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STORAGE MEDIUM, CONTROL METHOD, AND PRINTING SYSTEM

Abstract

The present invention is directed to a non-transitory computer-readable storage medium storing a computer program that extends a function of a generative AI service, the computer program causing a computer of an information processing apparatus to: acquire, from a user terminal, a natural language input related to a print instruction from a user, the print instruction being accepted through the generative AI service; determine a print setting on the basis of the natural language input related to the print instruction; and return the determined print setting to the user terminal.

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Background/Summary

BACKGROUND OF THE INVENTION
Field of the Invention
[0001] The present invention relates to a storage medium, a control method, and a printing system.
Description of the Related Art
[0002] Conversational AI, including chatbots and generative AI, has been developing rapidly in recent years. With this development, a variety of services using conversational AI are being provided. Japanese Patent Laid-Open No. 2019-207513 proposes a printing assistance system that makes print settings in print jobs through a chatbot.
[0003] However, this conventional technique has the following issue. This technique makes print settings by having the chatbot answer a series of questions, but when an instruction other than one for print settings, such as an instruction for the printer to print, is input, the print settings will not be made having accurately (appropriately) interpreted the input text. There is thus a problem in that it is difficult for a computer to automatically send a print job to the printer on the basis of instructions input for a printing instruction.
SUMMARY OF THE INVENTION
[0004] The present invention enables the realization of a system for appropriately determining print settings on the basis of a printing instruction input as natural language.
[0005] One aspect of the present invention provides a non-transitory computer-readable storage medium storing a computer program that extends a function of a generative AI service, the computer program causing a computer of an information processing apparatus to: acquire, from a user terminal, a natural language input related to a print instruction from a user, the print instruction being accepted through the generative AI service; determine a print setting on the basis of the natural language input related to the print instruction; and return the determined print setting to the user terminal.
[0006] Another aspect of the present invention provides a non-transitory computer-readable storage medium storing a computer program that uses a generative AI service, the computer program causing a computer of a user terminal to: accept a natural language input related to a print instruction from a user, through a generative AI interaction region in a settings screen; generate instruction text to the generative AI service on the basis of the natural language input accepted; send the instruction text generated to the generative AI service, and acquire a print setting determined by a plugin that extends a function of the generative AI service; and cause the user to confirm, through the settings screen, the print setting acquired.
[0007] Still another aspect of the present invention provides a control method for an information processing apparatus that extends a function of a generative AI service, the control method comprising: acquiring, from a user terminal, a natural language input related to a print instruction from a user, the print instruction being accepted through the generative AI service; determining a print setting on the basis of the natural language input related to the print instruction; and returning the determined print setting to the user terminal.
[0008] Yet still another aspect of the present invention provides a control method for a user terminal that uses a generative AI service, the control method comprising: accepting a natural language input related to a print instruction from a user, through a generative AI interaction region in a settings screen; generating instruction text to the generative AI service on the basis of the natural language input accepted; sending the instruction text generated to the generative AI service, and acquiring a print setting determined by a plugin that extends a function of the generative AI service; and causing the user to confirm, through the settings screen, the print setting acquired.
[0009] Still yet another aspect of the present invention provides a printing system comprising a

user terminal, a generative AI server that provides a generative AI service, an information processing apparatus that extends a function of the generative AI service, and a printing apparatus, wherein the user terminal includes: one or more first memory devices that store a set of instructions; and one or more first processors that execute the set of instructions to: accept a natural language input related to a print instruction from a user, through a generative AI interaction region in a settings screen; generate instruction text to the generative AI service on the basis of the natural language input accepted; send the instruction text generated to the generative AI service, and acquire a print setting determined by a plugin that extends a function of the generative AI service; and cause the user to confirm, through the settings screen, the print setting acquired, and the information processing apparatus includes: one or more second memory devices that store a set of instructions; and one or more second processors that execute the set of instructions to: acquire the instruction text from the user terminal; determine a print setting on the basis of the natural language input related to the print instruction; and return the determined print setting to the user terminal.
[0010] Further features of the present invention will be apparent from the following description of exemplary embodiments with reference to the attached drawings.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0011] FIG. **1** is a block diagram illustrating an example of the network configuration of a printing system according to one embodiment.
[0012] FIG. **2**A is a block diagram illustrating the hardware configuration of each of apparatuses in the printing system according to one embodiment.
[0013] FIG. **2**B is a block diagram illustrating the hardware configuration of each of apparatuses in the printing system according to one embodiment.
[0014] FIG. **3** is a block diagram illustrating the hardware configuration of a printer according to one embodiment.
[0015] FIG. **4**A is a block diagram illustrating a software configuration related to printing according to one embodiment.
[0016] FIG. **4**B is a block diagram illustrating a software configuration related to printing according to one embodiment.
[0017] FIG. **5**A is a diagram illustrating an example of a printing application according to one embodiment.
[0018] FIG. **5**B is a diagram illustrating an example of a printing application according to one embodiment.
[0019] FIGS. **6**A-**6**B are a diagram illustrating a printing sequence according to one embodiment.
[0020] FIG. **7** is a diagram illustrating an example of instruction text sent to a generative AI server according to one embodiment.
[0021] FIG. **8** is a diagram illustrating print settings saved in a print settings database according to one embodiment.
[0022] FIG. **9** is a flowchart illustrating a processing sequence performed by a generative AI plugin server according to an embodiment.
[0023] FIG. **10** is a flowchart illustrating a processing sequence performed by a computer according to one embodiment.
[0024] FIG. **11** is a flowchart illustrating a processing sequence performed by a computer according to one embodiment.
[0025] FIGS. **12**A-**1** and **12**A-**2** are a diagram illustrating a printing sequence according to one embodiment.
[0026] FIGS. **12**B-**1** and **12**B-**2** are a diagram illustrating a printing sequence according to one

embodiment.
[0027] FIGS. **13**A-**13**B are a diagram illustrating a printing sequence according to one embodiment.

DESCRIPTION OF THE EMBODIMENTS

[0028] Hereinafter, embodiments will be described in detail with reference to the attached drawings. Note, the following embodiments are not intended to limit the scope of the claimed invention. Multiple features are described in the embodiments, but limitation is not made to an invention that requires all such features, and multiple such features may be combined as appropriate. Furthermore, in the attached drawings, the same reference numerals are given to the same or similar configurations, and redundant description thereof is omitted.

First Embodiment

System Configuration

[0029] A first embodiment of the present invention will be described below. First, the network configuration of a printing system according to the present embodiment will be described with reference to FIG. **1**.
[0030] As illustrated in FIG. **1**, a printing system **100** is configured including a computer **110**, which is a terminal apparatus, a printer (printing apparatus) **200** configured to be capable of printing, a generative AI server **300**, and a generative AI plugin server **400**. For example, the computer **110** and the printer **200** are installed in an office, and are communicatively connected to each other over an internal network **500**. The internal network **500** is connected to the external Internet **6000** via a router (not shown). Here, the computer **110** is an example of a user terminal, and the generative AI plugin server **400** is an example of an information processing apparatus.
[0031] The generative AI server **300** is communicatively connected to the computer **110**, the printer **200**, and the generative AI plugin server **400** over the Internet **6000** and the internal network **500**. The generative AI server **300** is a server managed by a business that provides a generative AI service. The generative AI plugin server **400** is communicatively connected to the computer **110**, the printer **200**, and the generative AI server **300** over the Internet **6000** and the internal network **500**. The generative AI plugin server **400** is a server managed by a business that provides a printing service. In the present embodiment, the generative AI server **300**, the generative AI plugin server **400**, and generative AI control (a generative AI interaction region) **1150** on the computer **110** illustrated in FIG. **5** may be collectively referred to as a “generative AI system”. Note that the hardware in which the generative AI server **300**, the generative AI plugin server **400**, and the generative AI control **1150** are located may be separate, or these items may be located on the same hardware in an integrated manner. The internal network **500** may use a wired connection, or may use a wireless connection.

Hardware Configuration

[0032] The hardware configuration of each apparatus of the printing system **100** according to the present embodiment will be described with reference to FIG. **2**A to **3**. FIG. **2**A illustrates the hardware configuration of the computer **110** and the generative AI server **300**. FIG. **2**B illustrates the hardware configuration of the generative AI plugin server **400**. FIG. **3** illustrates the hardware configuration of the printer **200**.
[0033] As illustrated in FIG. **2**A, the computer **110** includes a display unit **101**, an operation unit **102**, a storage unit **103**, a control unit **104**, and a network communication unit **105**, which are communicatively connected to each other. The computer **110** is not particularly limited, and for example, a desktop or laptop personal computer, a tablet terminal, a smartphone, or the like can be used as the computer **110**. The control unit **104** is configured including a Central Processing Unit (CPU) **141** and a memory **142**, and controls the computer **110** as a whole.
[0034] The display unit **101** is constituted by a display such as a liquid crystal panel or the like, for example, and can display images and the like. The operation unit **102** is constituted by a mouse, a keyboard, and the like, for example, and can accept input operations made by a user. The storage

unit **103** is constituted by, for example, a storage medium such as a hard disk, an SSD, or the like, and stores various types of programs (software) and the like necessary for the computer **110** to operate. The programs are loaded into the memory **142** and executed by the CPU **141** as necessary. The programs include programs for causing the CPU **141** to execute the parts and functions of the printing system **100**. Note that these programs are not limited to programs stored in the computer **110**. The programs may be stored in the printer **200**, the generative AI server **300**, or the generative AI plugin server **400**, for example, or may be stored distributed among the computer **110**, the printer **200**, the generative AI server **300**, and the generative AI plugin server **400**. The network communication unit **105** inputs and outputs data with external apparatuses over an external network.

[0035] The generative AI server **300** includes a display unit **301**, an operation unit **302**, a storage unit **303**, a control unit **304**, and a network communication unit **305**, which are communicatively connected to each other. The control unit **304** is configured including a CPU **341**, a memory **342**, and a Graphics Processing Unit (GPU) **343**, and controls the generative AI server **300** as a whole. As described here, the hardware configuration of the generative AI server **300** is similar to the hardware configuration of the computer **110**, and will therefore not be described in detail.

[0036] As illustrated in FIG. **2**B, the hardware configuration of the generative AI plugin server **400** is substantially the same as the hardware configuration of the computer **110**. Accordingly, in the present embodiment, the hardware configurations of the generative AI server **300** and the generative AI plugin server **400** will not be described. Note that it is preferable for the generative AI server **300** to have the GPU **343** and for the generative AI plugin server **400** to have a GPU **443**.

[0037] As illustrated in FIG. **3**, the printer **200** includes a display unit **201**, an operation unit **202**, a storage unit **203**, a control unit **204**, a network communication unit **205**, and a printing unit **206**, which are communicatively connected to each other. As long as a printing function is included, the printer **200** is not particularly limited, and for example, a Multi-Function Printer (MFP), a Single-Function Printer (SFP), or the like can be used. The control unit **204** is configured including a CPU **241** and a memory **242**, and controls the printer **200** as a whole.

[0038] The display unit **201** is constituted by a display such as a liquid crystal panel or the like, for example, and can display images and the like. The operation unit **202** is constituted by a touch panel, various types of buttons, and the like, and can accept input operations made by a user. The storage unit **203** is constituted by, for example, a storage medium such as a hard disk, an SSD, or the like, and stores various types of programs (software) and the like necessary for the printer **200** to operate. The programs are loaded into the memory **242** and executed by the CPU **241** as necessary. The network communication unit **205** inputs and outputs data with external apparatuses over an external network. The printing unit **206** prints digital data stored in the storage unit **203**, the memory **242**, or the like as images on a printing sheet in accordance with instructions from the control unit **204**. The printing method is not particularly limited, and for example, an ink-based method, a toner-based method, or the like can be used.

Software Configuration

[0039] The software configuration of each apparatus of the printing system **100** according to the present embodiment will be described with reference to FIGS. **4**A and **4**B. FIG. **4**A illustrates modules related to printing in the software configuration of the computer **110**. FIG. **4**B illustrates modules related to printing in the software configurations of the generative AI server **300** and the generative AI plugin server **400**.

[0040] As illustrated in FIG. **4**A, the computer **110** includes an application **1100**, a generative AI client **1200**, an assist tool **1300**, and an Operating System (OS) **1400**. The application **1100** includes any desired software, such as security software, spreadsheet software, browser software, and the like, and in the example illustrated in FIG. **4**A, includes a printing application **1110**. The printing application **1110** is an application having a printing function. The printing application **1110** is not particularly limited, and may include, for example, spreadsheet software, browser software,

presentation software, or the like having a printing function.
[0041] When the printing function of the printing application **1110** is executed in response to a user operation, information or the like displayed in the display unit **101** of the computer **110** is sent to the printer **200**, and printing is then performed. The printing function is realized by calling the interface of a Graphic Device Interface (GDI) **1410** (described later). The assist tool **1300** is software that generates a print preview image, operates a printer driver **1420**, and the like using content created using the printing application **1110** and various print settings acquired from a print settings database **4300** (described later).
[0042] The generative AI client **1200** is client software executed by the computer **110**. The generative AI client **1200** receives instruction text created by a user from the printing application **1110**, generates instruction text to be sent to the generative AI server **300**, and sends the instruction text to the generative AI server **300**. Here, the instruction text to be sent is instruction text in which additional instructions have been added to the instruction text from the user.
[0043] The OS **1400** is software that controls the basic operations of the computer **110**. The OS **1400** includes the GDI **1410**, the printer driver **1420**, and a spooler **1430**. The printer driver **1420** is provided by the business that provides the printer **200**. The application **1100**, the printer driver **1420**, and the like are all managed by the OS **1400**, and can be used by being installed in the OS **1400**. The printer driver **1420** is provided by the business that provides the OS **1400**, and may be integrated into the OS **1400** in advance. The GDI **1410** is a component within the OS **1400** that provides an interface related to rendering, such as printing, to the exterior. The printer driver **1420** displays the print settings for printing by the printer **200** in a User Interface (UI). The printer driver **1420** also generates rendering data (Page Description Language (PDL)) that can be interpreted by the printer **200** when printing. The spooler **1430** performs processing for sending PDL generated by the printer driver **1420** to the printer **200**. Although a configuration using Microsoft (registered trademark) Windows (registered trademark) as the OS is described here, a different OS may be used as the OS **1400**. The print data received by the printer driver **1420** from the printing application **1110** may not only be data in GDI format, but also data in XML Paper Specification format (data in XPS format).
[0044] As illustrated in FIG. **4**B, the generative AI server **300** includes an application **3100**, an organization information database **3500**, and an OS **3400**. Note that the OS **3400** has substantially the same software configuration as the OS **1400**, and thus the OS **3400** will not be described here. The application **3100** includes any desired software, and in the example illustrated in FIG. **4**B, includes a generative AI application **3110**. The generative AI application **3110** is an application having a generative AI interpretation processing function. The generative AI application **3110** interprets instruction text from a user sent from the generative AI client **1200**, and determines a response to the instruction text. The generative AI application **3110** also determines, in accordance with the instruction text provided, whether a plugin needs to be called, as well as the plugin to be called to implement the instructed operation. The generative AI application **3110** further inputs information regarding the instruction text sent from the generative AI client **1200** to the called plugin. “Plugin” referred to here is a generative AI plugin **4100** (described later). The organization information database **3500** is a database referred to by the generative AI application **3110**. Various types of content, such as spreadsheet files, presentation files, and the like, created within an organization that can use the generative AI application **3110** are stored in the organization information database **3500**. The generative AI application **3110** can refer to the information of files saved in the organization information database **3500** in response to the instruction text from a user.
[0045] The generative AI plugin server **400** includes the generative AI plugin **4100**, print settings generative AI **4200**, the print settings database **4300**, a model information database **4500**, a print history database **4600**, and an OS **4400**. Note that the OS **4400** has substantially the same software configuration as the OS **1400**, and thus the OS **4400** will not be described here. The generative AI plugin **4100** is any desired software associated with the generative AI application **3110**, and is

called from the generative AI application **3110**. The generative AI plugin **4100** inputs the instruction text received from the generative AI application **3110** into the print settings generative AI **4200**, and returns a result of that processing to the generative AI application **3110**. One or more generative AI plugins **4100** are present in the generative AI plugin server **400**. The model information database **4500** is a database referred to by the generative AI plugin **4100**. Model-specific information, such as the paper size, paper type, and the like that can be used in each model of printer, device configuration information, or the like, is stored in the model information database **4500**. By referring to the model information database **4500**, the generative AI plugin **4100** can input information dependent on the model of the printer into the print settings generative AI **4200**. The print history database **4600** is a database referred to by the generative AI plugin **4100**. A combination of print settings used for printing up to that point is stored in the print history database **4600** on a user-by-user basis. By the generative AI plugin **4100** referring to the print history database **4600**, the user can input the information of print settings used for printing up to that point into the print settings generative AI **4200**.

[0046] The generative AI application **3110** determines the generative AI plugin **4100** to be called in accordance with a result of processing for interpreting natural language which is input. For example, the generative AI application **3110** determines that a generative AI plugin X is to be called when the result of the interpretation processing is determined to be content related to changing the print settings, that a generative AI plugin Y is to be called when the result is determined to be content related to executing the print settings, and the like. The print settings generative AI **4200** is a language model constructed using big data, including text data, and a deep learning technique. The print settings generative AI **4200** determines the optimal combination of print settings for achieving the printing desired by the user included in the instruction text that has been input.

[0047] The print settings database **4300** is a database that records information specifying the computer that sent instruction text in association with the combination of print settings determined by the print settings generative AI **4200**.

Example of Settings Screen

[0048] A screen **1111** displayed on the display unit **101** by the printing application **1110** according to the present embodiment will be described with reference to FIG. **5**A. An output condition instruction including printing conditions and the like used when printing using the printer **200** can be input in the screen **1111** displayed on the display unit **101** by the printing application **1110**. In this manner, in the present embodiment, the printing application **1110** also functions as input means for inputting an output condition.

[0049] The screen **1111** includes, as the printing conditions, a printer selection control **1120**, a print settings control **1130**, a printer driver control **1140**, a generative AI control **1150**, a print button **1161**, and a preview display button **1162**. Note that other output conditions for these printing conditions may be included in the screen **1111**. For example, if the printer **200** is configured to be capable of stapling, stapling conditions for setting the position, number, and the like of the staples may be included. Additionally, if the printer **200** is configured to be capable of cutting processing, cutting conditions for setting the position of the cut and the like may be included. The print button **1161** and the preview display button **1162** are examples of operation objects, and are operated to perform printing and a preview display, respectively.

[0050] In the printer selection control **1120**, a list of printers that can be used by the computer **110**, i.e., that can receive print jobs from the computer **110**, is displayed in a UI on the basis of the printer data stored in the storage unit **103** in advance. The user can select the printer **200** to which a print job is to be sent by operating the printer selection control **1120**. In FIG. **5**A, the name of the printer **200** is “CCC Printer”.

[0051] The print settings control **1130** is a setting region for making the print settings, and includes a copy number control **1131**, an orientation control **1132**, a color mode control **1133**, and a layout

control **1134**. The copy number control **1131** is an item for setting the number of copies to be printed. In FIG. **5**A, the copy number control **1131** is set to "1". The orientation control **1132** is an item for selecting the orientation of the sheet for printing. In the present embodiment, "portrait", in which the orientation for printing is set to the vertical direction, and "landscape", in which the orientation for printing is set to the horizontal direction, can be selected. In FIG. **5**A, the orientation control **1132** is set to "portrait". The color mode control **1133** is an item for selecting "color", for setting color printing, or "black and white", for setting black and white printing. In FIG. **5**A, the color mode control **1133** is set to "color". Note that the print settings control **1130** is not limited to including the copy number control **1131** to the color mode control **1133**, and it is sufficient for at least one of these items to be included. The print settings control **1130** may also include other setting items, such as an item for selecting the paper size, an item for selecting single-sided printing or double-sided printing, an item for selecting the number of pages per sheet, and the like. The layout control **1134** is an item for selecting the document pages to be printed on each sheet in layout printing. The layout control **1134** has setting values such as "1 in 1", for laying out and printing one document page per sheet, "2 in 1", for laying out and printing two document pages per sheet, and "4 in 1", for laying out and printing four document pages per sheet. In FIG. **5**A, the layout control **1134** is set to "4 in 1". If the user intends to save paper when printing, setting the setting value of the layout control **1134** makes it possible to obtain a printed product according to those intentions.

[0052] When operated by the user, the printer driver control **1140** displays an advanced print settings screen provided by the printer driver corresponding to the "CCC Printer" displayed in the printer selection control **1120**. Through this, the user can make detailed changes to the print setting values in the print settings screen of the printer driver. Then, when the print settings screen of the printer driver is closed, the content of the changes to the print setting values in the print settings screen are stored in the storage unit **103**.

[0053] The generative AI control **1150** includes a chat display region **1151**, an instruction input part **1152**, and an execute button **1153**. The printing application **1110** displays instruction text (natural language) input by the user, text corresponding to processing results received from the generative AI server **300**, and the like in the chat display region **1151** in an interactive format. Through the instruction input part **1152**, the printing application **1110** provides a function for inputting desired instructions representing processing details. The user can input the instructions through the operation unit **102**, which is a keyboard and the like, for example. Alternatively, speech spoken by the user may be accepted as audio input through a microphone (not shown). In FIG. **5**A, instruction text "print while saving paper" is input in the instruction input part **1152** in Japanese. Note that the text input into the instruction input part **1152** is not limited to text for changing the setting value for layout printing, and can be any desired text, such as, for example, changing the color mode, enlarging or reducing the printing range, or the like. The execute button **1153** is a button for sending an instruction including the instructions input to the instruction input part **1152** to the generative AI server **300**. It is also desirable to reflect the determined print settings, e.g., "4 in 1", in the layout control **1134**, which is the corresponding control, in accordance with the instruction text input to the instruction input part **1152**, as illustrated in FIG. **5**A. In other words, although each control for the print settings can be set according to the user input, settings made in accordance with interactions with the generative AI control **1150** may be reflected as well.

Preview Display

[0054] A preview display displayed on the display unit **101** by the assist tool **1300** according to the present embodiment will be described with reference to FIG. **5**B. When the print button **1161** in the screen **1111** is operated, the printing application **1110** sends the print job to the printer **200** on the basis of the print settings specified in the print settings control **1130**, without displaying a print preview image display UI **1170**. However, when the preview display button **1162** in the screen **1111** is operated, the printing application **1110** displays the print preview image display UI **1170**

provided by the assist tool **1300**.

[0055] The print preview image display UI **1170** includes a print preview display region **1171** and a print button **1172**. The assist tool **1300** displays a printing result preview image in the print preview display region **1171** on the basis of the print settings determined by the print settings generative AI **4200** and the content created by the printing application **1110**. This enables the user to confirm the printed product to be printed by the printer **200** before the printed product is actually output. When the print button **1172** is operated, the printing application **1110** starts print job sending processing for the content displayed in the print preview image display UI **1170**. As such, the print button **1172** is an example of an operation object.

Sequence

[0056] A sequence of processing performed among the elements constituting the computer **110**, the generative AI server **300**, and the generative AI plugin server **400** according to the present embodiment will be described next with reference to FIGS. **6**A-**6**B. The numbers following "S" hereinafter indicate step numbers in the sequence.

[0057] In step S**601**, the printing application **1110** creates content to be printed in accordance with operation instructions made by the user. Presentation slides, documents, charts, graphs, and the like can be given as examples of the content. After the content has been created, in step S**602**, the printing application **1110** accepts an instruction from the user, and in step S**603**, displays the print settings screen **1111** on the display unit **101**. Next, in step S**604**, the printing application **1110** accepts a print instruction for performing desired printing using natural language through the instruction input part **1152** in the print settings screen **1111**. An example of the printing instruction is an instruction that includes conditions for printing, such as "print while saving as much paper as possible". In step S**605**, the printing application **1110** inputs the print instruction input by the user, the IP address of the computer **110**, the printer name (print queue name) selected as the destination for sending the print job, and the like to the generative AI client **1200**. In this manner, the printing application **1110** inputs the IP address, which is identification information of the apparatus (the user terminal) that requested the print instruction through the print settings screen **1111**, and the name (the printer name), which is identification information of the selected printing apparatus, along with the natural language input.

[0058] Upon receiving the print instruction, in step S**606**, the generative AI client **1200** generates instruction text to be sent to the generative AI server **300** using the received information. The IP address of the computer **110** for specifying the source of the instruction text, the printer name selected in the print settings screen **1111** as the destination for sending the print job, and the like are added to the instruction text as additional information, in addition to the print instruction input by the user. The instruction text to be sent to the generative AI server **300** will be described later with reference to the specific example illustrated in FIG. **7**. Next, in step S**607**, the generative AI client **1200** sends the generated instruction text to the generative AI application **3110** of the generative AI server **300**.

[0059] Upon receiving the instruction text, in step S**608**, the generative AI application **3110** interprets the content of the instruction text and determines the generative AI plugin **4100** to be called. Then, in step S**609**, the generative AI application **3110** inputs the instruction text received from the generative AI client **1200** to the generative AI plugin determined.

[0060] Upon receiving the instruction text, in step S**610**, the generative AI plugin **4100** inputs the received instruction text to the print settings generative AI **4200**. In step S**611**, the print settings generative AI **4200** determines an optimal combination of print settings for obtaining the output result desired by the user by interpreting the print instruction from the user included in the instruction text. Note that the print settings that can be set differ depending on the type of the printer **200**. The print settings generative AI **4200** may be configured to determine the print settings that can be set by the printer **200** specified by the printer name to which the print job is sent, included in the instruction text received in step S**609**, by referring to a print settings function

database (not shown). Furthermore, in step S**611**, the print settings generative AI **4200** may determine the combination of the print settings on the basis of the determined print settings that can be set and the instruction text. Such a configuration makes it possible for the print settings generative AI **4200** to determine print settings that can be designated by the printer **200**. Next, in step S**612**, the print settings generative AI **4200** returns the determined combination of print settings to the generative AI plugin as a determination result.

[0061] Upon receiving this response, in step S**613**, the generative AI plugin **4100** records the combination of the print settings included in the response, the IP address of the computer **110** included in the instruction text received in step S**609**, and the printer name in association with each other in the print settings database **4300**. A specific example of the information recorded in the print settings database will be described later with reference to FIG. **8**. Next, in step S**615**, the generative AI plugin **4100** returns the response received in step S**612** to the generative AI application **3110** as a result of the processing performed in step S**609**.

[0062] Then, in step S**616**, the generative AI application **3110** returns the processing result received in step S**615** to the generative AI client **1200** as a result of the processing performed in step S**607**. Next, in step S**617**, the generative AI client **1200** generates response text for the printing application **1110** from the received processing result. The response text is text explaining the combination of print settings determined by the print settings generative AI **4200** in step S**611** to the user using natural language, and is displayed in the generative AI control **1150**. In step S**618**, the generative AI client **1200** responds to the printing application **1110** using the response text generated as a result of the processing performed in step S**605**.

[0063] In step S**619**, the printing application **1110** displays the received response text to the user. The details of the applied print settings (“4 in 1 has been set”), a message confirming whether to execute the print, a button enabling the user to specify whether to execute the print thereafter, and the like, as illustrated in the chat display region **1151**, can be given as an example of the display of the response text. Additionally, in step S**612**, the print settings generative AI **4200** may return information that displays a button enabling one or more print settings to be specified, such that the user can additionally specify desired print settings.

[0064] In step S**620**, the printing application **1110** accepts a user operation of the preview display button provided in the print settings screen **1111**. When the preview display button is operated, in step S**621**, the printing application **1110** launches the assist tool **1300** and issues a preview image display instruction. Here, the instruction in step S**621** includes information for specifying print settings to be acquired from the print settings database **4300**. This information includes the IP address of the computer **110**, the printer name designated as the destination to which the print job is to be sent, and information on the location (a file path name) where the content to be printed, which is used for generating the print preview image, is stored.

[0065] Upon receiving the stated instruction, in step S**622**, the assist tool **1300** accesses the print settings database **4300** and instructs the combination of print settings to be used for the preview display to be acquired. Here, the instruction in step S**622** includes the IP address of the computer **110** and the printer name designated as the destination to which the print job is to be sent as information for specifying the print settings to be acquired. Having received the instruction, the print settings database **4300** acquires the combination of print settings recorded in association with the IP address and the printer name included in the instruction in step S**623**. Then, in step S**624**, the print settings database **4300** returns the acquired combination of print settings to the assist tool **1300**.

[0066] In step S**625**, the assist tool **1300** instructs the spooler **1430** to apply the acquired combination of print settings in the printer driver **1420**. Having received the instruction, in step S**626**, the spooler **1430** instructs the printer driver **1420** associated with the printer set as the destination for sending the print job to apply the various print settings. Having received the instruction, in step S**627**, the printer driver **1420** applies the various print settings that have been

designated, and in S**628**, returns the result of that processing to the spooler **1430**. Having received the processing result from the printer driver **1420**, in step S**629**, the spooler **1430** returns that processing result to the assist tool **1300**.

[0067] Next, in step S**630**, the assist tool **1300** acquires the content to be printed on the basis of the information on the location where the content to be printed is stored, received in step S**621**. Note that the assist tool **1300** may acquire the information on the location where the content to be printed is stored from the print settings database **4300** rather than from the printing application **1110**. Alternatively, the assist tool **1300** may acquire the content to be printed itself from the print settings database **4300**. In these cases, the information on the location where the content to be printed is stored, or the content to be printed itself, is specified by the printing application **1110** or the generative AI client **1200**, and as a result, the information is included in the instruction text in step S**607**.

[0068] Next, in step S**631**, the assist tool **1300** generates a print preview image on the basis of the content to be printed, acquired in step S**630**, and the combination of the print settings, acquired in step S**624**. Then, in step S**632**, the assist tool **1300** displays the generated print preview image to the user. The print preview image is displayed in the print preview display screen displayed by the assist tool **1300**. Then, in step S**633**, the assist tool **1300** accepts an instruction to execute the print job, made by the user who has confirmed the print preview image operating the print button on the print preview display screen. Having received the instruction to execute the print job, the assist tool **1300** instructs the spooler **1430** to execute the print job in step S**634**. Then, in step S**635**, the spooler **1430** instructs the printer driver **1420** to execute the printing processing. Having received the instruction to execute the printing processing, the printer driver **1420** generates the print job on the basis of the instruction in step S**636**, and sends the generated print job to the printer in step S**637**. Having received the print job, the printer executes the printing processing in accordance with the details of the print job in step S**638**, after which the sequence ends.

Example of Instruction Text

[0069] An example of the instruction text sent to the generative AI server **300** in step S**606** will be described next with reference to FIG. **7**. The instruction text includes the information indicated by **701** to **705**. **701** indicates the print instruction input by the user to the instruction input part **1152** in step S**604**. **702** indicates the printer name set as the printer to which the print job is to be sent in the printer selection control **1120**. **703** indicates the IP address of the computer **110**. **704** indicates the details of the instructions to the generative AI application **3110**. Specifically, the details of the instructions inquire about the combination of print settings in accordance with the instruction text from the user. **705** indicates user identification information for identifying the user who input the instruction text. Note that **702**, **703**, **704**, and **705** are not details explicitly input to the instruction input part **1152**, but are rather sentences automatically added by the generative AI client **1200**. The generative AI application **3110** determines the plugin to be called by interpreting the content of this instruction text.

Print Settings

[0070] The print settings stored in the print settings database **4300** according to the present embodiment will be described with reference to FIG. **8**. A combination of print settings pertaining to paper size **803**, paper type **804**, layout **805**, and color mode **806** is stored in the database using an IP address **801** and a printer name **802** as keys. The assist tool **1300** can specify a combination of print settings to be acquired, which are stored in the database, using the IP address of the computer **110** and the printer name set as the destination for sending the print job as keys. Note that the print settings illustrated in FIG. **8** are merely examples, and are not intended to limit the present invention. Other desired print settings can be combined instead of or in addition to these print settings.

Processing Sequence by Print Setting Generative AI

[0071] A processing sequence by the print settings generative AI **4200**, executed by the generative

AI plugin server **400** according to the present embodiment, will be described next with reference to FIG. **9**. The processing described hereinafter is realized, for example, by a CPU **441** of the generative AI plugin server **400** reading out a program stored in a storage unit **403** into a memory **442** and executing the program.

[0072] In step S**101**, the CPU **441** acquires the instruction text generated from the user instructions input in the computer **110** via the generative AI server **300**. The instruction text includes a print instruction from the user, the IP address of the computer **110** specifying the source of the instruction text, and the printer name of the printer to which the instruction text is to be sent, as illustrated in FIG. **7**. In step S**102**, the CPU **441** acquires the printer name from the received instruction text.

[0073] In step S**103**, the CPU **441** interprets the instruction text. Specifically, the CPU **441** interprets the instruction details **704** and the print instruction **701** from the user, illustrated in FIG. **7**. For example, here, keywords related to the print settings are extracted from the instruction details, and the keywords are used as search keys when acquiring the combination of the print settings. Next, in step S**104**, the CPU **441** searches for print settings that can be designated from the print settings database **4300** using the printer name acquired in step S**102** and the search keywords extracted in step S**103**, and in step S**105**, determines the combination of the print settings found in the search.

[0074] In step S**106**, the CPU **441** returns the result of the processing to the generative AI server **300**. Furthermore, in step S**107**, the CPU **441** records the determined combination of print settings in the print settings database **4300** in association with the IP address of the computer **110** and the printer name, after which the processing of this flowchart ends.

Processing Sequence by User Terminal

[0075] A processing sequence by the computer (user terminal) **110** according to the present embodiment will be described next with reference to FIG. **10**. The processing described hereinafter is realized, for example, by the CPU **141** of the computer **110** reading out a program stored in the storage unit **103** into the memory **142** and executing that program.

[0076] First, in step S**201**, the CPU **141** displays the print settings screen **1111** on the display unit **101** in response to an instruction from the printing application **1110**. In step S**202**, the CPU **141** determines whether natural language input has been received from the user through the generative AI control (generative AI interaction region) **1150** of the print settings screen **1111**. The sequence moves to step S**203** if natural language input has been received, and to step S**206** if not.

[0077] In step S**203**, the CPU **141** generates instruction text, such as that illustrated in FIG. **7**, on the basis of the natural language input received and printing apparatus selection information and the like. Next, in step S**204**, the CPU **141** acquires the print settings determined by the generative AI plugin server **400** by inputting the generated instruction text into the generative AI server **300**. Then, in step S**205**, the CPU **141** confirms the acquired print settings with the user through the print settings screen **1111**. Here, as illustrated in FIG. **5**A, an inquiry as to whether to execute the print may be made along with the confirmation that the print settings determined in the generative AI control **1150** of the print settings screen **1111** (e.g., 4 in 1) have been set. Additionally, in the print settings screen **1111**, the CPU **141** updates the details of the print settings control **1130** in accordance with the acquired print settings.

[0078] Then, in step S**206**, the CPU **141** determines whether a print instruction has been received. Here, the print instruction corresponds to the print button **1161** being operated, or a print instruction received through the generative AI control **1150**. If a print instruction has been received, the sequence moves to step S**207**, and if not, the sequence moves to step S**208**. In step S**207**, the CPU **141** causes the selected printing apparatus to execute the print through the printer driver **1420**, after which the processing of the flowchart ends.

[0079] On the other hand, in step S**208**, the CPU **141** determines whether a preview display has been received as a result of the preview display button **1162** being operated. If the preview display

has been received, the sequence moves to step S**209**, and if not, the processing of the flowchart ends. In step S**209**, the CPU **141** performs the preview display, after which the processing of the flowchart ends. The preview display will be described in detail with reference to FIG. **11**.

Preview Display

[0080] A processing sequence for the preview display, performed in step S**209**, will be described in detail with reference to FIG. **11**. A preview display function of the assist tool **1300** will be described here. The assist tool **1300** is an example of display control means. The processing described hereinafter is realized, for example, by the CPU **141** of the computer **110** reading out a program stored in the storage unit **103** into the memory **142** and executing that program.

[0081] In step S**301**, the CPU **141** receives an instruction to display the preview image through the printing application **1110**, and the assist tool **1300** is launched. Specifically, when the preview display button **1162** in the screen **1111** is operated, the CPU **141** determines that an instruction to display the preview image has been received, and launches the assist tool **1300**. The processing thereafter is performed by the assist tool **1300**. Next, in step S**302**, the CPU **141** accesses the print settings database **4300** and acquires the print settings of the print job. The print settings acquired here correspond to the print settings recorded in the aforementioned step S**107**. In step S**303**, the CPU **141** instructs the acquired combination of print settings to be applied in the printer driver **1420**.

[0082] In step S**304**, the CPU **141** acquires the content included in the preview display instruction. For example, the preview display instruction need not include the content data itself, and in this case, information on the location where the content data is stored is included instead. The location where the content data is stored may be the computer **110**, or the print settings database **4300** of the generative AI plugin server **400**. Note that when data stored in the database is used as the content data, the information regarding the storage location is included in the instruction text.

[0083] In step S**305**, the CPU **141** generates a print preview image from the content data on the basis of the print settings, and displays the generated print preview image to the user through the printing application or the like. In step S**307**, the CPU **141** determines whether a print instruction has been received through the preview image display screen, and if a print instruction has been received, the sequence moves to step S**308**. In step S**308**, the CPU **141** instructs the printer driver **1420** to execute the print, after which the processing of the flowchart ends.

[0084] As described above, a printing system according to the present embodiment is configured including a user terminal, a generative AI server that provides a generative AI service, an information processing apparatus that extends a function of the generative AI service, and a printing apparatus. In particular, the user terminal accepts a natural language input related to a print instruction from a user through a generative AI interaction region of a settings screen, and generates instruction text to the generative AI service on the basis of the natural language input accepted. Additionally, the user terminal sends the generated instruction text to the generative AI service, acquires a print settings determined by a plugin that extends a function of the generative AI service, and causes the user to confirm the acquired print setting through the settings screen. In addition, the information processing apparatus acquires the instruction text from the user terminal, determines the print setting on the basis of the natural language input related to the print instruction, and returns the determined print setting to the user terminal. In this manner, according to the present embodiment, optimal print settings can be automatically determined by a print setting generative AI interpreting a print instruction made by a user using natural language. In addition, the generative AI plugin server **400** provided by the business that provides the printer **200** determines the print settings, and thus print settings can be determined which fully utilize the printing capabilities that can be specified in the printer **200**. Furthermore, in the present embodiment, acquiring the print settings determined by the assist tool and the content to be printed makes it possible to print using the print settings determined automatically.

[0085] The present invention is not intended to be limited to the foregoing embodiment, and many

variations and changes can be made within the scope thereof. The present invention can also be realized as a process executed by supplying a program implementing one or more functions of the foregoing embodiment to a system or apparatus over a network or by a storage medium and then causing one or more processors of a computer of the system or apparatus to read out and execute the program. The present invention can also be implemented by a circuit (for example, an ASIC) for implementing one or more functions.

[0086] Additionally, in the foregoing embodiment, the computer **110** includes an operation unit for inputting the output conditions of the printer **200**. However, the present invention is not limited thereto, and it is sufficient for at least one apparatus among the computer **110**, the generative AI server **300**, the generative AI plugin server **400**, and the printer **200** to include the operation unit. The operation unit may be displayed in the UI of a browser such as Microsoft (registered trademark) Edge or Google (registered trademark) Chrome. The operation unit may also be displayed in the UI of a generative application UI such as ChatGPT, the UI of a printing application such as Microsoft (registered trademark) Office, or the UI of a chat application such as Microsoft Teams.

[0087] Additionally, although the foregoing embodiment describes print settings provided in a standard printer driver **1420**, such as the number of copies, the orientation, the layout, and the like, the present invention is not limited thereto. The presence or absence of functions, such as staple settings, binding settings, or the like, may differ depending on the printer **200**. In this case too, performing processing such as acquiring device information of the printer **200** in advance makes it possible to automatically set the print settings as described in the foregoing embodiment.

[0088] Additionally, it is conceivable that in the foregoing embodiment, the print settings data stored in the storage unit may actually have different data formats for sending and receiving, such as PrintTicket, devmode, or the like, due to differences in the OS **1400** and the printer driver **1420** or the like. The present invention can also be applied when sending and receiving a variety of data formats in such a manner. Furthermore, the foregoing embodiment assumes that the printer driver **1420** sends the print job to the printer **200** connected to the same internal network **500** as the computer **110** in step S**637**. However, the present invention is not limited thereto. For example, the configuration may be such that in step S**637**, the printer driver **1420** uploads the print job to a printing service in the cloud, and the print job is then printed by a printer connected to a different network from the computer **110** via the cloud.

[0089] Additionally, there are cases in the printing system **100** where, for example, the generative AI server **300** (called a “server” hereinafter) is located outside of Japan and the computer **110**, which is a terminal apparatus (and will be called a “terminal apparatus” hereinafter) is located inside Japan. In this case as well, each file and item of data is sent from the server to the terminal device, and the terminal device can receive each file and item of data. In this manner, even if the server is located outside of Japan, files and data are sent and received (exchanged) in an integrated manner in the system. Because the system functions by the terminal apparatus located in Japan receiving each file and item of data, the sending and receiving can be considered to have been performed inside Japan. For example, in this system, even if the server is located outside Japan and the terminal apparatus is located inside Japan, the terminal apparatus can perform the main functions of the system, and the effects of those functions can be expressed inside Japan. For example, even if the server is located outside Japan, if the terminal apparatus constituting the system is located inside Japan, the system can be used domestically by using the terminal apparatus. The use of this system can affect the economic interests of the patent holder, for example.

[0090] Additionally, the foregoing embodiment describes a method in which the content is created by the printing application **1110**. However, the present invention is not limited thereto, and rather than the printing application **1110** creating the content, content stored in the storage unit **103** of the computer **110** may be imported, for example, or content may be imported from an external storage

apparatus such as a USB drive or an SD card.
[0091] Additionally, although the present embodiment describes the printing application **1110** and the generative AI client **1200** as separate configurations, the processing of the generative AI client **1200** may be included in the printing application **1110**. Additionally, although the foregoing embodiment described the assist tool **1300** as being launched in response to a preview screen display instruction from the printing application **1110**, the configuration is not limited thereto. For example, the tool may be automatically launched when the OS is started up, and may run in the background in the computer **110**. In this case, the assist tool **1300** periodically accesses the print settings database **4300** to acquire the newest print settings registered in the database, and displays the print preview image by acquiring the content for which the print preview is to be displayed through any desired method. Additionally, the assist tool **1300** may be configured to automatically display the print preview image display UI **1170** upon the print settings being successfully acquired. Additionally, although the foregoing embodiment described the assist tool **1300** as generating the print preview image, the print preview image may be generated by a different program having a print preview image generation function.
[0092] Additionally, although the foregoing embodiment described the processing for acquiring the print setting information from the print settings database **4300** by the assist tool **1300** as being completed through a single instance of processing, the configuration is not limited thereto. For example, if the desired information cannot be acquired from the print settings database **4300**, the print settings acquisition processing may be repeated for a set period of time. Additionally, the foregoing embodiment described using the IP address as the information for specifying the computer **110**, recorded in the print settings database **4300** in association with the combination of the print settings. However, the present invention is not limited thereto, and information aside from the IP address may be used as long as that information can uniquely identify the computer **110**. For example, a MAC address or an ID for uniquely identifying the computer **110** generated by an internal process of the assist tool **1300** may be used, and the value thereof may be associated with the print settings. Additionally, although the foregoing embodiment described recording the paper size, paper type, layout, and color mode information as items of the print settings stored in the print settings database **4300**, other information may be recorded as well. For example, the printing quality, printing direction, whether to apply stapling, paper feed port settings, and other items related to printing may be recorded.
Second Embodiment
[0093] A second embodiment of the present invention will be described hereinafter. In the present embodiment, configurations identical to those in the foregoing first embodiment will be given the same reference signs, and will not be described. A sequence of processing performed among the elements constituting the computer **110**, the generative AI server **300**, and the generative AI plugin server **400** according to the present embodiment will be described next with reference to FIGS. **12**A-**1** to **12**B-**2**. The numbers following “S” hereinafter indicate step numbers in the sequence.
[0094] In step S**1201**, the printing application **1110** creates desired content in accordance with operation instructions made by the user. Presentation slides, documents, charts, graphs, and the like can be given as examples of the content. After the content has been created, in step S**1202**, the printing application **1110** accepts an instruction from the user, and in step S**1203**, displays the print settings screen **1111** on the display unit **101**. Next, in step S**1204**, the printing application **1110** accepts a print instruction for performing desired printing using natural language through the instruction input part **1152** in the print settings screen **1111**. An example of the printing instruction is an instruction including conditions used when printing, such as “print the document created yesterday, within 10 pages, and print as material for distribution, with the usual settings”, and the content to be printed (which may be different from content currently being created). In step S**1205**, the printing application **1110** inputs the print instruction input by the user, the IP address of the computer **110**, the printer name (print queue name) selected as the destination for sending the print

job, and the like to the generative AI client **1200**.
[0095] Upon receiving the print instruction, in step S**1206**, the generative AI client **1200** generates instruction text to be sent to the generative AI server **300** using the received information. The IP address of the computer **110** for specifying the source of the instruction text, the printer name selected in the print settings screen **1111** as the destination for sending the print job, and the like are added to the instruction text as additional information, in addition to the print instruction input by the user. Next, in step S**1207**, the generative AI client **1200** sends the generated instruction text to the generative AI application **3110** of the generative AI server **300**.
[0096] Upon receiving the instruction text, in step S**1208**, the generative AI application **3110** interprets the content of the instruction text and determines the generative AI plugin **4100** to be called and data to be referenced. In the present embodiment, the user specifies “the document created yesterday” as the file to be printed. Accordingly, in steps S**1209** and S**1210**, the generative AI application **3110** refers to the organization information database **3500** as the data to be referenced, and acquires information on the corresponding file. A URL indicating the storage destination of the file to be printed can be given as an example of the information acquired here. Then, in step S**1211**, the generative AI application **3110** inputs the instruction text to the determined generative AI plugin having the information on the file to be printed, acquired in step S**1210**, to the instruction text received from the generative AI client **1200**.
[0097] Upon receiving the instruction text, in steps S**1212** and S**1213**, the generative AI plugin **4100** uses the printer name selected as the destination for sending the print job included in the received instruction text as a key, and acquires model-specific information corresponding thereto from the model information database **4500**. The model-specific information acquired includes a list of paper sizes that can be used in the corresponding model, post-processing that can be used (stapling), and information on whether layout printing can be used. Next, in steps S**1214** and S**1215**, the generative AI plugin **4100** uses the user identification information **705** included in the received instruction text as a key, and acquires print history information of printing executed by the user who made the print instruction from the print history database **4600**. The print history information acquired includes information on combinations of the print settings set during printing in the past (e.g., the paper size, whether layout printing was used, the post-processing information used, and the like).
[0098] Then, in step S**1216**, the generative AI plugin **4100** inputs, to the print settings generative AI **4200**, instruction text to which the information acquired in steps S**1213** and S**1215** has been added. In step S**1217**, the print settings generative AI **4200** determines an optimal combination of print settings for obtaining the output result desired by the user by interpreting the various types of information included in the instruction text and the content to be printed. Next, in step S**1218**, the print settings generative AI **4200** returns the determined combination of print settings to the generative AI plugin as a determination result.
[0099] Upon receiving this response, in steps S**1219** and S**1220**, the generative AI plugin **4100** records the combination of the print settings included in the response, the IP address of the computer **110** included in the instruction text received in step S**1211**, and the printer name in association with each other in the print settings database **4300**. Furthermore, in steps S**1221** and S**1222**, the generative AI plugin **4100** records the combination of print settings included in the response in the print history database in association with the user identification information **705**. Next, in step S**1223**, the generative AI plugin **4100** returns the response received in step S**1218** to the generative AI application **3110** as a result of the processing performed in step S**1211**. The subsequent processing of steps S**1224** to S**1246** is the same as that of steps S**616** to S**638**, and will therefore not be described here.
[0100] As described above, according to the present embodiment, optimal print settings can be automatically determined by the print setting generative AI interpreting information acquired from the organization information database **3500**, the model information database **4500**, and the print

history database, in addition to a print instruction made by a user using natural language. For example, even when the user has instructed the printing of content different from the content being created by the printing application **1110**, a print instruction for content created in the past can be made by referring to the information recorded in the organization information database **3500**. Furthermore, by inputting the information recorded in the model information database **4500** to the print settings generative AI **4200**, the print settings generative AI **4200** can estimate the optimal print settings after understanding information unique to the printer to which the print job is to be sent. Furthermore, by inputting the information recorded in the print history database **4600** to the print settings generative AI **4200**, the optimal print settings can be estimated having understood the print settings information used by the user in the past.

[0101] Although the present embodiment described a sequence in which information acquired from the model information database **4500**, the print history database **4600**, and the like is always added as input information to the print settings generative AI **4200**, the method for determining the information to be input to the print settings generative AI **4200** is not limited thereto. For example, the generative AI plugin **4100** may acquire the information from the various databases having first determined whether to use the information in the model information database **4500**, the print history database, and the like by inputting the instruction text input by the user to the print settings generative AI.

[0102] Additionally, although the organization information database **3500**, the model information database **4500**, and the print history database **4600** have been described as configurations provided in the generative AI server **300** and the generative AI plugin server **400**, another configuration may be used instead. For example, the organization information database **3500** may be provided on a server different from the server on which the generative AI application **3100** operates. Likewise, the model information database **4500** and the print history database **4600** may be provided on a server different from the server on which the generative AI plugin **4100** operates.

[0103] Additionally, although the present embodiment described an example in which the generative AI application **3100** acquires content information acquired from the organization information database **3500**, the information acquired is not limited thereto. For example, print settings that an administrator of an organization intends to apply throughout the organization may be registered in the organization information database **3500**. In this case, the generative AI application **3100** can add the print setting information specified by the administrator to the instruction text for the generative AI plugin **4100** by acquiring the print setting information from the organization information database **3500**. Through this, the print settings generative AI **4200** can determine optimal print settings in consideration of the print settings that the administrator of the organization intends to apply throughout the organization.

Third Embodiment

[0104] A third embodiment of the present invention will be described below. A sequence of processing performed among the elements constituting the computer **110**, the generative AI server **300**, and the generative AI plugin server **400** according to the present embodiment will be described next with reference to FIGS. **13**A-**13**B. The numbers following “S” hereinafter indicate step numbers in the sequence.

[0105] In step S**1301**, the printing application **1110** creates content to be printed in accordance with operation instructions made by the user. Presentation slides, documents, charts, graphs, and the like can be given as examples of the content. After the content has been created, in step S**1302**, the printing application **1110** accepts an instruction from the user, and in step S**1303**, displays the print settings screen **1111** on the display unit **101**. Next, in step S**1304**, the printing application **1110** accepts a print instruction for performing desired printing using natural language through the instruction input part **1152** in the print settings screen **1111**. An example of the printing instruction is an instruction that includes conditions for printing, such as “print while saving as much paper as possible”. In step S**1305**, the printing application **1110** inputs the print instruction input by the user,

the IP address of the computer **110**, the printer name (print queue name) selected as the destination for sending the print job, and the like to the generative AI client **1200**.

[0106] Upon receiving the print instruction, in step S**1306**, the generative AI client **1200** generates instruction text to be sent to the generative AI server **300** using the received information. The IP address of the computer **110** for specifying the source of the instruction text, the printer name selected in the print settings screen **1111** as the destination for sending the print job, and the like are added to the instruction text as additional information, in addition to the print instruction input by the user. Next, in step S**1307**, the generative AI client **1200** sends the generated instruction text to the generative AI application **3110** of the generative AI server **300**.

[0107] Upon receiving the instruction text, in step S**1308**, the generative AI application **3110** interprets the content of the instruction text and determines the generative AI plugin **4100** to be called. Next, in step S**1309**, the generative AI application **3110** determines the print settings to be input to the generative AI plugin **4100** by interpreting the details of the instruction text. Then, in step S**1310**, the generative AI application **3110** inputs the instruction text received from the generative AI client **1200** to the generative AI plugin determined. For example, in the present embodiment, the generative AI application **3110** determines that print settings in which a paper size of A4 is selected, double-sided printing is selected, and layout printing is enabled are in effect, in response to an instruction to “print while saving paper”. In the case of such a determination, the information input in step S**1310** includes information on these settings. Upon receiving the print setting information, in step S**1311**, the generative AI plugin **4100** generates a URL for launching the assist tool **1300**. In addition to a character string instructing the assist tool **1300** to start, the URL includes a character string expressing the print settings determined by the generative AI application **3110** in step S**1309**. An example of the generated character string is “assisttool:size=A4&duplex=True&layout=4”. Here, “assisttool:” is a character string instructing the assist tool **1300** to be launched. “size=A4&duplex=True&layout=4” means that the paper size is A4 and double-sided printing is enabled, and furthermore, an instruction to print four pages of content per page (layout printing) has been made. Next, in step S**1312**, the generative AI plugin **4100** returns the URL generated in step S**1311** as a result of the processing performed in step S**1310**.

[0108] Then, in step S**1313**, the generative AI application **3110** returns the processing result received in step S**1313** to the generative AI client **1200** as a result of the processing performed in step S**1307**. Next, in step S**1314**, the generative AI client **1200** generates response text for the printing application **1110** from the received processing result. The response text is text in natural language including the character string instructing the assist tool **1300** to be launched, generated by the generative AI plugin **4100** in step S**1311**, and is displayed in the generative AI control **1150**. In step S**1315**, the generative AI client **1200** responds to the printing application **1110** using the response text generated as a result of the processing performed in step S**1305**. In step S**1316**, the printing application **1110** displays the received response text to the user in the chat display region **1151**. A message prompting the assist tool **1300** to be launched, along with the URL for launching the assist tool **1300** (“please select this URL to launch the assist tool. assisttool:size=A4&duplex=True&layout=4”) can be given as an example of the response text.

[0109] When the user selects the URL for launching the assist tool **1300** displayed in the chat display region **1151** in step S**1317**, the printing application **1110** launches the assist tool **1300**. At this time, the printing application **1110** specifies “size=A4&duplex=True&layout=4”, which is the character string indicating the print setting information included in the URL, in the assist tool **1300**. Furthermore, the printing application **1110** specifies information on the location (the file path name) where the content to be printed is stored as a startup parameter in the assist tool **1300**.

[0110] In step S**1319**, the assist tool **1300** acquires the print setting information from the character string indicating the print setting information input as startup parameters. Specifically, by analyzing “size=A4&duplex=True&layout=4”, information on the paper size, whether double-sided printing

is effective, and whether layout printing is effective is acquired. The paper size being A4 and double-sided printing being enabled, and furthermore, an instruction to print four pages of content per page (layout printing) having been made, can be acquired from the stated character string. The subsequent processing of steps S**1320** to S**1324** is the same as that of steps S**625** to S**629**, and will therefore not be described here. In step S**1325**, the assist tool **1300** acquires the content to be printed on the basis of the information on the location where the content to be printed is stored, received in step S**1318** as one of the startup parameters. The subsequent processing of steps S**1326** to S**1333** is the same as that of steps S**631** to S**638**, and will therefore not be described here.

[0111] As described above, a printing system according to the present embodiment is configured including a user terminal, a generative AI server that provides a generative AI service, an information processing apparatus that extends a function of the generative AI service, and a printing apparatus. According to the present embodiment, optimal print settings can be automatically determined by a generative AI application interpreting a print instruction made by a user using natural language. Through this, a URL for the generative AI plugin **4100** to launch the assist tool **1300**, including the print setting information determined by the generative AI application **3110**, can be created. The URL created by the generative AI plugin **4100** is ultimately presented to the user, and by selecting the URL, the user can print using the print settings determined automatically by the assist tool **1300**. Although the present embodiment described the paper size, whether double-sided printing is enabled, and whether layout printing is enabled as the print setting information included in the URL generated by the generative AI plugin **4100**, the print settings that can be included in the URL are not limited thereto. For example, other print settings such as the paper type, the paper feed port used for printing, and information on the color used for printing (color or black and white) may be included.

[0112] According to the present invention, it is possible to appropriately determine print settings on the basis of a printing instruction input as natural language.

Other Embodiments

[0113] Embodiment(s) of the present invention can also be realized by a computer of a system or apparatus that reads out and executes computer executable instructions (e.g., one or more programs) recorded on a storage medium (which may also be referred to more fully as a ‘non-transitory computer-readable storage medium’) to perform the functions of one or more of the above-described embodiment(s) and/or that includes one or more circuits (e.g., application specific integrated circuit (ASIC)) for performing the functions of one or more of the above-described embodiment(s), and by a method performed by the computer of the system or apparatus by, for example, reading out and executing the computer executable instructions from the storage medium to perform the functions of one or more of the above-described embodiment(s) and/or controlling the one or more circuits to perform the functions of one or more of the above-described embodiment(s). The computer may comprise one or more processors (e.g., central processing unit (CPU), micro processing unit (MPU)) and may include a network of separate computers or separate processors to read out and execute the computer executable instructions. The computer executable instructions may be provided to the computer, for example, from a network or the storage medium. The storage medium may include, for example, one or more of a hard disk, a random-access memory (RAM), a read only memory (ROM), a storage of distributed computing systems, an optical disk (such as a compact disc (CD), digital versatile disc (DVD), or Blu-ray Disc (BD)™), a flash memory device, a memory card, and the like.

[0114] While the present invention has been described with reference to exemplary embodiments, it is to be understood that the invention is not limited to the disclosed exemplary embodiments. The scope of the following claims is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures and functions.

[0115] This application claims the benefit of Japanese Patent Application No. 2024-024828, filed

Feb. 21, 2024, and Japanese Patent Application No. 2024-064797, filed Apr. 12, 2024, which are hereby incorporated by reference herein in their entirety.

Claims

1. A non-transitory computer-readable storage medium storing a computer program that extends a function of a generative AI service, the computer program causing a computer of an information processing apparatus to: acquire, from a user terminal, a natural language input related to a print instruction from a user, the print instruction being accepted through the generative AI service; determine a print setting on the basis of the natural language input related to the print instruction; and return the determined print setting to the user terminal.

2. The storage medium according to claim 1, wherein the computer program further causes the computer of the information processing apparatus to: acquire identification information of a printing apparatus selected, in addition to the natural language input related to the print instruction, and acquire, on the basis of the natural language input and the identification information of the printing apparatus, a print setting that can be specified by the printing apparatus from a database storing print settings in advance.

3. The storage medium according to claim 2, wherein the computer program further causes the computer of the information processing apparatus to store the determined print setting in the database in association with identification information of an apparatus that has requested the print instruction and the identification information of the selected printing apparatus.

4. The storage medium according to claim 3, wherein the database further stores at least one of (i) organization information including content created within an organization that can use the generative AI service, (ii) model-specific information associated with each of models of printing apparatuses, and (iii) print history information for each of users, and the computer program further causes the computer of the information processing apparatus to determine the print setting on the basis of at least one of the organization information, the model-specific information, and the print history information, in addition to the natural language input related to the print instruction.

5. The storage medium according to claim 4, wherein the print instruction includes user identification information, and the computer program further causes the computer of the information processing apparatus to use the print history information stored in association with the user identification information.

6. The storage medium according to claim 1, wherein the computer program further causes the computer of the information processing apparatus to: generate a URL that reflects the determined print setting, the URL being a URL for access from the user terminal; and return the URL to the user terminal instead of the print setting.

7. The storage medium according to claim 6, wherein the computer program further causes the computer of the information processing apparatus to include information on a location where content to be printed is stored, along with information on the print setting, as startup parameters of the URL.

8. A non-transitory computer-readable storage medium storing a computer program that uses a generative AI service, the computer program causing a computer of a user terminal to: accept a natural language input related to a print instruction from a user, through a generative AI interaction region in a settings screen; generate instruction text to the generative AI service on the basis of the natural language input accepted; send the instruction text generated to the generative AI service, and acquire a print setting determined by a plugin that extends a function of the generative AI service; and cause the user to confirm, through the settings screen, the print setting acquired.

9. The storage medium according to claim 8, wherein the computer program further causes the computer of the user terminal to inquire with the user, through the generative AI interaction region of the settings screen, as to whether to execute printing using the print setting acquired.

10. The storage medium according to claim 8, wherein the settings screen includes a region for selecting a printing apparatus to perform printing, and a setting region for making a print setting, in accordance with a user input.

11. The storage medium according to claim 10, wherein the setting region related to the print setting reflects the print setting acquired in the acquiring.

12. The storage medium according to claim 10, wherein the settings screen further includes an operation object that accepts an instruction to display a preview image.

13. The storage medium according to claim 12, wherein the computer program further causes the computer of the user terminal to, when the instruction to display the preview image is made through the operation object, acquire a corresponding print setting from a database storing the print setting determined by the plugin, generate a preview image of content to be printed in accordance with the print setting acquired, and display, to the user, a screen displaying the preview image.

14. The storage medium according to claim 13, wherein an operation object for instructing printing to be performed is displayed in the screen displaying the preview image.

15. A control method for an information processing apparatus that extends a function of a generative AI service, the control method comprising: acquiring, from a user terminal, a natural language input related to a print instruction from a user, the print instruction being accepted through the generative AI service; determining a print setting on the basis of the natural language input related to the print instruction; and returning the determined print setting to the user terminal.

16. A control method for a user terminal that uses a generative AI service, the control method comprising: accepting a natural language input related to a print instruction from a user, through a generative AI interaction region in a settings screen; generating instruction text to the generative AI service on the basis of the natural language input accepted; sending the instruction text generated to the generative AI service, and acquiring a print setting determined by a plugin that extends a function of the generative AI service; and causing the user to confirm, through the settings screen, the print setting acquired.

17. A printing system comprising a user terminal, a generative AI server that provides a generative AI service, an information processing apparatus that extends a function of the generative AI service, and a printing apparatus, wherein the user terminal includes: one or more first memory devices that store a set of instructions; and one or more first processors that execute the set of instructions to: accept a natural language input related to a print instruction from a user, through a generative AI interaction region in a settings screen; generate instruction text to the generative AI service on the basis of the natural language input accepted; send the instruction text generated to the generative AI service, and acquire a print setting determined by a plugin that extends a function of the generative AI service; and cause the user to confirm, through the settings screen, the print setting acquired, and the information processing apparatus includes: one or more second memory devices that store a set of instructions; and one or more second processors that execute the set of instructions to: acquire the instruction text from the user terminal; determine a print setting on the basis of the natural language input related to the print instruction; and return the determined print setting to the user terminal.