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(54) Title: RECOMMENDED PAGE SIZE DETERMINATION

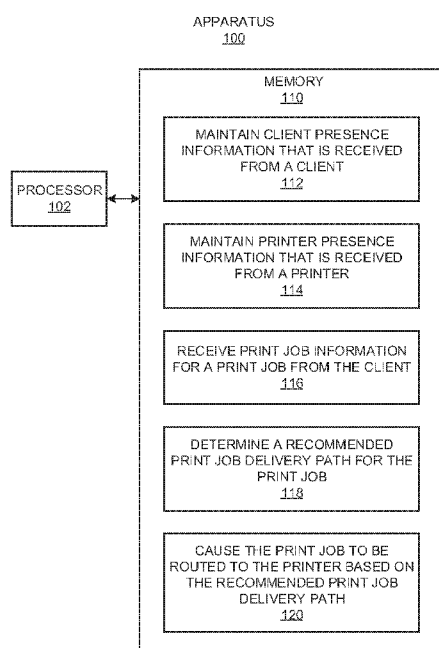


FIG. 1

(57) Abstract: According to examples, an apparatus may include a processor and a memory on which are stored machine-readable instructions that when executed by the processor, may cause the processor to access an image of a document captured using a camera. The processor may determine a focus distance of the camera to the document and may determine a height and/or a length of the document based on the determined focus distance of the camera. In some examples, based on the determined height and/or the determined length of the document, the processor may determine a recommended page size for the document.

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RECOMMENDED PAGE SIZE DETERMINATION

BACKGROUND

[0001] Mobile devices, such as mobile phones, may be used to scan documents using a camera. In some examples, the mobile devices may send the scanned documents to a printer to be printed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0002] Features of the present disclosure are illustrated by way of example and not limited in the following figure(s), in which like numerals indicate like elements, in which:

[0003] FIG. 1 depicts a block diagram of an example apparatus that may determine a recommended page size for a document;

[0004] FIG. 2 shows a block diagram of an example system within which the example apparatus depicted in FIG. 1 may be implemented;

[0005] FIG. 3 shows a flow diagram of an example method for determining a recommended page size for a document based on a size of the document that is determined based on a focus distance of a camera or an aspect ratio of the document; and

[0006] FIG. 4 depicts a block diagram of an example non-transitory computer-readable medium that may have stored thereon computer-readable instructions to determine a recommended page size for a document based on an estimated dimension of a document that is determined based on a focus distance of a camera and a size of an image of the document captured using the camera.

DETAILED DESCRIPTION

[0007] For simplicity and illustrative purposes, the present disclosure is described by referring mainly to examples. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. It will be readily apparent however, that the present disclosure may be practiced without limitation to these specific details. In other instances, some methods and structures have not been described in detail so as not to unnecessarily obscure the present disclosure.

[0008] Throughout the present disclosure, the terms “a” and “an” are intended to denote at least one of a particular element. As used herein, the term “includes” means includes but not limited to, the term “including” means including but not limited to. The term “based on” means based at least in part on.

[0009] Mobile devices, such as smartphones, tablets, laptop computers, and/or the like, may be implemented to perform many different functions. For instance, with increasing processing power and improved quality of cameras, smartphones may more frequently be used to scan documents. However, in some cases, a concern associated with using a smartphone to scan documents may be that the smartphone may not be able to accurately detect an actual page size of the scanned document.

[0010] Disclosed herein are apparatuses, systems, methods, and computer-readable media to detect a size of a scanned document that may be implemented on newer electronic devices, such as smartphones, tablet computers, or the like, as well as older electronic devices, based on a combination of different techniques. For instance, the electronic devices may employ a focus distance based technique and an aspect ratio based technique. In some examples, a processor may access an image of a document captured using a camera and determine a focus distance of the camera to the document. The processor may determine a height and/or length of the document based on the determined focus distance of the camera. In this regard, based on the determined height and/or length of the document, the processor may determine a recommended page size for the document. In some examples, based on a

determination that the focus distance for the camera to the document is not supported, the processor may determine an aspect ratio of the document based on the captured image of the document and may determine the recommended page size for the document based on the determined aspect ratio of the document. In some examples, the processor may generate a ranked list of page sizes for the document from which a page size may be selected for printing the document.

[0011] Through implementation of the features of the present disclosure, a processor may estimate an actual size of a document using a focus distance of a camera and/or an aspect ratio of the document. As such, newer electronic devices, which may use the focus distance to measure dimensions of a document, as well as older electronic devices, which may use the aspect ratio of a document in lieu of the focus distance, may estimate the actual size of a scanned document. The processor may generate a ranked list of page sizes based on the focus distance and/or aspect ratio, which may allow a more accurate identification of an actual size of a scanned document to enable printing of the scanned document on media having a size that most closely matches the size of the scanned document. As such, scanned documents may be efficiently and accurately be sized and formatted for printing.

[0012] Reference is first made to FIGS. 1 and 2. FIG. 1 shows a block diagram of an example apparatus 100 that may determine a recommended page size for a document. FIG. 2 shows a block diagram of an example system 200 within which the example apparatus 100 depicted in FIG. 1 may be implemented. It should be understood that the apparatus 100 depicted in FIG. 1 and/or the system 200 depicted in FIG. 2 may include additional features and that some of the features described herein may be removed and/or modified without departing from the scopes of the apparatus 100 and/or the system 200.

[0013] The apparatus 100 may include a computing device, such as a mobile phone, a tablet, a laptop computer, an electronic device such as Internet of Things (IoT) device, and/or the like. As shown, the apparatus 100 may include a processor 102 and a non-transitory computer-readable medium, e.g., a memory

110. The processor 102 may be a semiconductor-based microprocessor, a central processing unit (CPU), an application specific integrated circuit (ASIC), a field-programmable gate array (FPGA), and/or other hardware device. Although the apparatus 100 is depicted as having a single processor 102, it should be understood that the apparatus 100 may include additional processors and/or cores without departing from a scope of the apparatus 100 and/or system 200. In this regard, references to a single processor 102 as well as to a single memory 110 may be understood to additionally or alternatively pertain to multiple processors 102 and/or multiple memories 110.

[0014] The memory 110 may be an electronic, magnetic, optical, or other physical storage device that contains or stores executable instructions. The memory 110 may be, for example, Read Only Memory (ROM), flash memory, solid state drive, Random Access memory (RAM), an Electrically Erasable Programmable Read-Only Memory (EEPROM), a storage device, an optical disc, or the like. The memory 110 may be a non-transitory computer-readable medium. The term “non-transitory” does not encompass transitory propagating signals.

[0015] As shown in FIG. 1, the processor 102 may execute instructions 112-118 to determine a recommended page size for a scanned document. The instructions 112-118 may be machine-readable instructions, e.g., non-transitory computer-readable instructions. In other examples, the apparatus 100 may include hardware logic blocks or a combination of instructions and hardware logic blocks to implement or execute functions corresponding to the instructions 112-118.

[0016] The processor 102 may fetch, decode, and execute the instructions 112 to access an image 202 of a document captured using a camera 204. In some examples, the processor 102 may implement various functionalities of the camera 204 using an application programming interface (API) 206 for the camera 204. In this regard, the processor 102 may control the camera 204 to capture the image 202 of the document according to the capabilities that are enabled through the API 206 and may store the image 202 in the memory 110.

[0017] In some examples, the processor 102 may access characteristics

of the camera 204 from the API 206 and may use the characteristics of the camera 204 to calculate an approximate size of the document. By way of particular example and for purposes of illustration, a relationship may exist between an actual size of an object relative to a size of a projection of the object on an image plane, for instance, when capturing the object using a pinhole camera. This relationship may be defined as:

$$\begin{aligned} \text{real height of object (mm)} &= (\text{actual distance to object} \\ &(\text{mm}) * \text{object height (pixels)} * \text{sensor height (mm)}) / \\ &(\text{focal length (mm)} * \text{image height (pixels)}) \end{aligned}$$

[0018] In this regard, the above-defined relationship may include the actual distance to object value, measured in mm, in order to derive the real height of the object in mm. However, in some instances, the actual distance to object value may be difficult to determine using the camera 204. As such, a relationship similar to the above-described relationship may be defined using characteristics of the camera 204 that may be available through the API 206. In some examples, a focus distance 208 of the camera 204 may be used in lieu of the actual distance to object to obtain the size of the object.

[0019] By way of particular example, the dimensions 212 of a document, such as the real height of a document, may be defined in a first relationship as:

$$\begin{aligned} <\text{real height of document (mm)}> = <\text{focus distance} \\ &(\text{mm})> * <\text{page height (pixels)}> / <\text{focal length (pixels)}> \end{aligned}$$

where:

$$\begin{aligned} <\text{focal length (pixels)}> &= 0.5 * <\text{image width (pixels)}> / \\ &\tan (\text{camera field of view angle} / 2) \end{aligned}$$

[0020] In this instance, the <focus distance (mm)>, such as the focus distance 208 depicted in FIG. 2, may be a value that is based on a camera-dependent function of lens position, which may be accessible through the API 206. The processor 102 may obtain the camera field of view angle and <focal length (pixels)> through the API 206.

[0021] In some examples, the dimensions 212 of the document, such as

the real height of the document, may be defined in a second relationship as:

$$\begin{aligned} <\text{real height of document (mm)}> = <\text{focus distance} \\ &(\text{mm})> * <\text{page height on sensor (mm)}> / <\text{focal length} \\ &(\text{mm})> \end{aligned}$$

where:

$$\begin{aligned} <\text{page size on sensor (mm)}> = <\text{page size (pixels)}> * \\ &<\text{sensor physical size (mm)}> / <\text{sensor size (pixels)}> \end{aligned}$$

[0022] In this instance, the $<\text{focus distance (mm)}>$ may be a focus distance of the camera 204, such as the focus distance 208 as depicted in FIG. 2. In some examples, the $<\text{focus distance (mm)}>$ may be converted to a metric unit of measure from a diopter unit of measure, where $1 \text{ mm} = 1000/\text{diopter}$. The $<\text{page size (pixels)}>$ may be a value for a page size of the document, which may be calculated using an algorithm for page rectification. The focus distance of the camera 204 may be defined as a distance between the camera 204 and the document at which the document may be in focus. In some examples, the focus distance may correspond to a distance between the camera 204 and the document. The focus distance may be a camera-dependent function of lens position.

[0023] In some examples, the processor 102 may access various characteristics of the camera 204 from the API 206, such as the focus distance 208, a focal length, a sensor size in pixels, a sensor physical size in mm, a camera field of view angle, and/or the like. In some examples, the characteristics of the camera 204 may be user-defined, based on testing/experimentation on the camera 204, prior knowledge, and/or the like.

[0024] The processor 102 may access information related to the document as depicted in the first relationship and the second relationship between the dimensions 212 of the document to the characteristics of the camera 204 as described above, for instance, the page height, the image width, the page size on the image sensor in mm, the page size in pixels, and/or the like. The processor 102 may access the information related to the document from the image 202 of

the document, a file stored on the memory 110, and/or the like. The processor 102 may determine whether to use the first relationship or the second relationship to determine the dimensions 212 of the document using the information on the camera 204 accessed through the API 206.

[0025] The processor 102 may fetch, decode, and execute the instructions 114 to determine a focus distance 208 of the camera 204 to the document. In some examples, the processor 102 may determine whether the focus distance 208 of the camera 204 to the document is a supported focus distance. In some examples, the focus distance 208 may be supported when the focus distance 208 is available through the API 206 for the camera 204 on the apparatus 100. In some examples, the focus distance 208 may be determined to be a supported focus distance 208 when the focus distance 208 is available through a predetermined version API and/or camera 204, which may provide support for specific functions or characteristics, such as support for focus distance 208 values within a certain error rate.

[0026] In this regard, the processor 102 may determine platform limitations for the camera 204 on the apparatus 100, such as limitations based on a type and/or a version of an operating system (OS) implemented on the apparatus 100. By way of particular example, an OS may not provide support for a particular version of a camera API to enable certain features for the camera, such as focus distance 208 or calibration information 210. Based on the determined platform limitations for the camera 204, the processor 102 may determine whether the focus distance 208 is supported, for instance, through the API 206.

[0027] In some examples, the processor 102 may determine whether the focus distance 208 is a supported focus distance based on whether calibration information 210 for the camera 204 is defined in the API 206. The calibration information 210 may indicate calibration of various characteristics of the camera 204, such as the focus distance 208, a focal length, a sensor size, a lens position, and/or the like. For instance, while a focus distance 208 may be available through the API 206, the accuracy of such a focus distance 208 may be unverified without the calibration information 210, and as such, the processor 102 may determine

that the focus distance 208 is unsupported when the calibration information 210 is not available.

[0028] In this regard, based on a determination that the calibration information 210 is available, the processor 102 may determine the recommended page size 216 for the document using the focus distance 208 of the camera 204 to the document. In some examples, based on a determination that the calibration information 210 is not available, the processor 102 may determine that the focus distance 208 is not supported by the API 206 and/or the camera 204. In this regard, the processor 102 may determine the recommended page size 216 for the document based on an aspect ratio 214 of the document, in which the aspect ratio 214 may be determined based on the image 202 of the document.

[0029] In some examples, the calibration information 210 may be obtained outside of the API 206, the OS, or the camera 204. In this regard, the calibration information 210 may be stored in the memory 110 on the apparatus 100, accessed from a remote apparatus or server, entered by a user, and/or the like. The calibration information 210 may be used to calculate the focus distance 208, for instance, as a function of lens position when the focus distance 208 is not supported or available through the API 206.

[0030] The processor 102 may fetch, decode, and execute the instructions 116 to determine dimensions 212 of the document based on the determined focus distance 208 of the camera 204. In this regard, the processor 102 may determine the dimensions 212 of the document based on a determination that the focus distance 208 and/or the calibration information 210 is available in the API 206. In some examples, the processor 102 may determine a height and/or a length of the document based on the determined focus distance 208 of the camera 204. By way of particular example and for purposes of illustration, the processor 102 may determine the height and/or the length of the document using the first relationship or the second relationship between the dimensions 212 of the document to the focus distance 208 of the camera 204, as previously described.

[0031] In some examples, the processor 104 may determine an aspect ratio 214 of the document based on the captured image 202 of the document.

The processor 104 may determine the aspect ratio 214 using an algorithm to identify a relative height and width of the document, for instance, an algorithm used for page rectification, or the like. The processor 104 may use the aspect ratio 214 in instances in which the focus distance 208 of the camera 204 to the document is not supported, for instance, when the focus distance 208 is not supported in the API 206 and/or when the calibration information 210 is not available.

[0032] The processor 102 may fetch, decode, and execute the instructions 118 to determine a recommended page size 216 for the document based on the determined dimensions 212 of the document such as the determined height and/or the determined length of the document. In some examples, the processor 102 may access predetermined page sizes 218, and may identify as the recommended page size 216 a page size among the predetermined page sizes 218 that corresponds to the determined dimensions 212 of the document. In some examples, the processor 102 may use the determined dimensions 212 to identify the recommended page size 216 when the focus distance 208 is supported by the API 206 and the camera 204.

[0033] In some examples, the processor 102 may select a page size among the predetermined page sizes 218 as the recommended page size 216 based on an error factor between the determined height and/or the determined length of the document relative to an actual height and/or length of the document. In this instance, the focus distance 208 may be based on a characteristic of the camera 204, including the lens position, the focal length, and/or the like, and the determined height and/or the determined length of the document may correspond to the actual height and/or the actual length of the document within the error factor. For instance, the focus distance 208 of the camera 204 may correspond to an actual distance of the camera 204 to the document within the error factor, and as such, the focus distance 208 may be an approximation of the actual distance of the camera 204 to the document. In this regard, the error factor may be previously determined and, in some examples, the error factor may be user-defined, based on testing/experimentation on the camera 204, prior knowledge, and/or the like. In some examples, the processor 102 may access the error factor

from the API 206 of the camera 204.

[0034] In some examples, the processor 102 may generate a ranked list of page sizes for the document. In some examples, the processor 102 may select the ranked list of page sizes among a plurality of predetermined page sizes 218 based on the determined dimensions 212 of the document, including the determined height and/or the determined length of the document, and/or based on the determined aspect ratio 214 of the document. In this regard, the predetermined page sizes 218 may include user preferred page sizes, standard page sizes, for instance, letter, A3, JIS B4, and/or the like.

[0035] In some examples, the ranked list of page sizes may be unique to a user or a device. For instance, the page sizes included in the ranked list may be different for each user, and may be selected among the predetermined page sizes 218 based on user geo-location, language, user preferences, user history, and/or the like.

[0036] In some examples, the processor 102 may generate the ranked list of page sizes for the document using page sizes selected among the plurality of predetermined page sizes 218 that are within an error factor associated with the recommended page size 216 of the document. By way of particular example and for purposes of illustration, when the error factor associated with the recommended page size 216 is 15%, the processor 102 may generate the ranked list of page sizes for the document by selecting among the plurality of predetermined page sizes 218 those page sizes that do not exceed the deviation of +/- 15% from the detected page size.

[0037] In some examples, the processor 102 may generate the recommended page size 216, including the ranked list of page sizes, based on the aspect ratio 214 of the document. For instance, the processor 102 may construct the ranked list of page sizes based on page sizes that have aspect ratios that are closer to the determined aspect ratio 214. In some examples, the processor 102 may select page sizes having similar aspect ratios among a preferred list of page sizes, a standard list of page sizes, and/or the like.

[0038] In some examples, the ranked list of page sizes may have the same

sorting as the preferred list of page sizes. In some examples, for multiple page sizes that have similar aspect ratios, the processor 102 may use the determined dimensions 212 of the document to sort the ranked list of page sizes. For instance, the processor 102 may assign a higher rank for a page size that more closely corresponds to the determined dimensions 212 of the document among different page sizes with similar aspect ratios. In some examples, the processor 102 may sort the page sizes in the ranked list of page sizes for the document based on the dimensions 212, which may be based on the focus distance 208 that is unsupported or unverified. In this regard, the determined dimensions 212 of the document may be measurements for the document obtained using the focus distance 208 of the camera 204 that is not supported or verified, for instance, in a case where a corresponding calibration information 210 for the camera 204 is not available in the API 206, where a version of the API 206 or a version of the OS is not a predetermined version, and/or the like.

[0039] In some examples, the processor 102 may generate a scanned document 220 using the image 202 of the document. In this regard, the scanned document 220 may be a document that is formatted in a predetermined file format, such as a pdf file, or the like. The scanned document 220 may include the captured image 202, formatted in the predetermined file format. In some examples, the apparatus 100 may be coupled to a printer 222 over a network 224, through a direct connection, and/or the like. In this regard, the apparatus 100 may be connected to the printer 222 through a wireless connection, a wired connection, a point-to-point wireless connection, and/or the like. In some examples, the processor 102 may send a print job including the scanned document 220 to the printer 222 for printing.

[0040] In some examples, the processor 102 may associate a recommended page size 216 for the document to the scanned document 220. In this regard, the processor 102 may add metadata to the scanned document 220 to identify the recommended page size 216 in the scanned document 220. By way of particular example and for purposes of illustration, the processor 102 may cause a camera preview window to appear on a display of the apparatus 100 to enable scanning of the document using the camera 204. The processor 102 may

display a print preview of the scanned document 220 matched to the recommended page size 216, such as US Letter paper size, for printing. The printer 222 may print the scanned document 220 using the recommended page size 216, to enable the scanned document 220 to be printed in the same size as the original document.

[0041] In some examples, the processor 102 may associate the recommended page size 216 for the document as a ranked list of page sizes associated with the document. In this regard, the processor 102 may add metadata to the scanned document 220 to associate the ranked list of page sizes. By way of particular example and for purposes of illustration, the processor 102 may cause a camera preview window to appear on a display of the apparatus 100 to enable scanning of the document using the camera 204. For purposes of illustration, the original document may have a JIS B4 paper size. In a case in which a default page size is A4, which may have a similar aspect ratio as the A4 paper size of the document, the processor 102 may display a print preview of the scanned document 220 matched to the default A4 page size. In some examples, the processor 102 may display the ranked list of page sizes associated with the scanned document 220 and may enable selection of one of the page sizes among the ranked list of page sizes. In this regard, the processor 102 may cause the printer 222 to print the scanned document 220 in the selected page size among the ranked list of page sizes. In some examples, the processor 102 may reset the default page size on the printer 222 to the selected page size.

[0042] Various manners in which the processor 102 may operate are discussed in greater detail with respect to the method 300 depicted in FIG. 3. FIG. 3 depicts a flow diagram of an example method 300 for determining a recommended page size 216 for a document based on a size of the document based on a focus distance 208 of a camera 204 or an aspect ratio 214 of the document. It should be understood that the method 300 depicted in FIG. 3 may include additional operations and that some of the operations described therein may be removed and/or modified without departing from the scope of the method 300. The description of the method 300 is made with reference to the features depicted in FIGS. 1 and 2 for purposes of illustration.

[0043] At block 302, the processor 102 may access an image 202 of a document captured using a camera 204. At block 304, the processor 102 may determine that a focus distance 208 of the camera 204 is a supported focus distance 208. In some examples, the focus distance 208 may be available through an API 206 for the camera 204. In this regard, the processor 102 may determine that the focus distance 208 is supported when the information regarding the focus distance 208 is provided by a particular version of API, a calibration information 210 is available through the API 206 to verify the focus distance 208, and/or the like.

[0044] At block 306, based on a determination that the focus distance 208 of the camera 204 is a supported focus distance, the processor 102 may determine a recommended page size for the document based on the supported focus distance. In some examples, the processor 102 may determine a size of the document using the focus distance 208, such as dimensions 212 of the document depicted in FIG. 2. In this regard, the processor 102 may determine the size of the document based on the focus distance 208 of the camera 204 from the API 206 using a relationship between the focus distance 208 and an actual size of the document.

[0045] At block 308, based on a determination that the focus distance 208 of the camera 204 to the document is an unsupported focus distance, the processor 102 may determine the recommended page size 216 for the document based on an aspect ratio 214 of the document based on the image 202 of the document and/or the unsupported focus distance. In some examples, the processor 102 may determine the aspect ratio 214 of the document using an algorithm for rectification of the captured image 202 of the document. By way of particular example and for purposes of illustration, the processor 102 may determine that the focus distance 208 is an unsupported focus distance when the API 206 is not a predetermined version that may provide, for instance, a verified focus distance value. Alternatively or additionally, the processor 102 may determine that the focus distance 208 is unsupported when the calibration information 210 is not available, either through the API 206, in memory 110, and/or the like.

[0046] In some examples, the processor 102 may determine the recommended page size 216 by selecting page sizes having a similar aspect ratio as the aspect ratio 214 of the document. The processor 102 may rank or identify, among the selected page sizes having a similar aspect ratio, a page size that may more closely match the actual size of the document using the focus distance 208. In this regard, the focus distance 208 may be an unsupported focus distance, which may be provided by an unsupported API, provided without calibration information 210, and/or the like.

[0047] In some examples, the processor 102 may generate a ranked list of page sizes for the document. The processor 102 may select the ranked list of page sizes among a plurality of predetermined page sizes 218 based on the aspect ratio of the document and/or a size of the document that is determined using the supported focus distance. In some examples, the processor 102 may format the image 202 of the document to generate a scanned document 220. The processor 102 may associate the ranked list of page sizes with the scanned document 220, and may allow selection of one page size among the ranked list of page sizes for printing the scanned document 220.

[0048] In some examples, the processor 102 may determine an error factor between the size of the document based on the focus distance 208 that is supported relative to an actual size of the document. In this regard, the processor 102 may determine that the supported focus distance is based on a characteristic of the camera 204 and may determine that the determined size of the document based on the supported focus distance corresponds to the actual size of the document within the determined error factor. In some examples, the characteristic of the camera 204 may include the focus distance 208, a focal length, a sensor size in pixels, a sensor physical size in mm, a camera field of view angle, and/or the like. The processor 102 may determine that an error factor for a particular characteristic of the camera 204 corresponds to an error factor between the determined dimensions 212 of the document and actual dimensions of the document.

[0049] In some examples, the processor 102 may generate a ranked list of

page sizes for the document based on the aspect ratio 214 of the document that is based on the image 202 of the document. In this regard, the processor 102 may select the ranked list of page sizes among a plurality of predetermined page sizes 218 within an error factor associated with the recommended page size 216 of the document relative to an actual page size of the document. In some examples, the processor 102 may sort the page sizes in the ranked list of page sizes for the document based on the focus distance 208 that is unsupported.

[0050] In some examples, the processor 102 may generate a scanned document 220 using a captured image, such as image 202 of the document depicted in FIG. 2. The processor 102 may prepare the scanned document 220 for printing on printer 222 using the recommended page size 216 for the document. By way of particular example and for purposes of illustration, the processor 102 may embed information related to the recommended page size 216 or a ranked list of recommended page sizes into the scanned document 220. The processor 102 may access the embedded information to change information in a print job for a desired page size, change a setting for a default page size at the printer 222, and/or the like.

[0051] Some or all of the operations set forth in the method 300 may be included as utilities, programs, or subprograms, in any desired computer accessible medium. In addition, the method 300 may be embodied by computer programs, which may exist in a variety of forms both active and inactive. For example, they may exist as computer-readable instructions, including source code, object code, executable code or other formats. Any of the above may be embodied on a non-transitory computer-readable storage medium.

[0052] Examples of non-transitory computer-readable storage media include computer system RAM, ROM, EPROM, EEPROM, and magnetic or optical disks or tapes. It is therefore to be understood that any electronic device capable of executing the above-described functions may perform those functions enumerated above.

[0053] Turning now to FIG. 4, there is shown a block diagram of a non-transitory computer-readable medium 400 that may have stored thereon

computer-readable instructions to determine a recommended page size 216 for a document based on an estimated dimension of a document, such as dimensions 212 of the document depicted in FIG. 2, based on a focus distance 208 of a camera 204 and a size of an image 202 of the document captured using the camera 204. It should be understood that the computer-readable medium 400 depicted in FIG. 4 may include additional instructions and that some of the instructions described herein may be removed and/or modified without departing from the scope of the computer-readable medium 400 disclosed herein. The computer-readable medium 400 may be a non-transitory computer-readable medium. The term “non-transitory” does not encompass transitory propagating signals.

[0054] The computer-readable medium 400 may have stored thereon computer-readable instructions 402-408 that a processor, such as the processor 102 depicted in FIGS. 1-2, may execute. The computer-readable medium 400 may be an electronic, magnetic, optical, or other physical storage device that contains or stores executable instructions. The computer-readable medium 400 may be, for example, Random-Access memory (RAM), an Electrically Erasable Programmable Read-Only Memory (EEPROM), a storage device, an optical disc, or the like.

[0055] The processor may fetch, decode, and execute the instructions 402 to access an image 202 of a document captured using a camera 204. The processor may fetch, decode, and execute the instructions 404 to determine a focus distance 208 of the camera 204.

[0056] The processor may fetch, decode, and execute the instructions 406 to determine an estimated dimension of the document based on the determined focus distance 208 of the camera 204 and a size of the image 202 of the document. In some examples, the size of the image 202 of the document may be a size of the image 202 captured on an image plane, measured in pixels, mm, or the like. The processor may fetch, decode, and execute the instructions 408 to determine a recommended page size 216 for the document based on the estimated dimension of the document.

[0057] In some examples, the processor may determine whether the focus distance 208 of the camera 204 to the document is verified or calibrated. In this regard, the processor may access the focus distance 208 from an API 206 associated with the camera 204. Based on a determination that the focus distance 208 of the camera 204 to the document is verified or calibrated, the processor may determine the recommended page size 216 for the document based on the focus distance 208 of the camera 204 to the document.

[0058] In some examples, based on a determination that the focus distance 208 of the camera 204 to the document is not verified or calibrated, the processor may determine the recommended page size 216 for the document based on an aspect ratio 214 of the document based on the image 202 of the document. In some examples, the processor 102 may determine the recommended page size 216 for the document based on the determined aspect ratio 214 of the document, and alternatively or additionally, the processor may determine the recommended page size 216 for the document based on both the aspect ratio 214 of the document and the estimated dimension of the document.

[0059] Although described specifically throughout the entirety of the instant disclosure, representative examples of the present disclosure have utility over a wide range of applications, and the above discussion is not intended and should not be construed to be limiting, but is offered as an illustrative discussion of aspects of the disclosure.

[0060] What has been described and illustrated herein is an example of the disclosure along with some of its variations. The terms, descriptions and figures used herein are set forth by way of illustration and are not meant as limitations. Many variations are possible within the scope of the disclosure, which is intended to be defined by the following claims -- and their equivalents -- in which all terms are meant in their broadest reasonable sense unless otherwise indicated.

What is claimed is:

1. An apparatus comprising:
a processor; and
a memory on which are stored machine-readable instructions that when executed by the processor, cause the processor to:
access an image of a document captured using a camera;
determine a focus distance of the camera to the document;
determine a height and/or a length of the document based on the determined focus distance of the camera; and
based on the determined height and/or the determined length of the document, determine a recommended page size for the document.
2. The apparatus of claim 1, wherein the instructions cause the processor to:
determine whether the focus distance of the camera to the document is a supported focus distance;
based on a determination that the focus distance of the camera to the document is a supported focus distance, determine the recommended page size for the document using the focus distance of the camera to the document; and
based on a determination that the focus distance of the camera to the document is not a supported focus distance, determine the recommended page size for the document based on an aspect ratio of the document based on the image of the document.
3. The apparatus of claim 1, wherein the instructions cause the processor to:
generate a ranked list of page sizes for the document, the ranked list of page sizes being selected among a plurality of predetermined page sizes based on the determined height and/or the determined length of the document within an error factor, and/or based on a determined aspect ratio of the document.
4. The apparatus of claim 1, the instructions cause the processor to:
determine an error factor between the determined height and/or the

determined length of the document relative to an actual height and/or length of the document,

wherein the focus distance is based on a characteristic of the camera and the determined height and/or the determined length of the document based on the determined focus distance corresponds to the actual height and/or the actual length of the document within the determined error factor.

5. The apparatus of claim 1, wherein the instructions cause the processor to: generate a ranked list of page sizes for the document based on an aspect ratio of the document that is based on the image of the document; and

sort the page sizes in the ranked list of page sizes for the document based on the determined focus distance between the camera and the document,

wherein the determined focus distance is an unsupported focus distance.

6. The apparatus of claim 1, wherein the instructions cause the processor to: generate a scanned document using the image of the document;

associate a page size among a ranked list of page sizes for the document to the scanned document; and

add metadata to the scanned document, the metadata to identity the associated page size in the scanned document.

7. The apparatus of claim 1, wherein the instructions cause the processor to: determine that the focus distance of the camera to the document is a supported focus distance based on information from an application programming interface (API) for the camera, the API for the camera to define the focus distance of the camera, and/or based on presence of calibration information for the camera.

8. A method comprising:

accessing, by a processor, an image of a document captured using a camera;

determining, by the processor, that a focus distance of the camera is a

supported focus distance;

based on a determination that the focus distance of the camera is a supported focus distance, determining, by the processor, a recommended page size for the document based on the supported focus distance; and

based on a determination that the focus distance of the camera to the document is an unsupported focus distance, determining, by the processor, the recommended page size for the document that is based on an aspect ratio of the document based on the image of the document and/or the unsupported focus distance.

9. The method of claim 8, further comprising:

generating a ranked list of page sizes for the document, the ranked list of page sizes being selected among a plurality of predetermined page sizes based on the aspect ratio of the document and/or a size of the document that is determined using the supported focus distance.

10. The method of claim 9, further comprising:

formatting the image of the document to generate a scanned document;
associating the ranked list of page sizes with the scanned document; and
selecting one page size in the ranked list of page sizes for printing the scanned document.

11. The method of claim 8, further comprising:

determining an error factor between a size of the document based on the supported focus distance relative to an actual size of the document,

wherein the supported focus distance is based on a characteristic of the camera and a size of the document determined based on the supported focus distance corresponds to the actual size of the document within the determined error factor.

12. The method of claim 8, further comprising:

generating a ranked list of page sizes for the document based on the

aspect ratio of the document based on the image of the document; and
sort the page sizes in the ranked list of page sizes for the document based on the unsupported focus distance.

13. The method of claim 8, further comprising:
generating a scanned document using a captured image; and
preparing the scanned document for printing using the recommended page size for the document.

14. A non-transitory computer readable medium on which is stored machine readable instructions that, when executed by a processor, cause the processor to:

access an image of a document captured using a camera;

determine a focus distance of the camera;

determine an estimated dimension of the document based on the determined focus distance of the camera and a size of the image of the document;
and

based on the estimated dimension of the document, determine a recommended page size for the document.

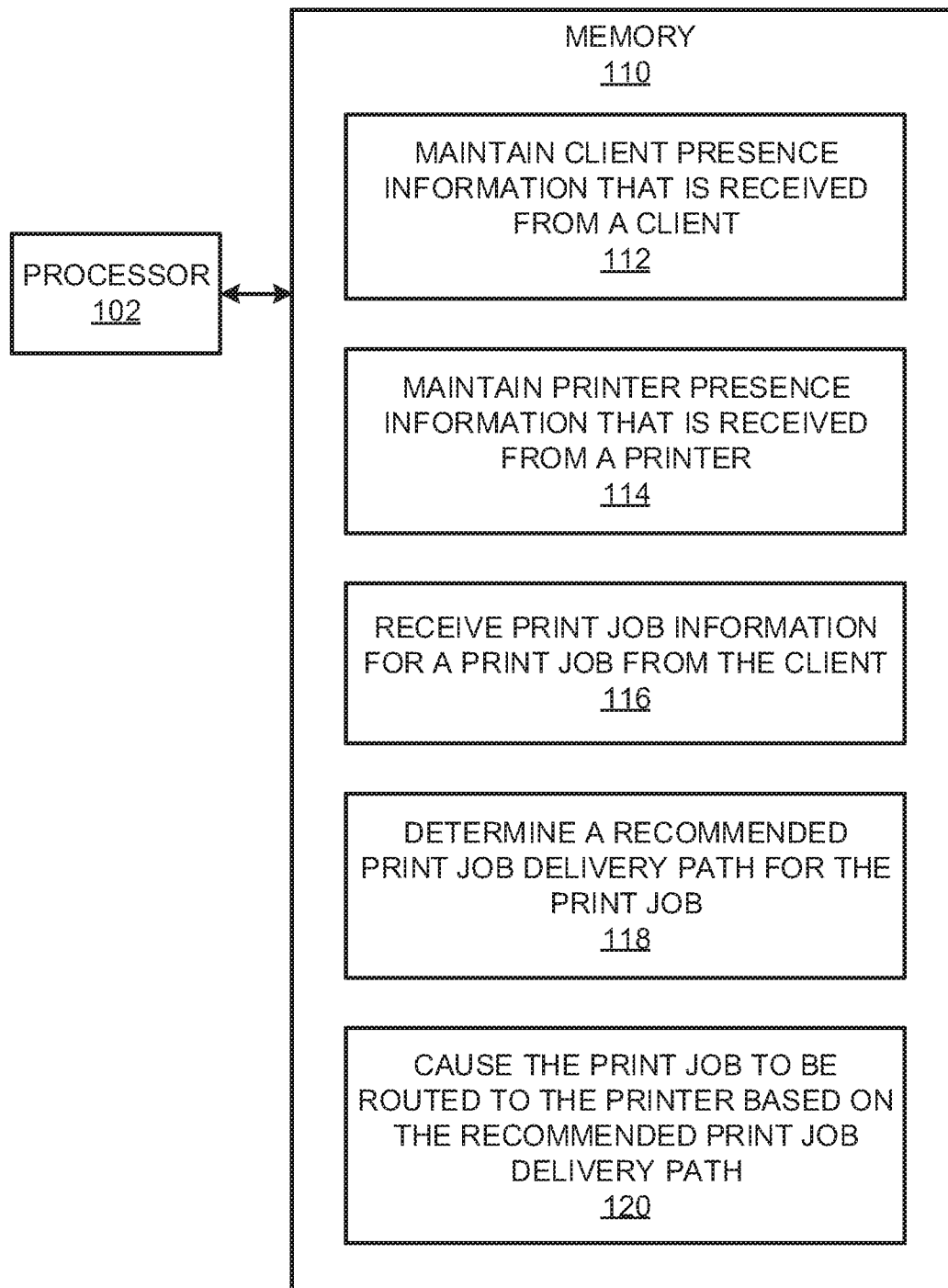
15. The non-transitory computer readable medium of claim 14, wherein the instructions cause the processor to:

determine whether the focus distance of the camera to the document is verified or calibrated;

based on a determination that the focus distance of the camera to the document is verified or calibrated, determine the recommended page size for the document based on the focus distance; and

based on a determination that the focus distance of the camera to the document is not verified or calibrated, determine the recommended page size for the document based on an aspect ratio of the document that is based on the image of the document.

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APPARATUS
100*FIG. 1*

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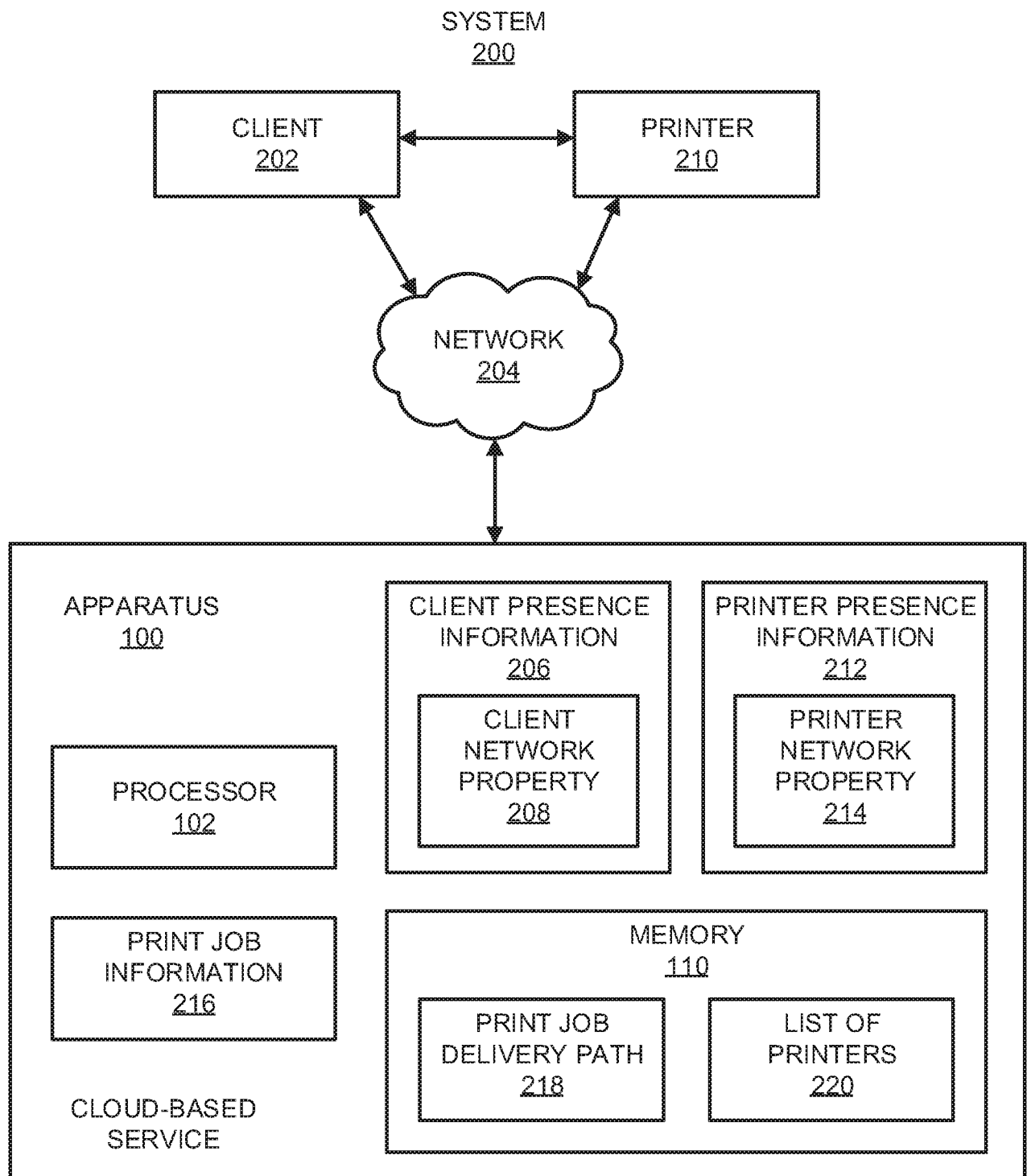
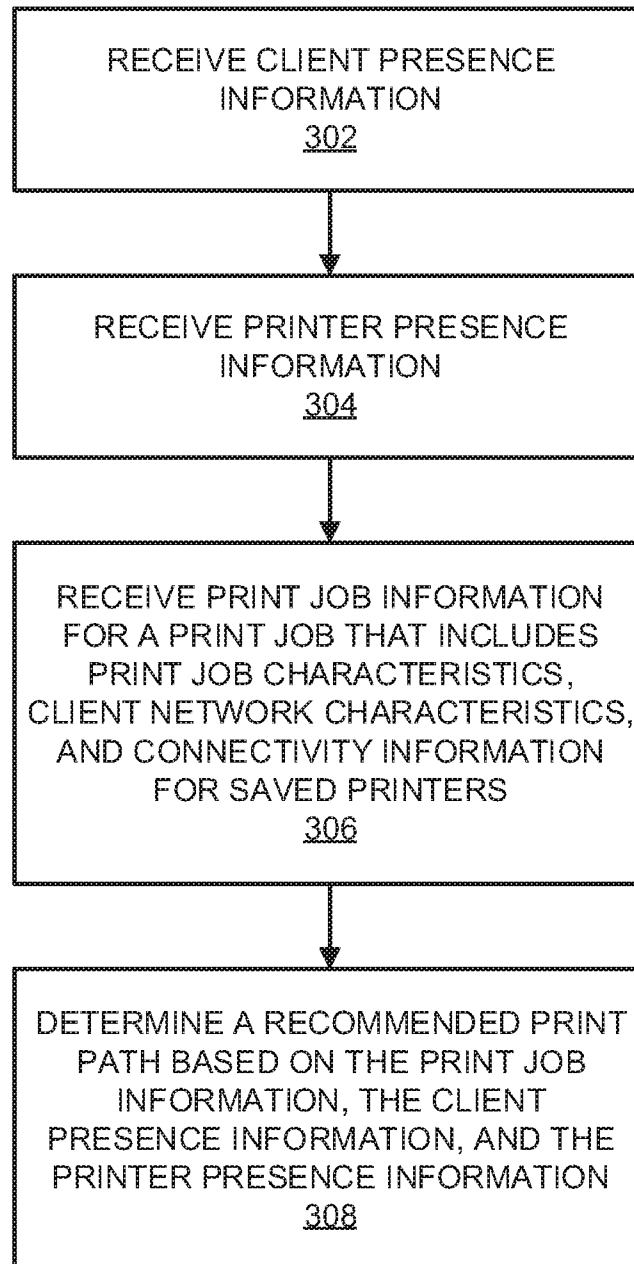
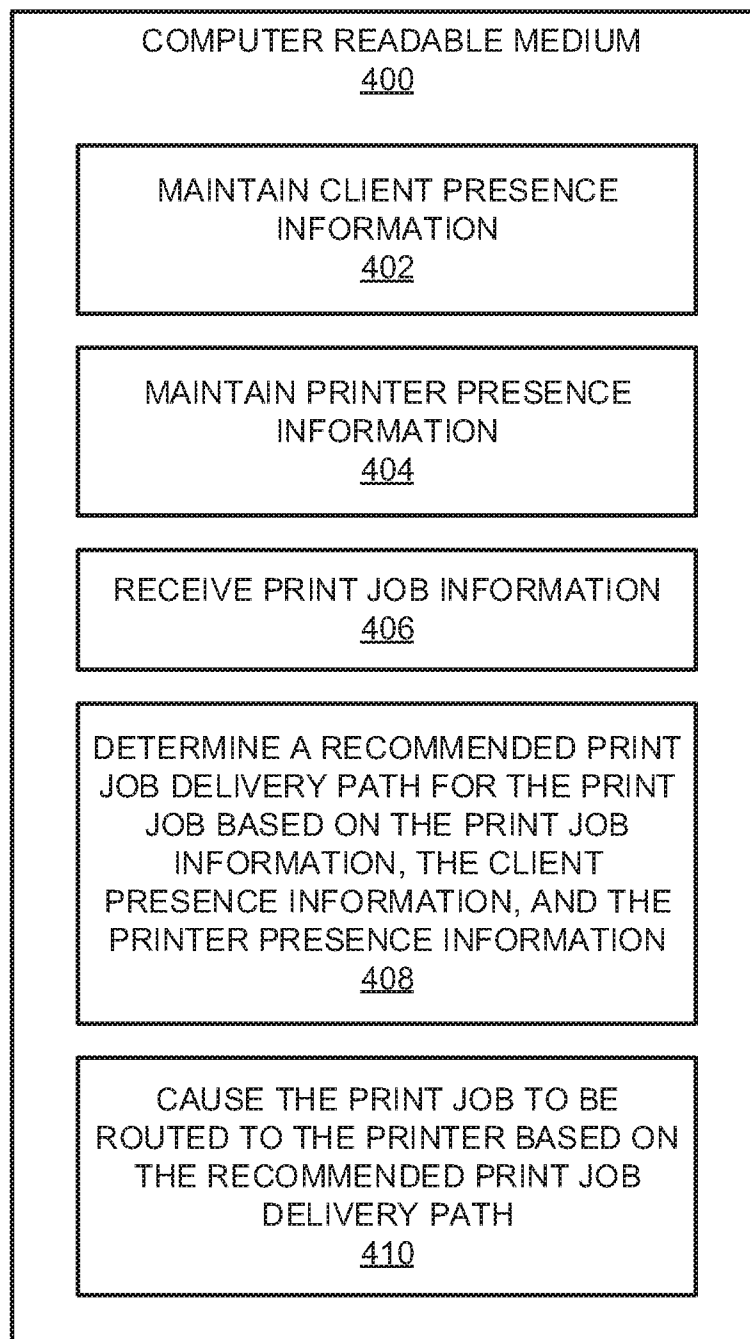


FIG. 2

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METHOD
300*FIG. 3*

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**FIG. 4**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2020/048262

A. CLASSIFICATION OF SUBJECT MATTER

*G06K 9/20 (2006.01)**G06K 9/62 (2006.01)**G06F 3/12 (2006.01)*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G06K 9/00-9/62, G06F 3/00-3/12, G06T 11/00-11/60

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Espacenet, PatSearch, PAJ, WIPO, USPTO, RUPTO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2020/0007720 A1 (ML NETHERLANDS C.V) 02.01.2020, [0034]- [0036], [0042], [0057], [0060], [0061], [0063]-[0065], [0094], [0096], [0101], [0103], [0122], [0145], [0152], [0186], [0191], [0200], [0219], [0226], [0276]	1-15
A	US 2016/0330374 A1 (DACUDA AG) 10.11.2016	1-15
A	US 2013/0033640 A1 (LEE MYOUNG SOOL) 07.02.2013	1-15
A	US 2005/0052525 A1 (CANON KABUSHIKI KAISHA) 10.03.2005	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"D" document cited by the applicant in the international application	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"E" earlier document but published on or after the international filing date	"&" document member of the same patent family
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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