number setting value. When the number setting value is three and the three setting values are the diameter setting value, the height setting value, and the curvature radius setting value, the braille test chart **410** consists of 27 braille patch images **411**. The braille test chart **410** consists of one reference braille patch image **411***a* and **26** adjustment braille patch images **411***b*.
[0135] The data generator **253** generates an adjustment parameter corresponding to each of the plurality of adjustment braille patch images **411***b*. The data generator **253** generates the adjustment parameter using the reference parameter and the interval information. When the reference parameter includes the diameter setting value, the height setting value, and the curvature radius setting value, the data generator **253** generates the adjustment parameter using one of the diameter adjustment value, the height adjustment value, and the curvature radius adjustment value. The adjustment parameter includes an adjustment diameter setting value, an adjustment height setting value, and an adjustment curvature radius setting value. The data generator **253** causes at least one of the adjustment diameter setting value, the adjustment height setting value, and the adjustment curvature radius setting value included in the adjustment parameter to differ from a corresponding one of the diameter setting value, the height setting value, and the curvature radius setting value included in the reference parameter. The data generator **253** causes the reference parameter to differ from the adjustment parameter.
[0136] By way of example, the data generator **253** causes the adjustment diameter setting value included in the adjustment parameter to differ from the diameter setting value included in the reference parameter. The data generator **253** generates the adjustment diameter setting value included in the adjustment parameter by adding or subtracting the diameter adjustment value to or from the diameter setting value included in the reference parameter. The data generator **253** generates the adjustment diameter setting value included in the adjustment parameter by adding or subtracting a multiple of the diameter adjustment value to or from the diameter setting value included in the reference parameter. The data generator **253** generates the adjustment height setting value and the adjustment curvature radius setting value included in the adjustment parameter in a similar method.
[0137] When the reference parameter includes the ink layer number setting value instead of the

height setting value, the data generator **253** generates an adjustment parameter including an adjustment ink layer number setting value. The data generator **253** converts the height adjustment value to an ink layer number adjustment value. The ink layer number adjustment value is the number of layers of the ink layers **407** corresponding to the height adjustment value. The data generator **253** uses the ink layer number setting value and the ink layer number adjustment value to generate the adjustment ink layer number setting value. When the height adjustment value is set, the adjustment ink layer number setting value differs from the ink layer number setting value. The adjustment ink layer number setting value corresponds to an example of a second layer number setting value.

[0138] The data generator **253** generates braille test chart print data including the reference parameter and a plurality of adjustment parameters and then transmits the braille test chart print data to the printer **100** via the communication controller **255**. The printer **100** receives braille test chart print data. The printer **100** prints the braille test chart **410** based on the braille test chart print data.

[0139] After causing the printer **100** to print the braille test chart **410**, the printing control apparatus **200** receives a result of the user's evaluation of the braille patch images **411**. The user performs a specification input operation, which specifies a desired one of the braille patch images **411**, on the input device **310**. The input unit **230** inputs specification data corresponding to the specification input operation. The specification data includes patch specification information indicating the desired one of the braille patch images **411**. The input unit **230** transmits the specification data to the data generator **253**. The data generator **253** uses the patch specification information to identify the braille patch image **411**. The data generator **253** causes a braille character parameter for printing the identified braille patch image **411** to be stored in the storage unit **220**. The braille character parameter is one of the reference parameter and the plurality of adjustment parameters. In response to obtaining a print instruction for printing the braille character **400**, the printing control apparatus **200** generates print data including the braille character parameter. The printing control apparatus **200** causes the printer **100** to perform printing based on the print data including the braille character parameter.

[0140] The printing control apparatus **200** includes the data generator **253** that generates braille test chart print data for causing the printer **100**, which ejects ink, to print the braille test chart **410** consisting of a plurality of braille patch images **411** each including the reference braille patch image **411***a* and the adjustment braille patch images **411***b*, and the communication controller **255** that transmits the braille test chart print data to the printer **100**. The data generator **253** causes the reference parameter related to the reference dot **403***a* included in the reference braille patch image **411***a* to differ from the adjustment parameter related to the adjustment dot **403***b* included in the adjustment braille patch image **411***b*.

[0141] When braille characters are printed by the printer **100**, a printing result varies depending on, for example, the type of recording paper. The printing control apparatus **200** may cause the printer **100** to print the braille test chart **410** including the braille characters **400** that differ in printing conditions. The user may determine printing conditions for printing the desired braille characters **400** by evaluating the braille test chart **410**.

[0142] The input unit **230** receives the braille character interval information indicating a difference between a reference parameter and an adjustment parameter. The data generator **253** desirably generates the adjustment parameter based on the reference dot setting information and the braille character interval information.

[0143] The user may adjust shape differences among a plurality of braille patch images **411** in the braille test chart **410** to desired differences.

[0144] When the input unit **230** receives reference dot setting information including the height setting value, the data generator **253** desirably generates a reference parameter including an adjustment ink layer number setting value, which is the number of the ink layers **407** corresponding

to the height setting value, and generates an adjustment parameter including an adjustment ink layer number setting value different from the ink layer number setting value.
[0145] The printing control apparatus **200** may convert the shape of the dot **403** to data that is likely to correspond to the printing conditions imposed by the printer **100**.
[0146] The print control program PG causes the printing control apparatus **200** to execute the data generator **253**, which generates braille test chart print data for causing the printer **100** to print the braille test chart **410** consisting of a plurality of braille patch images **411** each including the reference braille patch image **411***a* and the adjustment braille patch images **411***b*, and the communication controller **255**, which transmits the braille test chart print data to the printer **100**. The data generator **253** causes the reference parameter related to the reference dot **403***a* included in the reference braille patch image **411***a* to differ from the adjustment parameter related to the adjustment dot **403***b* included in the adjustment braille patch image **411***b*.
[0147] The print control program PG may cause the printer **100** to print the braille test chart **410** including the braille characters **400** with different printing conditions. The user may determine printing conditions for printing the desired braille characters **400** by evaluating the braille test chart **410**.
[0148] FIG. **9** shows an example of the braille test chart **410**. FIG. **9** shows a first braille test chart **410***a* as an example of the braille test chart **410**. FIG. **9** shows the first braille test chart **410***a* that is printed based on the braille test chart print data by the printer **100**. The first braille test chart **410***a* is printed on the print media M. FIG. **9** shows the first braille test chart **410***a* when the number setting value is three.
[0149] The first braille test chart **410***a* shown in FIG. **9** consists of 27 braille patch images **411**. The first braille test chart **410***a* consists of one reference braille patch image **411***a* and **26** adjustment braille patch images **411***b*. The reference braille patch image **411***a* is formed of a plurality of reference dots **403***a*. The reference dot **403***a* is printed based on the reference parameter. The adjustment braille patch images **411***b* is formed of a plurality of adjustment dots **403***b*. The adjustment dot **403***b* is printed based on the adjustment parameter. The respective adjustment dots **403***b* forming the plurality of adjustment braille patch images **411***b* are printed based on the adjustment parameters different from each other. The reference dot shape of the reference dot **403***a* included in the reference braille patch image **411***a* differs from the adjustment dot shape of the adjustment dot **403***b* included in the adjustment braille patch image **411***b*. The adjustment dot shapes of the respective adjustment dots **403***b* forming the plurality of adjustment braille patch images **411***b* differ from each other. The reference dot shape corresponds to an example of a first shape. The adjustment dot shape corresponds to an example of a second shape. The plurality of braille patch images **411** included in the first braille test chart **410***a* are printed using parameters different from each other. The plurality of braille patch images **411** included in the first braille test chart **410***a* are printed in shapes different from each other.
[0150] In the first braille test chart **410***a*, the braille patch images **411** are arranged in nine columns and three rows. The reference braille patch image **411***a* included in the first braille test chart **410***a* shown in FIG. **9** is arranged at the center position of the plurality of braille patch images **411**. The arrangement of the braille patch images **411** is not limited to the arrangement shown in FIG. **9**. The arrangement of the braille patch images **411** may be set as appropriate.
[0151] The plurality of braille patch images **411** included in the first braille test chart **410***a* are arranged to be divided into three braille image groups BG. Each of the plurality of braille image groups BG includes braille patch images **411** that are printed using the three setting values one of which has the same value. The plurality of braille patch images **411** included in the first braille test chart **410***a* are arranged to be divided into three braille image groups BG, but are not limited to this. The plurality of braille patch images **411** may not be divided into a plurality of braille image groups BG.
[0152] The first braille test chart **410***a* includes the reference braille patch image **411***a* and the

adjustment braille patch images **411***b*. The reference dot shape of the reference dot **403***a* included in the reference braille patch image **411***a* differs from the adjustment dot shape of the adjustment dot **403***b* included in the adjustment braille patch image **411***b*.

[0153] When checking the first braille test chart **410***a* with a finger, the user easily distinguish the reference braille patch image **411***a* from the adjustment braille patch image **411***b*.

[0154] FIG. **10** shows an example of the braille test chart **410**. FIG. **10** shows a second braille test chart **410***b* as an example of the braille test chart **410**. FIG. **10** shows the second braille test chart **410***b* that is printed based on the braille test chart print data by the printer **100**. The second braille test chart **410***b* is printed on the print media M. FIG. **10** shows the second braille test chart **410***b* when the number setting value is three.

[0155] The second braille test chart **410***b* displays first identification images **413***a*. Other than displaying the first identification images **413***a*, the second braille test chart **410***b* has the same configuration as the first braille test chart **410***a*.

[0156] An identification image **413** is an image identifying the braille patch image **411**. The identification image **413** distinguishes the reference braille patch image **411***a* from the adjustment braille patch images **411***b*. The identification image **413** distinguishes the plurality of adjustment braille patch images **411***b* from each other. The first identification image **413***a* is an example of the identification image **413**. The user may perform the specification input operation mentioned above, which specifies the braille patch image **411**, using information indicated by the identification image **413**.

[0157] The first identification images **413***a* indicate setting values for the dots **403** that form the braille patch image **411**. The first identification images **413***a* indicate a setting value for the diameter D, a setting value for the height H, and a setting value for the radius of curvature R. The setting value for the diameter D, the setting value for the height H, and the setting value for the radius of curvature R are the diameter setting value, the height setting value, and the curvature radius setting value, respectively. The diameter setting value, the height setting value, and the curvature radius setting value are included in the reference parameter or the adjustment parameter. The user may recognize the shapes of the dots **403**, which form each braille patch image **411**, by checking the first identification images **413***a*.

[0158] In the second braille test chart **410***b*, the braille patch images **411** are divided into a first braille image group BG**1**, a second braille image group BG**2**, and a third braille image group BG**3**. The first braille image group BG**1**, the second braille image group BG**2**, and the third braille image group BG**3** are examples of the braille image group BG. The first braille image group BG**1** includes the braille patch images **411** in which the height setting value for the dot **403** is 0.49. The second braille image group BG**2** includes the braille patch images **411** in which the height setting value for the dot **403** is 0.50. The third braille image group BG**3** includes the braille patch images **411** in which the height setting value for the dot **403** is 0.51.

[0159] FIG. **11** shows an example of the braille test chart **410**. FIG. **11** shows a third braille test chart **410***c* as an example of the braille test chart **410**. FIG. **11** shows the third braille test chart **410***c* that is printed based on the braille test chart print data by the printer **100**. The third braille test chart **410***c* is printed on the print media M. FIG. **11** shows the third braille test chart **410***c* when the number setting value is three.

[0160] The third braille test chart **410***c* displays second identification images **413***b*. Other than displaying the second identification images **413***b*, the third braille test chart **410***c* has the same configuration as the first braille test chart **410***a*.

[0161] The second identification image **413***b* is an example of the identification image **413**. The second identification image **413***b* is a numerical value corresponding to the braille patch image **411**. Numerical value 1, numerical value 2, and other numerical values of the second identification images **413***b* indicate adjustment braille patch images **411***b*. Numerical value 14 of the second identification image **413***b* indicates the reference braille patch image **411***a*. The user may identify

any braille patch image **411** among a plurality of braille patch images **411** by checking the second identification image **413***b*.

[0162] FIG. **12** shows an example of the braille test chart **410**. FIG. **12** shows a fourth braille test chart **410***d* as an example of the braille test chart **410**. FIG. **12** shows the fourth braille test chart **410***d* that is printed based on the braille test chart print data by the printer **100**. The fourth braille test chart **410***d* is printed on the print media M. FIG. **12** shows the fourth braille test chart **410***d* when the number setting value is two.

[0163] The fourth braille test chart **410***d* displays third identification images **413***c* and the braille patch images **411**. The braille patch images **411** include a reference braille patch image **411***a* and adjustment braille patch images **411***b*. The fourth braille test chart **410***d* includes one reference braille patch image **411***a* and eight adjustment braille patch images **411***b*. The reference dot shape of the reference dot **403***a* included in the reference braille patch image **411***a* differs from the adjustment dot shape of the adjustment dot **403***b* included in the adjustment braille patch image **411***b*. The adjustment dot shapes of the respective adjustment dots **403***b* forming the plurality of adjustment braille patch images **411***b* differ from each other.

[0164] The third identification image **413***c* is an example of the identification image **413**. The third identification image **413***c* is printed based on identification image data. The identification image data corresponds to an example of the identification image data. The identification image data is generated by the data generator **253**. The identification image data is added to the braille test chart print data. With the identification image data, the printer **100** prints characters, numerical values, and so on, which identify the braille patch image **411**, in the braille characters **400**.

[0165] The third identification image **413***c* displays the braille characters **400** corresponding to the braille patch image **411**. The third identification image **413***c* shown in FIG. **12** consists of two braille characters **400**. The braille character **400** of the third identification image **413***c* includes, by way of example, the reference dot **403***a*. The braille characters **400** of the third identification image **413***c* indicate numerical values. The user may identify the third identification image **413***c* when evaluating the braille patch image **411** with a finger. The user may identify any braille patch image **411** among the plurality of braille patch images **411** by checking the third identification image **413***c*.

[0166] The third identification image **413***c* shown in FIG. **12** consists of two braille characters **400**, but is not limited to this. The third identification image **413***c* may consist of one or three or more braille characters **400**. The braille characters **400** of the third identification image **413***c* may indicate characters, for example.

[0167] The fourth braille test chart **410***d* includes the third identification images **413***c* that distinguish the reference braille patch image **411***a* from the adjustment braille patch images **411***b*. The data generator **253** generates identification image data for printing the third identification images **413***c* in the braille characters **400** and adds the identification image data to the braille test chart print data.

[0168] The user may check the identification image **413** corresponding to the braille patch image **411** with a finger. The user is likely to identify a desired braille patch image **411**.

[0169] FIG. **13** shows an exemplary braille pattern setting screen **500**. FIG. **13** shows a second braille pattern setting screen **500***b*, which is an example of the braille pattern setting screen **500**. The second braille pattern setting screen **500***b* is displayed on the display **320** under control of the display controller **251**. The second braille pattern setting screen **500***b* receives an operation input by a user with the input device **310**.

[0170] The second braille pattern setting screen **500***b* includes the standard setting field **510**, a second reference dot setting field **520***b*, a second interval setting field **530***b*, the patch number setting field **540**, and the decision button icon **550**. The standard setting field **510**, the patch number setting field **540**, and the decision button icon **550** in the second braille pattern setting screen **500***b* have the same configurations as the standard setting field **510**, the patch number setting field **540**,

and the decision button icon **550** in the first braille pattern setting screen **500***a*.
[0171] The second reference dot setting field **520***b*, which is an example of the reference dot setting field **520**, receives a reference setting value group for setting the reference parameter for the reference dot **403***a*. The reference setting value group corresponds to the shape of the reference dot **403***a*. The reference setting value group includes one or more setting values. The second reference dot setting field **520***b* includes the diameter setting field **521**, a stacked layer number setting field **527**, and the curvature radius setting field **525**. The diameter setting field **521** and the curvature radius setting field **525** included in the second reference dot setting field **520***b* have the same configurations as the diameter setting field **521** and the curvature radius setting field **525** included in the first reference dot setting field **520***a*.
[0172] The stacked layer number setting field **527** receives a stacked layer number setting value. The stacked layer number setting value is a setting value for the number of stacked ink layers **407** that are stacked when the printer **100** prints the reference dot **403***a* by ejecting ink. The stacked layer number setting value is an exemplary setting value and is included in the reference setting value group. The stacked layer number setting value corresponds to an example of layer number information. The stacked layer number setting field **527** displays a stacked layer number setting value set by a user using the input device **310**.
[0173] The second interval setting field **530***b*, which is an example of the interval setting field **530**, receives an adjustment value group related to each setting value. The adjustment value group is used when an adjustment parameter related to adjustment dot **403***b* is generated. The adjustment value group includes one or more adjustment values. The second interval setting field **530***b* includes the diameter interval setting field **531**, a stacked layer number interval setting field **537**, and the curvature radius interval setting field **535**. The diameter interval setting field **531** and the curvature radius interval setting field **535** included in the second interval setting field **530***b* have the same configurations as the diameter interval setting field **531** and the curvature radius interval setting field **535** included in the first interval setting field **530***a*.
[0174] The stacked layer number interval setting field **537** receives a stacked layer number adjustment value. The stacked layer number adjustment value is related to the number of stacked ink layers **407** when the shape of the adjustment dot **403***b* is formed. The stacked layer number adjustment value is an exemplary adjustment value and is included in the adjustment value group. The stacked layer number interval setting field **537** displays a stacked layer number adjustment value set by a user using the input device **310**.
[0175] After receiving the reference dot setting information, the braille character interval information, and the number setting value, the input unit **230** transmits the reference dot setting information, the braille character interval information, and the number setting value to the data generator **253**. The reference dot setting information includes a stacked layer number setting value. The braille character interval information includes a stacked layer number adjustment value.
[0176] The data generator **253** receives the reference dot setting information including a stacked layer number setting value and the braille character interval information including a stacked layer number adjustment value as setting data. The data generator **253** generates the braille test chart print data using the reference dot setting information, the braille character interval information, and the number setting value. The braille test chart print data includes a reference parameter and an adjustment parameter. The data generator **253** generates the reference parameter and the adjustment parameter.
[0177] The reference setting value group desirably includes at least one or more of the diameter setting value, the height setting value, the curvature radius setting value, and/or the stacked layer number setting value.
[0178] The user may set the shapes of the dots **403** included in the braille patch image **411** in detail.

Claims

1. An information processing apparatus comprising: a generator configured to generate test chart image data for causing a printing apparatus ejecting ink to print a test chart image including a plurality of braille patches, the plurality of braille patches including a first braille patch and a second braille patch; and a transmitter configured to transmit the test chart image data to the printing apparatus, wherein the generator is configured to cause a first parameter related to a first dot included in the first braille patch to differ from a second parameter related to a second dot included in the second braille patch.

2. The information processing apparatus according to claim 1, further comprising: a receiving section configured to receive setting information for setting the first parameter, wherein the setting information includes at least one of shape information of the first dot or type information of a standard related to the first dot.

3. The information processing apparatus according to claim 2, wherein the receiving section is configured to receive interval information indicating a difference between the first parameter and the second parameter, and the generator is configured to generate the second parameter based on the setting information and the interval information.

4. The information processing apparatus according to claim 2, wherein the receiving section is configured to receive number specification information specifying a number of the plurality of braille patches included in the test chart image.

5. The information processing apparatus according to claim 2, wherein the shape information includes at least one or more of diameter information, height information, curvature radius information, or layer number information indicative of a number of ink layers forming the first dot.

6. The information processing apparatus according to claim 5, wherein, in response to the receiving section receiving the shape information including the height information, the generator is configured to generate the first parameter including a first layer number setting value, the first layer number setting value being a number of ink layers corresponding to the height information, and to generate the second parameter including a second layer setting value different from the first layer number setting value.

7. The information processing apparatus according to claim 1, wherein the test chart image includes identification information distinguishing the first braille patch from the second braille patch, and the generator is configured to generate identification information data for causing the identification information to be printed in a braille character and to add the identification information data to the test chart image data.

8. A non-transitory computer-readable storage medium storing an information processing program that, when executed, causes a computer to execute: a generator configured to generate test chart image data for causing a printing apparatus to print a test chart image including a plurality of braille patches including a first braille patch and a second braille patch; and a transmitter configured to transmit the test chart image data to the printing apparatus, wherein the generator is configured to cause a first parameter related to a first dot included in the first braille patch to differ from a second parameter related to a second dot included in the second braille patch.

9. A test chart comprising: a first braille patch; and a second braille patch, wherein a first shape of a first dot included in the first braille patch differs from a second shape of a second dot included in the second braille patch.