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(71) Applicant: **TENCENT TECHNOLOGY (SHENZHEN) COMPANY LIMITED** [CN/CN]; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN).

(72) Inventors: **HU, Bo**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **WANG, Xi**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **ZHANG, Kai**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **ZHOU, Ruiyi**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **XIE, Zhengkai**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **HE, Bosen**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **YANG, Huijiao**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **HUANG, Ying**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **LIU, Yulei**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **LI, Wei**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **FENG, Cheng**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **TANG, Tingyong**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN). **MO, Sha**; Room 403, East Block 2, SEG Park, Zhenxing Road, Futian District, Shenzhen, Guangdong 518044 (CN).

(74) Agent: **ADVANCE CHINA I.P.LAW OFFICE**; Suite 918-920, Dongshan Plaza, No.69 Xianlie Central Road, Guangzhou City, Guangdong 510095 (CN).

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(54) Title: METHOD AND DEVICE FOR BATCH SCANNING 2D BARCODES

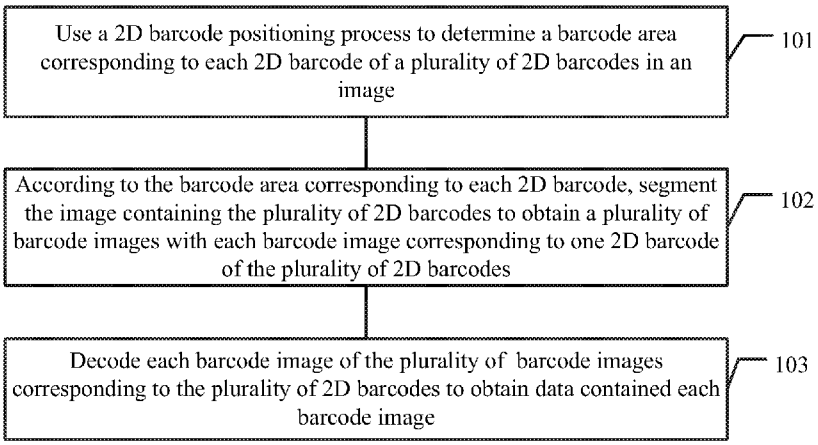


FIG. 1

(57) Abstract: Methods and devices for batch scanning 2D barcodes are provided by using a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image. According to the barcode area corresponding to each 2D barcode, the image containing the plurality of 2D barcodes can be segmented to provide a plurality of 2D barcode images with each barcode image corresponding to one 2D barcode of the plurality of 2D barcodes. Each barcode image of the plurality of 2D barcode images corresponding to the plurality of 2D barcodes can be decoded to obtain data contained in each barcode image. An exemplary device can include a positioning module, a segmenting module, and a decoding module.

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Description

METHOD AND DEVICE FOR BATCH SCANNING 2D BARCODES

CROSS-REFERENCES TO RELATED APPLICATIONS

[0001] This application claims priority to Chinese Patent Application No. CN201210349051.6, filed on September 19, 2012, the entire contents of which are incorporated herein by reference.

FIELD OF THE DISCLOSURE

[0002] The present disclosure relates to the field of computer applications and, more particularly, relates to methods and devices for batch scanning two-dimensional (2D) barcodes.

BACKGROUND

[0003] With rapid development of mobile Internet and growing popularity of smart phones, more and more important information is carried by 2D barcodes. Scanning 2D barcodes to read information becomes an important method for obtaining information.

[0004] 2D barcode is a coding scheme based on traditional bar code. After error correction to code the characters, text, images and other information, the resulting binary code stream may be expressed as 2D barcode symbols. Compared with traditional one-dimensional code, 2D barcode may have high information capacity and error correction ability, which does not rely on database support. 2D barcode is widely used in document recognition and reading, logistics, electronic data exchange, etc.

[0005] Currently, scanning devices that have a function to read and parse 2D barcodes can scan the 2D barcodes. By identifying binary data recorded as a length and width of the barcode, information contained therein may be obtained.

[0006] Conventionally, scanning of 2D barcodes is performed in a manner that after a scanning of a first 2D barcode, another scanning of a second 2D barcode is followed. The user uses a scanning device that can scan and read a 2D barcode and align its camera with the 2D barcode for the scanning. After a successful scanning, the scanning device can read information from the first scanned 2D barcode. After reading this information, the scanning device is then switched back to a scanning interface to scan the second 2D barcode. This switching process can be repeated as needed to scan a batch of barcodes. When a large number of 2D barcodes needs to be scanned, scanning such batch of 2D barcodes in a manner of one after another is complicated, time-consuming, and inefficient.

BRIEF SUMMARY OF THE DISCLOSURE

[0007] According to various embodiments, there is provided a method for batch scanning 2D barcodes by using a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image. According to the barcode area corresponding to each 2D barcode, the image containing the plurality of 2D barcodes can be segmented to obtain a plurality of 2D barcode images with each barcode image corresponding to a 2D barcode of the plurality of 2D barcodes. Each barcode image of the plurality of 2D barcode images can be decoded to obtain data contained in each barcode image of the plurality of 2D barcode images corresponding to the plurality of 2D barcodes.

[0008] According to various embodiments, there is also provided a device for batch scanning 2D barcodes. The device can include a positioning module, a segmenting module, and a decoding module. The positioning module can be configured to use a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image. The segmenting module can be configured to segment the image containing the plurality of 2D barcodes to obtain a plurality of 2D barcode images with each barcode image corresponding to one 2D barcode of the plurality of 2D barcodes, after the positioning module determines the barcode area and according to the barcode area corresponding to each 2D barcode. The decoding module can

be configured to decode each barcode image of the plurality of 2D barcode images corresponding to the plurality of 2D barcodes to obtain data contained in each barcode image of the plurality of 2D barcode images, after the segmenting module obtains the plurality of 2D barcode images.

[0009] Other aspects or embodiments of the present disclosure can be understood by those skilled in the art in light of the description, the claims, and the drawings of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The following drawings are merely examples for illustrative purposes according to various disclosed embodiments and are not intended to limit the scope of the present disclosure.

[0011] FIG. 1 depicts an exemplary method for batch scanning 2D barcodes in accordance with various disclosed embodiments;

[0012] FIG. 2 depicts another exemplary method for batch scanning 2D barcodes in accordance with various disclosed embodiments ;

[0013] FIG. 3 depicts an image development during an exemplary 2D barcode positioning process in accordance with various disclosed embodiments;

[0014] FIG. 4 depicts various exemplary positioning patterns of 2D barcodes in accordance with various disclosed embodiments;

[0015] FIG. 5 depicts an exemplary scanning device in accordance with various disclosed embodiments; and

[0016] FIG. 6 depicts another exemplary scanning device in accordance with various disclosed embodiments.

DETAILED DESCRIPTION

[0017] Reference will now be made in detail to exemplary embodiments of the disclosure, which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0018] Methods and devices for batch scanning 2D barcodes are provided to implement batch scanning and recognition of 2D barcodes. The disclosed methods and devices can effectively simplify the batch scanning process of 2D barcodes to save operation time, and enhance the scanning efficiency.

[0019] FIG. 1 depicts an exemplary method for batch scanning 2D barcodes in accordance with various disclosed embodiments.

[0020] In Step 101, a 2D barcode positioning process is used to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image.

[0021] The image can be any image, for example, obtained from scanning, and/or selected from a photo gallery, a photo album, and/or a photo stream. Although the present disclosure is described using an image obtained from scanning as an example, one of ordinary skill in the art would understand that the disclosed methods and devices can be performed in regard to any image without limitation.

[0022] In one embodiment, the user may align a camera of a scanning device with the plurality of 2D barcodes that are pre-arranged to capture an image. The image can therefore be obtained in the scanning device. For example, the scanning device can use the 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of the plurality of 2D barcodes in the image obtained from scanning. In an exemplary embodiment where the scanned image contains five 2D barcodes, the scanning device can determine the barcode area in the image corresponding to each of the five 2D barcodes.

[0023] In Step 102, according to the barcode area corresponding to each 2D barcode, the image containing the plurality of 2D barcodes is segmented to provide a plurality of 2D barcode images with each barcode image corresponding to one 2D barcode of the plurality of 2D barcodes.

[0024] In various embodiments, after the scanning device determines the barcode area corresponding to each 2D barcode, according to the barcode area corresponding to each 2D barcode, the scanning device can sequentially segment the image containing the plurality of 2D barcodes to

obtain a plurality of barcode images of the 2D barcodes. For example, if the image scanning device determines the barcode area corresponding to each of the five 2D barcodes in an image, the scanning device can sequentially segment the 2D barcodes according to the barcode area corresponding to each of the five 2D barcodes and obtain barcode images corresponding to the five 2D barcodes.

[0025] In Step 103, each barcode image of the plurality of 2D barcode images is decoded to obtain data contained in each barcode image of the plurality of 2D barcode images corresponding to the plurality of 2D barcodes.

[0026] In one embodiment, after obtaining the barcode images, the scanning device can sequentially decode each barcode image of the plurality of 2D barcode images to obtain data contained in each barcode image. For example, if the scanning device obtains barcode images corresponding to five 2D barcodes, the scanning device can sequentially decode each barcode image of the five 2D barcode images to obtain data contained in each barcode image.

[0027] As disclosed herein, by using the 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes, the image containing the plurality of 2D barcodes can be sequentially segmented to obtain a plurality of 2D barcode images. Each barcode image of the plurality of 2D barcode images corresponding to the 2D barcodes can be decoded to obtain data contained in each barcode image of the plurality of 2D barcodes. This effectively realizes batch scanning and recognition of a plurality of 2D barcodes and simplifies scanning and recognition operations of 2D barcodes. This also saves operation time and increases operation efficiency.

[0028] FIG. 2 depicts another exemplary method for batch scanning 2D barcodes in accordance with various disclosed embodiments.

[0029] In Step 201, an image, e.g., from scanning, is binarized to provide a binary image.

[0030] In one embodiment, the user can align a camera of a scanning device with a plurality of 2D barcodes according to a predetermined arrangement to sort the image, such that the scanning device obtains barcode images of the plurality of 2D barcodes. In addition, the scanning device can

binarize the image from scanning to obtain a binary image. Such binarizing process refers to a process to set a gray value of the pixel to be about 0 or about 255, such that the entire image has a clear black and white effect.

[0031] For example, the binarizing process can be carried out using the following formula:

$$g(x,y)=\begin{cases}255 & , \quad f(x,y)\geq T\\ 0 & , \quad f(x,y)<T\end{cases} \qquad \text{formula (1)}$$

Where f (x, y) is a gray value of pixel (x, y), g (x, y) is a binarized value of the pixel (x, y), and T is a pre-set gray value.

[0032] In Step 202, a dilation operation and an edge detection are performed on the binary image to determine a barcode area corresponding to each 2D barcode contained in the image.

[0033] For example, after binarizing the image from scanning to obtain a binary image, the scanning device can perform a dilation operation and an edge detection on the binary image to determine the barcode area corresponding to each 2D barcode contained in the image.

[0034] In various embodiments, Step 201 and Step 202 can include a 2D barcode positioning process in the image. FIG. 3 depicts an image development when the image is processed by an exemplary 2D barcode positioning process in accordance with various disclosed embodiments. As shown in FIG. 3, the image development can include development form an original image (i.e., the image from scanning or from other suitable sources), a binarized image, a dilated image, to an image after edge detection.

[0035] In one embodiment, the scanning device can further determine the type of the 2D barcode based on the barcode area of the 2D barcode. For example, the scanning device can obtain a positioning pattern contained in the barcode area corresponding to the 2D barcode; and determine the type of the 2D barcode based on the positioning pattern.

[0036] For example, as shown in FIG. 4, an exemplary Matrix 2D barcode can include three types of positioning patterns including a positioning pattern of QR-CODE, MAXICODE, and

DATAMATRIX type. The QR-CODE type can include a positioning pattern located respectively in the upper-left corner, bottom-left corner, and upper-right corner of the barcode area. The MAXICODE type can include a positioning pattern having three equally spaced concentric rings located in the center of the barcode area. DATAMATRIX type can include a positioning pattern having two perpendicular solid lines located in adjacent sides of the barcode area.

[0037] In one embodiment, the scanning device can obtain the positioning pattern contained in barcode area corresponding to the 2D barcode. In one example, when there are three positioning patterns located respectively in three corners of the barcode area, it is determined that the 2D barcode includes the QR-CODE type. In another example, when the positioning pattern in the barcode area corresponding to the 2D barcode obtained by the scanning device includes three equally spaced concentric rings in the center of the barcode area, it is determined that the 2D barcode includes the MAXICODE type. In still another example, when the positioning pattern in the barcode area corresponding to the 2D barcode obtained by the scanning device includes two perpendicular solid lines, it is determined that the 2D barcode includes the DATAMATRIX type.

[0038] In practical applications, a 2D barcode can correspond with the positioning pattern(s) inherently contained in the 2D barcode, and the positioning pattern can be used for determining the type of 2D barcode, such that the type of 2D barcode can be determined according to the positioning pattern(s) in the barcode area corresponding to the 2D barcode.

[0039] In Step 203, according to a regional growth method, the barcode area corresponding to each 2D barcode is corrected to obtain a corrected barcode area of the 2D barcode.

[0040] In one embodiment, because boundaries of the barcode area are not sufficiently complete after the edge detection, there is a need to perform a boundary correction process to the barcode area of the 2D barcode. Therefore, after determining the barcode area corresponding to each 2D barcode in the image, the scanning device can correct the barcode area corresponding to each 2D barcode according to a regional growth method to obtain a corrected barcode area of the 2D barcode.

[0041] In Step 204, a convex hull calculation method is used to segment out the barcode images corresponding to the 2D barcodes from the image, according to the corrected barcode area of the 2D barcode.

[0042] In one embodiment, after correcting the barcode area of the 2D barcode, the scanning device can use a convex hull calculation method to segment out the barcode images corresponding to the 2D barcodes from the image according to the corrected barcode area of the 2D barcode. The segmenting process of the image containing the 2D barcodes can be performed.

[0043] In Step 205, a grid sampling is performed on each barcode image of the 2D barcode images corresponding to the 2D barcodes to obtain pixel values of the sampling points.

[0044] In Step 206, according to the pixel values of the sampling points, a binary sequence value of the 2D barcodes is obtained.

[0045] In Step 207, an error correction and a decoding process is performed on the binary sequence value of the 2D barcodes to obtain data contained in each barcode image of the 2D barcode images.

[0046] In one embodiment, after the scanning device obtains the barcode image of the 2D barcodes, the scanning device can sequentially decode the barcode image of the plurality of 2D barcodes to obtain data contained in the barcode image of each 2D barcode. For example, the barcode image of the 2D barcodes can be processed as follows.

[0047] The scanning device can perform a grid sampling on the barcode image of the 2D barcodes to obtain pixel values of sampling points. The scanning device can then determine whether the pixel values of the sampling points are greater than or equal to a preset pixel value. If a pixel value of the sampling point is greater than the pre-set pixel value, a value corresponding to the sample point is 1. If a pixel value of the sampling point is less than or equal to the pre-set pixel value, a value corresponding to the sample point is 0. In this manner, each pixel value of the sampling point can be determined and the binary sequence value corresponding to the 2D barcodes can be

obtained. In addition, the scanning device can perform error correction and decoding of the obtained binary sequence value and obtain data contained in each barcode image of the 2D barcodes.

[0048] As disclosed herein, use of image binarizing process, dilation operation, and edge detection can effectively determine that the barcode area corresponding to each 2D barcode is included in the image and can correct the barcode area corresponding to each 2D barcode to obtain a corrected barcode area. The corrected barcode area can be processed by a regional growth method and a convex hull calculation to effectively segment each 2D barcode from the image. Further, a decoding process can be performed on each barcode image of the 2D barcodes. This effectively realizes batch scanning and recognition of a plurality of 2D barcodes and simplifies scanning and recognition operations of 2D barcodes. This also saves operation time and increases operation efficiency.

[0049] For better understanding the method depicted in FIG. 2, an exemplary application scenario is provide as the following.

[0050] In this example, a user may need to scan four 2D barcodes including, e.g., a 2D barcode A, a 2D barcode B, a 2D barcode C, and a 2D barcode D. The user can arrange the four 2D barcodes in a preset manner (e.g., in two rows with each row having two 2D barcodes). The user can align a camera of the disclosed scanning device with the 2D barcodes to capture an image E. When the scanning device obtain the captured image E, the scanning device can perform a binarizing process on the image E and perform a dilation operation and an edge detection on the binarized image to determine a barcode area corresponding to each 2D barcode in the image E.

[0051] The barcode area can include positions of 2D barcode A, 2D barcode B, 2D barcode C, and 2D barcode D in the image E. The scanning device can then correct the barcode area corresponding to 2D barcode A, 2D barcode B, 2D barcode C, and 2D barcode D according to a region growth method and can use a convex hull calculation method to sequentially segment out each barcode image corresponding to the 2D barcode A, 2D barcode B, 2D barcode C, and 2D barcode D from the image according to the corrected barcode area of the 2D barcodes.

[0052] Then, the scanning device can sequentially perform a grid sampling on each barcode image of the 2D barcode A, B, C, and D to obtain pixel values of sampling points. According to the pixel values of the sampling points, the scanning device can obtain a binary sequence value of the 2D barcode A, B, C, and D.

[0053] Further, the scanning device can perform error correction and decoding of the obtained binary sequence value corresponding to the 2D barcode A, B, C, and D to obtain the data contained in each barcode image of the 2D barcode A, B, C, and D. Batch scanning of 2D barcodes can thus be performed.

[0054] FIG. 5 depicts an exemplary scanning device in accordance with various disclosed embodiments. The exemplary scanning device can include a positioning module 501, a segmenting module 502, and/or a decoding module 503.

[0055] The positioning module 501 is configured to use a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image, e.g., obtained from scanning.

[0056] The segmenting module 502 is configured, after the positioning module 501 determines the barcode area, and according to the barcode area corresponding to each 2D barcode, to sequentially segment the image containing the plurality of 2D barcodes to obtain a plurality of 2D barcode images.

[0057] The decoding module 503 is configured, after the segmenting module 502 obtains barcode images corresponding to the 2D barcodes, to sequentially decode each barcode image of the plurality of 2D barcode images to obtain data contained in each barcode image of the plurality of 2D barcodes.

[0058] As disclosed, the positioning module 501 in the scanning device 500 uses a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes. The segmenting module 502, according to the barcode area corresponding to each 2D barcode, sequentially segments the plurality of 2D barcodes to obtain the plurality of 2D

barcode images. The decoding module 503 sequentially decodes each barcode image of the plurality of 2D barcode images to obtain data contained in each barcode image of the plurality of 2D barcode images.

[0059] As disclosed herein, by using the 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes, the plurality of 2D barcodes can be sequentially segmented to obtain the plurality of 2D barcode images. Each barcode image of the plurality of 2D barcode images can be decoded to obtain data contained in each barcode image of the plurality of 2D barcode images. This effectively realizes batch scanning and recognition of a plurality of 2D barcodes and simplifies scanning and recognition operations of 2D barcodes. This also saves operation time and increases operation efficiency.

[0060] FIG. 6 depicts another exemplary scanning device in accordance with various disclosed embodiments. The exemplary scanning device depicted in FIG.6 can also include a positioning module 501, a segmenting module 502, and/or a decoding module 503, as depicted in FIG. 5.

[0061] For example, the positioning module 501 in FIG. 6 can include a binarizing module 601, and/or a barcode area determining module 602.

[0062] The binarizing module 601 is configured to binarize an image to obtain a binary image. The barcode area determining module 602 is configured, after the binarizing module 601 binarizes the image, to perform a dilation operation and an edge detection on the binary image to determine the barcode area corresponding to each 2D barcode contained in the binary image.

[0063] The exemplary scanning device depicted in FIG. 6 further includes: a type determining module 603. The type determining module 603 is configured to obtain a positioning pattern contained in a barcode area corresponding to each 2D barcode and to determine the type of the 2D barcode based on the positioning pattern.

[0064] The segmenting module 502 in FIG. 6 can include a correcting module 604 and/or an area segmenting module 605.

[0065] The correcting module 604 is configured, according to a regional growth method, to correct the barcode area corresponding to each 2D barcode to obtain corrected barcode area of the 2D barcode.

[0066] The area segmenting module 605 is configured, after the correcting module 604 obtains the corrected barcode area of the 2D barcode, to use a convex hull calculation method to segment out the barcode images corresponding to the 2D barcodes from the image according to the corrected barcode area of the 2D barcode.

[0067] The decoding module 503 in FIG. 6 can also include a sampling module 606, a binary sequence value obtaining module 607, and/or a processing module 608.

[0068] The sampling module 606 is configured to perform a grid sampling on each barcode image of the 2D barcode images to obtain pixel values of the sampling points.

[0069] The binary sequence value obtaining module 607 is configured, after the sampling module 606 obtains the pixel values of the sampling points, according to the pixel values of sampling points, to obtain a binary sequence value of the 2D barcodes.

[0070] The processing module 608 is configured, after the binary sequence value obtaining module 607 obtains the binary sequence value of the 2D barcodes, to perform an error correction and decoding process on the binary sequence value of the 2D barcodes to obtain data contained in each barcode image of the 2D barcodes.

[0071] As disclosed herein, the binarizing module 601 in the positioning module 501 in the scanning device can binarize an image to obtain a binary image. The barcode area determining module 602 can perform a dilation operation and an edge detection on the binary image to determine the barcode area corresponding to each 2D barcode contained in the binary image. Optionally, the type determining module 603 can obtain a positioning pattern contained in barcode area corresponding to the 2D barcode and to determine the type of the 2D barcode based on the positioning pattern.

[0072] Additionally, the correcting module 604 in the segmenting module 502 in the scanning device can correct the barcode area corresponding to each 2D barcode to obtain a corrected barcode area of the 2D barcode, according to a regional growth method. The area segmenting module 605 can then use a convex hull calculation method to segment out the barcode images corresponding to the 2D barcodes from the image according to the corrected barcode area of the 2D barcode.

[0073] Further, the sampling module 606 in the decoding module 503 in the scanning device can perform a grid sampling on each barcode image of the 2D barcodes to obtain pixel values of the sampling points. The binary sequence value obtaining module 607 obtains a binary sequence value of the 2D barcodes according to the pixel values of sampling points. The processing module 608 performs an error correction and decoding process on the binary sequence value of the 2D barcodes to obtain data contained in each barcode image of the 2D barcodes.

[0074] As disclosed herein, use of image binarizing process, dilation operation, and edge detection can effectively determine that the barcode area corresponding to each 2D barcode is included in the image and can correct the barcode area corresponding to each 2D barcode to obtain a corrected barcode area. The corrected barcode area can be processed by a regional growth method and a convex hull calculation to effectively segment each 2D barcode from the image. Further, a decoding process can be performed on each barcode image of the 2D barcode images corresponding to the 2D barcodes. This effectively realizes batch scanning and recognition of a plurality of 2D barcodes and simplifies scanning and recognition operations of 2D barcodes. This also saves operation time and increases operation efficiency.

[0075] It should be noted that, in the present disclosure each embodiment is progressively described, i.e., each embodiment is described and focused on difference between embodiments. Similar and/or the same portions between various embodiments can be referred to with each other. In addition, exemplary apparatus is described with respect to corresponding methods.

[0076] Note that, the term "comprising", "including" or any other variants thereof are intended to cover a non-exclusive inclusion, such that the process, method, article, or apparatus containing a number of elements also include not only those elements, but also other elements that are not expressly listed; or further include inherent elements of the process, method, article or apparatus. Without further restrictions, the statement "includes a ....." does not exclude other elements included in the process, method, article, or apparatus having those elements.

[0077] A person of ordinary skill in the art can understand that the modules included herein are described according to their functional logic, but are not limited to the above descriptions as long as the modules can implement corresponding functions. Further, the specific name of each functional module is used for distinguishing from on another without limiting the protection scope of the present disclosure.

[0078] In various embodiments, the disclosed modules can be configured in one apparatus or configured in multiple apparatus as desired. The modules disclosed herein can be integrated in one module or in multiple modules. Each of the modules disclosed herein can be divided into one or more sub-modules, which can be recombined in any manner.

[0079] One of ordinary skill in the art would appreciate that suitable software and/or hardware (e.g., a universal hardware platform) may be included and used in the disclosed methods and devices. For example, the disclosed embodiments can be implemented by hardware only, which alternatively can be implemented by software products only. The software products can be stored in a computer-readable storage medium including, e.g., ROM/RAM, magnetic disk, optical disk, etc. The software products can include suitable commands to enable a terminal device (e.g., including a mobile phone, a personal computer, a server, or a network device, etc.) to implement the disclosed embodiments.

[0080] The embodiments disclosed herein are exemplary only. Other applications, advantages, alternations, modifications, or equivalents to the disclosed embodiments are obvious to those skilled in the art and are intended to be encompassed within the scope of the present disclosure.

INDUSTRIAL APPLICABILITY AND ADVANTAGEOUS EFFECTS

[0081] Without limiting the scope of any claim and/or the specification, examples of industrial applicability and certain advantageous effects of the disclosed embodiments are listed for illustrative purposes. Various alternations, modifications, or equivalents to the technical solutions of the disclosed embodiments can be obvious to those skilled in the art and can be included in this disclosure.

[0082] As disclosed herein, by using the 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image, the plurality of 2D barcodes can be sequentially segmented to obtain a plurality of barcode images corresponding to the plurality of 2D barcodes. Each barcode image of the plurality of barcode images can be decoded to obtain data contained in each barcode image. This effectively realizes batch scanning and recognition of a plurality of 2D barcodes and simplifies scanning and recognition operations of 2D barcodes. This also saves operation time and increases operation efficiency.

[0083] As also disclosed herein, use of image binarizing process, dilation operation, and edge detection can effectively determine that the barcode area corresponding to each 2D barcode is included in the image and can correct the barcode area corresponding to each 2D barcode to obtain a corrected barcode area. The corrected barcode area can be processed by a regional growth method and a convex hull calculation to effectively segment each 2D barcode from the image. Further, a decoding process can be performed on each barcode image of the 2D barcode images corresponding to the 2D barcodes. This effectively realizes batch scanning and recognition of a plurality of 2D barcodes and simplifies scanning and recognition operations of 2D barcodes. This also saves operation time and increases operation efficiency.

REFERENCE SIGN LIST

Positioning module 501

Segmenting module 502

Decoding module 503

Binarizing module 601

Barcode area determining module 602

Type determining module 603

Correcting module 604

Area segmenting module 605

Sampling module 606

Binary sequence value obtaining module 607

Processing module 608

Claims

1. A method for batch scanning 2D barcodes comprising:

using a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image;

according to the barcode area corresponding to the each 2D barcode, segmenting the image containing the plurality of 2D barcodes to obtain a plurality of barcode images with each barcode image corresponding to a 2D barcode of the plurality of 2D barcodes; and

decoding the each barcode image of the plurality of barcode images corresponding to the plurality of 2D barcodes to obtain data contained in the each barcode image.

2. The method of claim 1, wherein the using of the 2D barcode positioning process to determine the barcode area corresponding to the each 2D barcode comprises:

binarizing the image to obtain a binary image; and

performing a dilation operation and an edge detection on the binary image to determine the barcode area corresponding to the each 2D barcode contained in the image.

3. The method of any claim of claims 1 and 2, wherein the using of the 2D barcode positioning process to determine the barcode area corresponding to the each 2D barcode further comprises:

obtaining a positioning pattern contained in the barcode area corresponding to the each 2D barcode; and

determining a type of the each 2D barcode based on the positioning pattern.

4. The method of claim 3, wherein the segmenting of the image containing the plurality of 2D barcodes to obtain the plurality of 2D barcode images comprises:

according to a regional growth method, correcting the barcode area corresponding to the each 2D barcode to obtain a corrected barcode area of the each 2D barcode; and

using a convex hull calculation method, according to the corrected barcode area of the each 2D barcode, to segment out the plurality of barcode images corresponding to the plurality of 2D barcodes from the image.

5. The method of claim 4, wherein the decoding of the each barcode image of the plurality of barcode images corresponding to the plurality of 2D barcodes to obtain the data contained in the each barcode image comprises:

performing a grid sampling on the each barcode image of the plurality of 2D barcode images corresponding to the plurality of 2D barcodes to obtain pixel values of sampling points;

according to the pixel values of the sampling points, obtaining a binary sequence value of the plurality of 2D barcodes; and

performing an error correction and a decoding process on the binary sequence value of the plurality of 2D barcodes to obtain data contained in the each barcode image of the plurality of 2D barcode images corresponding to the plurality of 2D barcodes.

6. A device for batch scanning 2D barcodes comprising:

a positioning module, configured to use a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image;

a segmenting module, configured to segment the image containing the plurality of 2D barcodes to obtain a plurality of 2D barcode images with each barcode image corresponding to one 2D barcode of the plurality of 2D barcodes, after the positioning module determines the barcode area and according to the determined barcode area corresponding to the each 2D barcode; and

a decoding module, configured to decode the each barcode image of the plurality of 2D barcode images corresponding to the plurality of 2D barcodes to obtain data contained in the each barcode image, after the segmenting module obtains the plurality of 2D barcode images.

7. The device of claim 6, wherein the positioning module comprises:

a binarizing module, configured to binarize the image to obtain a binary image; and

a barcode area determining module, configured to perform a dilation operation and an edge detection on the binary image to determine the barcode area corresponding to the each 2D barcode contained in the image.

8. The device of any claim of claims 6 and 7, further comprising:

a type determining module, configured to obtain a positioning pattern contained in the barcode area corresponding to the each 2D barcode and to determine a type of the each 2D barcode based on the positioning pattern.

9. The device of claim 8, wherein the segmenting module comprises:

a correcting module, configured to correct the barcode area corresponding to the each 2D barcode to obtain a corrected barcode area of the each 2D barcode according to a regional growth method; and

an area segmenting module, configured to use a convex hull calculation method, according to the corrected barcode area of the each 2D barcode, to segment out the barcode images corresponding to the plurality of 2D barcodes from the image.

10. The device of claim 9, wherein the decoding module comprises:

a sampling module, configured to perform a grid sampling on the each barcode image of the plurality of 2D barcodes to obtain pixel values of sampling points;

a binary sequence value obtaining module, configured to obtain a binary sequence value of the plurality of 2D barcodes according to the pixel values of the sampling points; and

a processing module, configured to perform an error correction and decoding process on the binary sequence value of the plurality of 2D barcodes to obtain data contained in the each barcode image of the plurality of 2D barcodes.

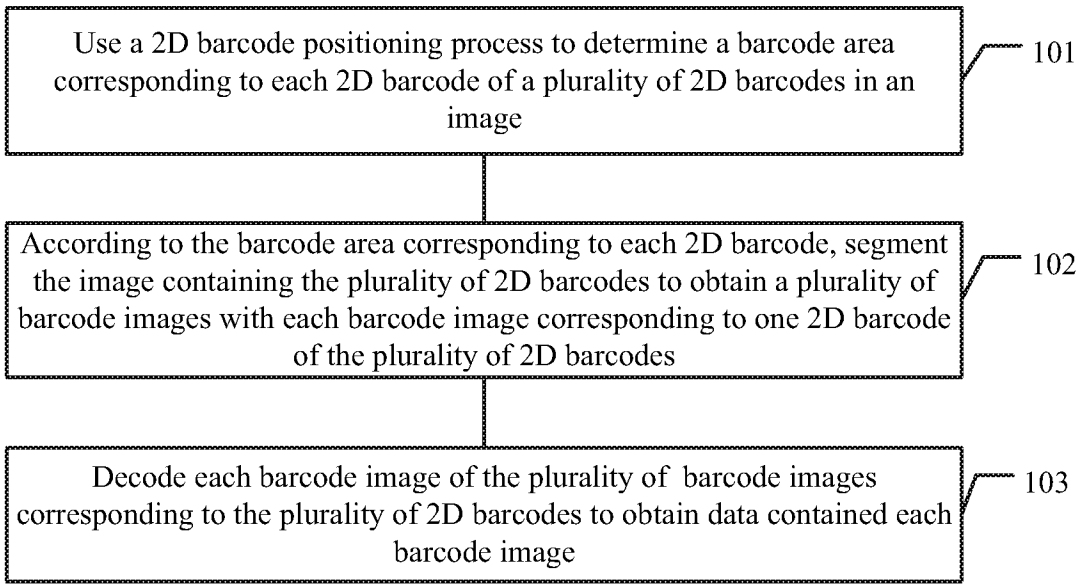

Use a 2D barcode positioning process to determine a barcode area corresponding to each 2D barcode of a plurality of 2D barcodes in an image
101
According to the barcode area corresponding to each 2D barcode, segment the image containing the plurality of 2D barcodes to obtain a plurality of barcode images with each barcode image corresponding to one 2D barcode of the plurality of 2D barcodes
102
Decode each barcode image of the plurality of barcode images corresponding to the plurality of 2D barcodes to obtain data contained each barcode image
103

FIG. 1

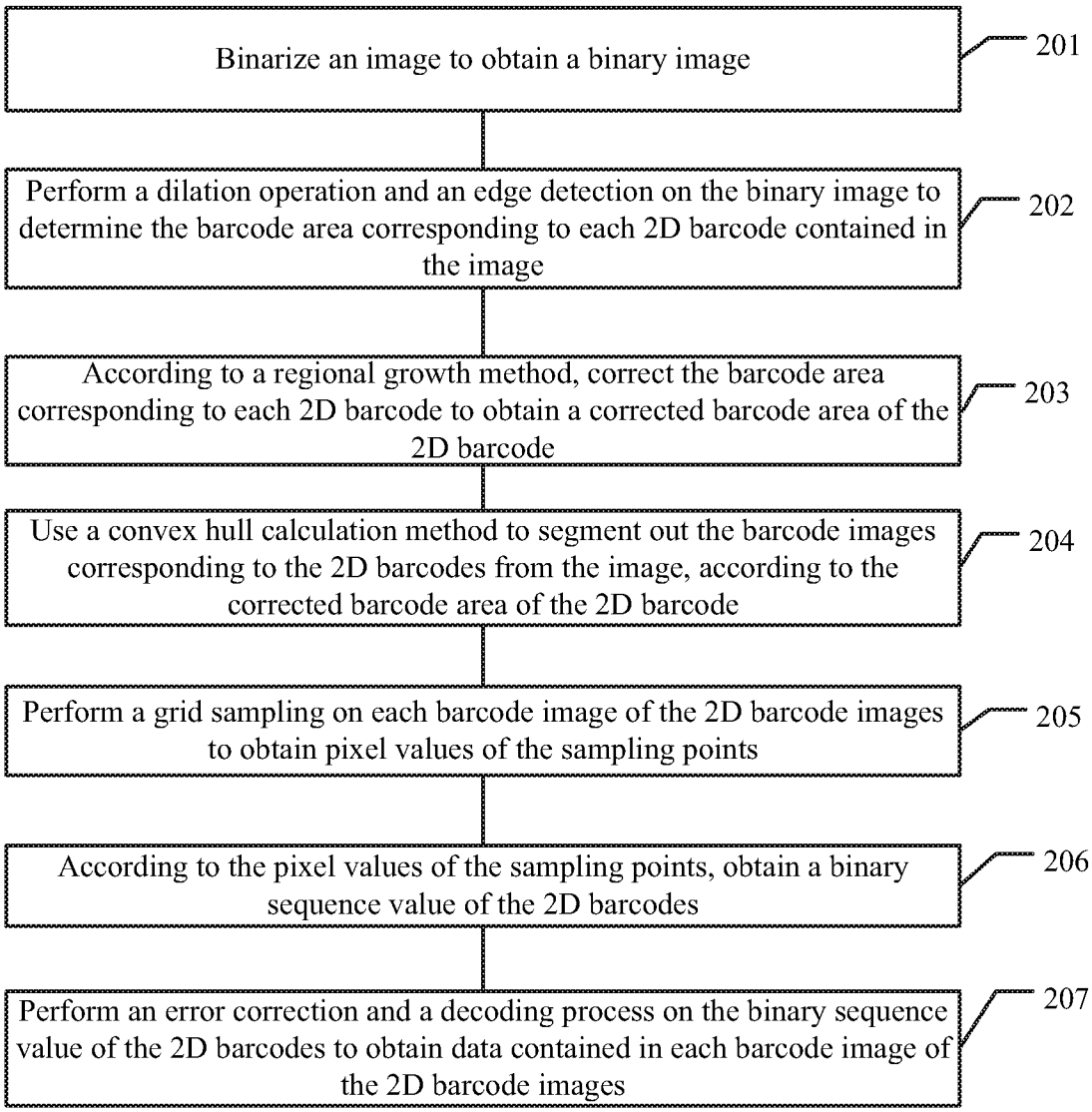
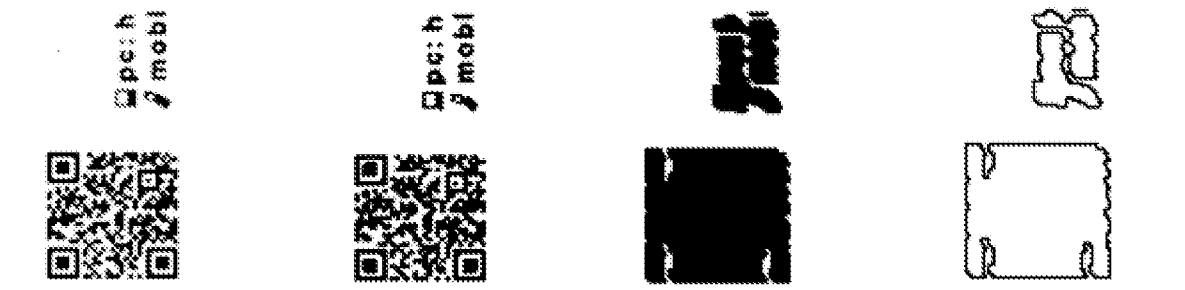
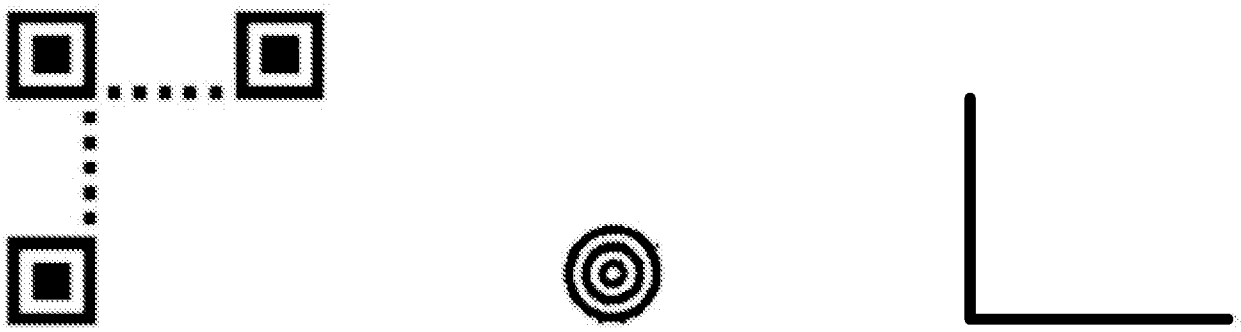

Binarize an image to obtain a binary image
201
Perform a dilation operation and an edge detection on the binary image to determine the barcode area corresponding to each 2D barcode contained in the image
202
According to a regional growth method, correct the barcode area corresponding to each 2D barcode to obtain a corrected barcode area of the 2D barcode
203
Use a convex hull calculation method to segment out the barcode images corresponding to the 2D barcodes from the image, according to the corrected barcode area of the 2D barcode
204
Perform a grid sampling on each barcode image of the 2D barcode images to obtain pixel values of the sampling points
205
According to the pixel values of the sampling points, obtain a binary sequence value of the 2D barcodes
206
Perform an error correction and a decoding process on the binary sequence value of the 2D barcodes to obtain data contained in each barcode image of the 2D barcode images
207

FIG. 2



A. Original image B. Binarized image C. Dilated image D. Image after edge detection

FIG. 3



A. QR-CODE positioning pattern B: MAXICODE positioning pattern C. DATAMATRIX positioning pattern

FIG. 4

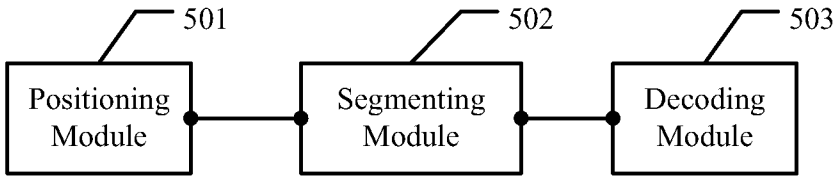


FIG. 5

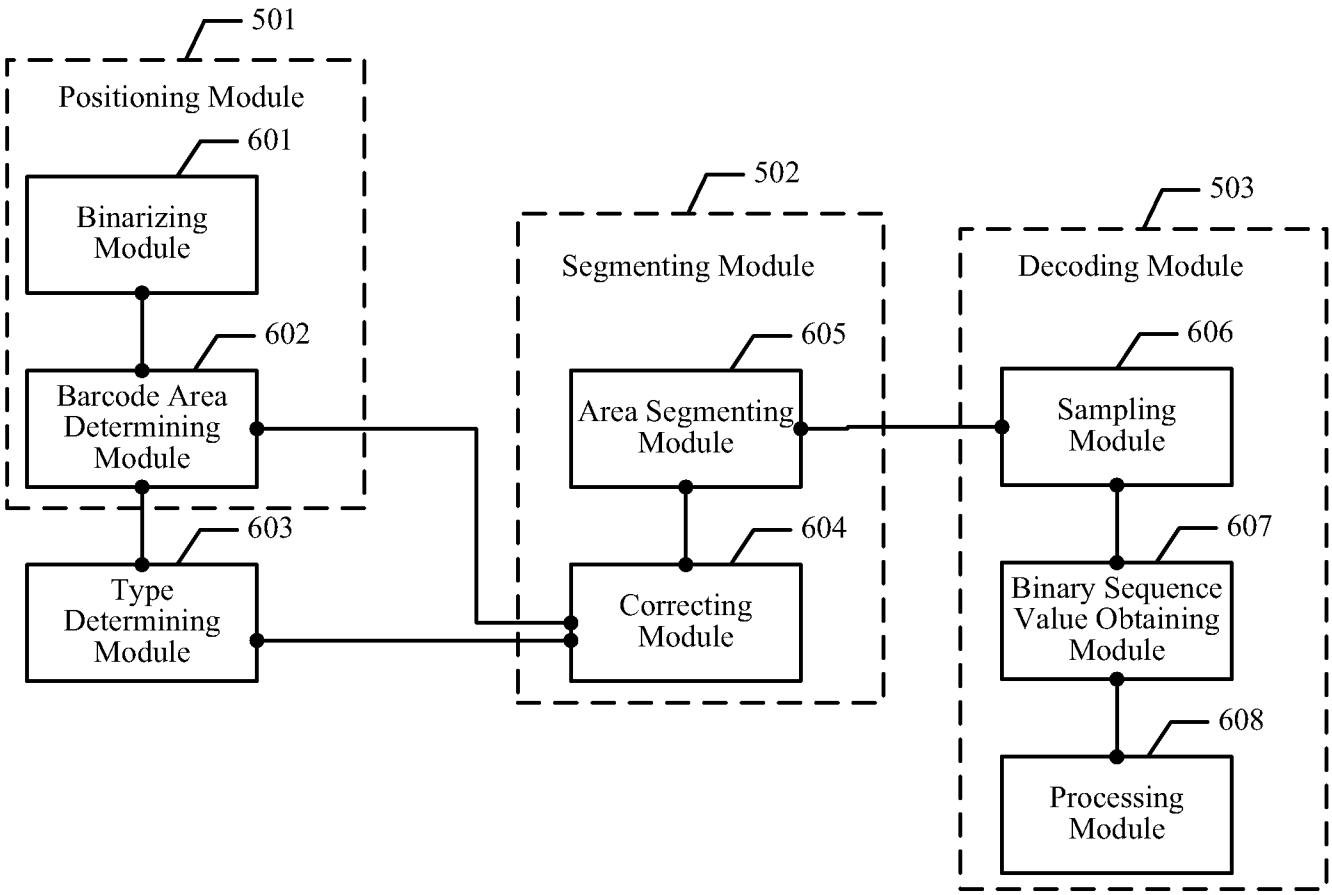

501
Positioning Module
601
Binarizing Module
602
Barcode Area Determining Module
603
Type Determining Module
502
Segmenting Module
605
Area Segmenting Module
604
Correcting Module
503
Decoding Module
606
Sampling Module
607
Binary Sequence Value Obtaining Module
608
Processing Module

FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/083581

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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)

IPC: G06K 7/-; G06K 9/-

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)

CNPAT, WPI, EPODOC, CNKI: barcode?, bar, code?, plura+, multi+, segment+, divid+, position+, decod+, binariz+, dilat+, edge

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 102446264 A (AEROSPACE INFORMATION CO., LTD.) 09 May 2012 (09.05.2012) description, paragraphs [0070] to [0085]	1,6
Y		2-5,7-10
Y	ZHU, Mingli et al. A 2D Barcode Identifying System Based on Image Processing. Computer & Information Technology. September 2005, pages 4-5 and 33	2-5,7-10
PX	CN 102880850 A (TENCENT TECHNOLOGY SHENZHEN CO., LTD.) 16 January 2013 (16.01.2013) claims 1 to 10	1-10
A	US 5481098 A (SPECTRA-PHYSICS SCANNING SYSTEMS, INC.) 02 January 1996 (02.01.1996) the whole document	1-10
A	CN 101882211 A (FUJIAN NEWLAND COMPUTER CO., LTD.) 10 November 2010 (10.11.2010) the whole document	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

"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

"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

"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

"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

"&"document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
07 November 2013 (07.11.2013)	**19 Dec. 2013 (19.12.2013)**
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer LONG, Xuanyao Telephone No. (86-10)62413437

Form PCT/ISA /210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2013/083581

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 102446264 A	09.05.2012	None	
CN 102880850 A	16.01.2013	None	
US 5481098 A	02.01.1996	None	
CN 101882211 A	10.11.2010	None	

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2013/083581

CLASSIFICATION OF SUBJECT MATTER

G06K 7/10 (2006.01) i
G06K 9/60 (2006.01) i
G06K 9/46 (2006.01) i