

NARROW-STRIP 2-DIMENSIONAL BAR CODES, METHODS, APPARATUSES, AND DEVICES FOR GENERATING AND IDENTIFYING NARROW-STRIP 2- DIMENSIONAL BAR CODES

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TECHNICAL FIELD

[0001] One or more embodiments of the present specification relate to the field of image processing technologies, and in particular, to narrow-strip 2-dimensional bar codes and methods, apparatuses, and devices for generating and identifying narrow-strip 2-dimensional bar codes.

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BACKGROUND

[0002] A 2-dimensional bar code (2-dimensional bar code) is a barcode that records information by using graphs distributed in a 2-dimensional direction of a plane based on a specific rule. Quick Response 2-dimensional bar codes (QR codes for short) are most common. Conventional QR codes typically provide three large pile-point structures for positioning. In a binary 2-dimensional bar code, a black-and-white length ratio of a line segment of the large pile-point structure satisfies 1:1:3:1:1. However, in some scenarios, for example, when the 2-dimensional bar code is used to record information related to a book number, because space used to post the 2-dimensional bar code is relatively small, a conventional 2-dimensional bar code is not easy to use.

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[0003] Therefore, a 2-dimensional bar code needs to be generated, so as to facilitate use when use space is relatively small.

SUMMARY

[0004] One or more embodiments of the present specification describe narrow-strip 2-dimensional bar codes and methods, apparatuses, and devices for generating and identifying narrow-strip 2-dimensional bar codes, so as to generate a small 2-dimensional bar code, which can be conveniently used when space is relatively small.

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[0005] According to a first aspect, a method for generating a narrow-strip 2-dimensional bar code is provided, including the following: a rectangular region is determined, where the rectangular region includes blocks to be filled and arranged in a grid shape; two square regions at two vertices in the rectangular region are separately
5 filled with two positioning graphs, where each positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round; for each positioning graph in the rectangular region, a region surrounding the positioning graph is filled with first color blocks, to form a corresponding isolation region; and a data
10 region is filled with a first color block and a second color block that are corresponding to 2-dimensional bar code data, where the data region is a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

[0006] According to a second aspect, a method for identifying a narrow-strip 2-dimensional bar code is provided, including the following: an image of a narrow-strip
15 2-dimensional bar code is obtained; a positioning graph in the image is detected, where the positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round, and where the positioning graph has an isolation region formed by first color blocks at the periphery; when the two positioning graphs are detected, a
20 target region that includes a rectangular region corresponding to the narrow-strip 2-dimensional bar code is determined from the image and based on center positions of the two positioning graphs; a data region to be identified is determined from the target region; and 2-dimensional bar code data of the data region is identified.

[0007] According to a third aspect, a narrow-strip 2-dimensional bar code is
25 provided, including: two positioning graphs, where the two positioning graphs are located at two vertices of a rectangular region, each positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round; two isolation regions, each of which is formed by first color blocks, in the rectangular region,
30 surrounding one of the positioning graphs; and a data region, used to form 2-dimensional bar code data and including a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

[0008] According to a fourth aspect, an apparatus for generating a narrow-strip 2-dimensional bar code is provided, including: a determining unit, configured to

determine a rectangular region, where the rectangular region includes blocks to be filled and arranged in a grid shape; and a filling unit, configured to separately fill, with two positioning graphs, two square regions at two vertices in the rectangular region determined by the determining unit, where each positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round; the filling unit is further configured to: for each positioning graph in the rectangular region determined by the determining unit, fill a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region; and the filling unit is further configured to fill a data region with a first color block and a second color block that are corresponding to 2-dimensional bar code data, where the data region is a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

[0009] According to a fifth aspect, an apparatus for identifying a narrow-strip 2-dimensional bar code is provided, including: an acquisition unit, configured to obtain an image of a narrow-strip 2-dimensional bar code; a detection unit, configured to detect a positioning graph in the image obtained by the acquisition unit, where the positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round, and where the positioning graph has an isolation region formed by first color blocks at the periphery; a determining unit, configured to: when the detection unit detects the two positioning graphs, determine, from the image and based on center positions of the two positioning graphs, a target region that includes a rectangular region corresponding to the narrow-strip 2-dimensional bar code; where the determining unit is further configured to determine a data region to be identified from the target region; and an identification unit, configured to identify 2-dimensional bar code data of the data region determined by the determining unit.

[0010] According to a sixth aspect, a device for generating a narrow-strip 2-dimensional bar code is provided, including: a memory; one or more processors; and one or more programs, where the one or more programs are stored in the memory and configured to be executed by the one or more processors, the program being executed by the processor to implement the following steps: determining a rectangular region, where the rectangular region includes blocks to be filled and arranged in a grid shape; separately filling two square regions at two vertices in the rectangular region with two

positioning graphs, where each positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round; for each positioning graph in the rectangular region, filling a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region; and filling a data region with a first color block and a second color block that are corresponding to 2-dimensional bar code data, where the data region is a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

[0011] According to a seventh aspect, a device for identifying a narrow-strip 2-dimensional bar code is provided, including: a memory; one or more processors; and one or more programs, where the one or more programs are stored in the memory and configured to be executed by the one or more processors, the program being executed by the processor to implement the following steps: obtaining an image of a narrow-strip 2-dimensional bar code; detecting a positioning graph in the image, where the positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round, and where the positioning graph has an isolation region formed by first color blocks at the periphery; when the two positioning graphs are detected, determining, from the image and based on center positions of the two positioning graphs, a target region that includes a rectangular region corresponding to the narrow-strip 2-dimensional bar code; determining a data region to be identified from the target region; and identifying 2-dimensional bar code data of the data region.

[0012] One or more embodiments of the present specification provide a narrow-strip 2-dimensional bar code and a method, an apparatus, and a device for generating and identifying a narrow-strip 2-dimensional bar code. The method includes: determining a rectangular region, where the rectangular region includes blocks to be filled and arranged in a grid shape; separately filling two square regions at two vertices in the rectangular region with two positioning graphs, where each positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round; for each positioning graph in the rectangular region, filling a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region; and filling a data region with a first color block and a second color block that are corresponding to 2-dimensional bar code data, where the data region is a region in the

rectangular region excluding the two positioning graphs and corresponding isolation regions. It can be understood that the narrow-strip 2-dimensional bar code generated in the present specification can include only two positioning graphs, so the area of the narrow-strip 2-dimensional bar code can be greatly reduced, facilitating use when space is relatively small.

BRIEF DESCRIPTION OF DRAWINGS

[0013] To describe the technical solutions in the embodiments of the present specification more clearly, the following briefly describes the accompanying drawings needed for describing the embodiments. Clearly, the accompanying drawings in the following description show merely some embodiments of the present specification, and a person of ordinary skill in the art can still derive other drawings from these accompanying drawings without creative efforts.

[0014] FIG. 1 is a flowchart illustrating a method for generating a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification;

[0015] FIG. 2a is a schematic diagram 1 illustrating a positioning graph, according to the present specification;

[0016] FIG. 2b is a schematic diagram 2 illustrating a positioning graph, according to the present specification;

[0017] FIG. 3 is a schematic diagram illustrating an isolation region of a positioning graph, according to the present specification;

[0018] FIG. 4 is a schematic diagram illustrating a narrow-strip 2-dimensional bar code, according to the present specification;

[0019] FIG. 5 is a flowchart illustrating a method for identifying a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification;

[0020] FIG. 6 is a schematic diagram illustrating an apparatus for generating a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification;

[0021] FIG. 7 is a schematic diagram illustrating an apparatus for identifying a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification;

[0022] FIG. 8 is a schematic diagram illustrating a device for generating a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification; and

[0023] FIG. 9 is a schematic diagram illustrating a device for identifying a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification.

DESCRIPTION OF EMBODIMENTS

[0024] The following describes the solutions provided in the present specification with reference to the accompanying drawings.

10 [0025] FIG. 1 is a flowchart illustrating a method for generating a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification. The method can be performed by a device having a processing capability, such as a server, a system, or an apparatus. As shown in FIG. 1, the method can specifically include the following steps.

15 [0026] Step 102: Determine a rectangular region.

[0027] The rectangular region can include blocks to be filled and arranged in a grid shape. The blocks here can correspond to several pixels. It is worthwhile to note that, in the initially determined rectangular region, pixel values of these pixels are not yet determined, so a color value of each block in the rectangular region is null.

20 [0028] It is worthwhile to note that a size (or an area) of the generated rectangular region can be $N \times M$, where N is the width of the rectangular region, and M is the length of the rectangular region. In the present specification, M can be greater than N . For example, in an example, N can be 6, and M can be 23. In another example, N can be 7, and M can be 20. It is worthwhile to note that, to ensure that a subsequently generated
25 narrow-strip 2-dimensional bar code can store enough data, the size of the rectangular region can be set to be greater than 120, that is, $N \times M > 120$.

[0029] Step 104: Separately fill two square regions at two vertices in the rectangular region with two positioning graphs.

[0030] The two vertices here can be two vertices at two ends of a diagonal line of
30 the rectangular region, or can be two vertices at two ends of a rectangular long side of the rectangular region.

[0031] Each positioning graph can include a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round. The first color block here can be a white block, or can be a black block. It can be understood that when the first color block is a white block, the second color block is a black block. When the first color block is a black block, the second color block is a white block.

[0032] In addition, a width ratio of the square structure of the positioning graph and the enclosure structure can be 1:1, that is, in a horizontal direction and/or a vertical direction, a width ratio of the second color block, the first color block, and the second color block of the positioning graph can be 1:1:1.

[0033] In an example, the positioning graph can be shown in FIG. 2a. In FIG. 2a, the central square structure of the positioning graph includes one white block, and the enclosure structure surrounding the square structure by one round includes eight black blocks. In addition, in the horizontal and/or vertical direction, the width ratio of the black block, the white block, and the black block of the positioning graph is 1:1:1.

[0034] In another example, the positioning graph can be shown in FIG. 2b. In FIG. 2b, the central square structure of the positioning graph includes four white blocks, and the enclosure structure surrounding the square structure by one round includes 32 black blocks. In addition, in the horizontal and/or vertical direction, the width ratio of the black block, the white block, and the black block of the positioning graph is 2:2:2, that is, the width ratio of the positioning graph is also 1:1:1.

[0035] Certainly, in practice, the white block in FIG. 2a and FIG. 2b can also be replaced with a black block, and the black block can also be replaced with a white block. This is not limited in the present specification.

[0036] It can be understood that the positioning graph in the narrow-strip 2-dimensional bar code generated in the present specification occupies smaller area than a conventional large pile-point structure. In addition, in the present specification, only two positioning graphs are generated. This can reserve more regions for a data region, that is, the narrow-strip 2-dimensional bar code can store more 2-dimensional bar code data.

[0037] Step 106: For each positioning graph in the rectangular region, fill a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region.

[0038] The width of the isolation region can be the width of one block. Using the positioning graph in FIG. 2a as an example, an isolation region corresponding to the positioning graph can be shown in FIG. 3.

[0039] Step 108: Fill a data region with a first color block and a second color block that are corresponding to 2-dimensional bar code data.

[0040] The data region here can be a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

[0041] After the filling step is completed, a narrow-strip 2-dimensional bar code can be obtained. In an example, the generated narrow-strip 2-dimensional bar code can be shown in FIG. 4. In FIG. 4, the length of the narrow-strip 2-dimensional bar code is greater than the width thereof, and the narrow-strip 2-dimensional bar code can include: two positioning graphs, where the two positioning graphs are respectively located at two vertices on two ends of a diagonal line of a rectangular region, and each positioning graph includes a central white square formed by a white block, and a black enclosure formed by black blocks and surrounding the white square by one round. For each positioning graph, a width ratio of a black block, a white block, and a black block in a horizontal and/or vertical direction is 1:1:1. In addition, the narrow-strip 2-dimensional bar code can further include two isolation regions and a data region used to form 2-dimensional bar code data. Each isolation region is formed by white blocks surrounding one positioning graph in the rectangular region. The data region includes a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

[0042] It is worthwhile to note that FIG. 4 shows only a shape structure of the narrow-strip 2-dimensional bar code. In another example, the two positioning graphs can also be located at vertices of the lower left corner and the upper right corner of the rectangular region, or located at two vertices at two ends of a rectangular long side of the rectangular region. In addition, the length of the narrow-strip 2-dimensional bar code can also be less than the width thereof, which is not limited in the present specification.

[0043] In summary, while a data capacity is ensured, the narrow-strip 2-dimensional bar code generated in the embodiments can occupy a relatively small area, thereby facilitating use of the narrow-strip 2-dimensional bar code when use space is relatively small.

[0044] It is worthwhile to note that, for the generated narrow-strip 2-dimensional bar code, the present specification further provides a corresponding method for identifying the narrow-strip 2-dimensional bar code, which is specifically as follows:

[0045] FIG. 5 is a flowchart illustrating a method for identifying a narrow-strip 2-dimensional bar code, according to some embodiments of the present specification. The method can be performed by a device having a processing capability, such as a server, a system, or an apparatus. As shown in FIG. 5, the method can specifically include the following steps.

[0046] Step 502: Obtain an image of a narrow-strip 2-dimensional bar code.

[0047] The narrow-strip 2-dimensional bar code here can be a 2-dimensional bar code whose length is greater than the width, or a 2-dimensional bar code whose length is less than the width.

[0048] Step 504: Detect a positioning graph in the image.

[0049] The positioning graph can include a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round. The positioning graph can have an isolation region formed by first color blocks at the periphery. In an example, the positioning graph and the corresponding isolation region can be shown in FIG. 3.

[0050] In addition, a width ratio of a second color block, a first color block, and a second color block of the positioning graph in a horizontal and/or vertical direction can be 1:1:1. Therefore, the positioning graph can be detected in the image based on this structural feature.

[0051] Step 506: When two positioning graphs are detected, determine, from the image and based on center positions of the two positioning graphs, a target region that includes a rectangular region corresponding to the narrow-strip 2-dimensional bar code.

[0052] Specifically, when the two positioning graphs are respectively located at two vertices at two ends of a diagonal line of the rectangular region, the determining process of the target region can be: determining, based on the center positions of the two positioning graphs, the diagonal line of the rectangular region corresponding to the narrow-strip 2-dimensional bar code; and determining, from the image and based on the diagonal line, the target region including the rectangular region.

[0053] When the two positioning graphs are respectively located at two vertices at two ends of a rectangular long side of the rectangular region, the target region can be determined based on the center positions of the two positioning graphs and another

positioning graph. Another positioning graph here can be, for example, two black blocks at the lower left corner and the upper right corner of FIG. 4.

[0054] Step 508: Determine a data region to be identified from the target region.

[0055] It is worthwhile to note that the target region determined by using step 508 is only an approximate position of the narrow-strip 2-dimensional bar code in the image. To improve identification efficiency of the narrow-strip 2-dimensional bar code, the corresponding rectangular region can further be positioned in the target region. For example, a contour of the rectangular region can be extracted from the target region based on an erode algorithm. Then, the data region to be identified is determined based on the extracted contour.

[0056] In some embodiments, the process of determining the data region to be identified based on the extracted contour can be: scanning the extracted contour, and in the scanning process, repeatedly performing the following steps: selecting two points from the contour and calculating a slope of a connection line constructed by using the two points; after the extracted contour is scanned by one round, counting times of occurrence of each slope; determining a horizontal direction of the narrow-strip 2-dimensional bar code based on a slope of maximum quantity of occurrences; constructing a central connection line based on the center positions of the two positioning graphs; determining an angle of the central connection line relative to the horizontal direction; determining four vertices of the narrow-strip 2-dimensional bar code based on the center positions of the two positioning graphs and the angle; and determining the data region to be identified based on the four vertices.

[0057] Step 510: Identify 2-dimensional bar code data of the data region.

[0058] The identification process can be specifically: determining a perspective transformation relationship based on coordinates of the four determined vertices and predetermined standard code coordinates; sampling the 2-dimensional bar code data of the data region based on the perspective transformation relationship; and decoding the sampled 2-dimensional bar code data.

[0059] It is worthwhile to note that, in the method for identifying the 2-dimensional bar code provided in the embodiments of the present specification, because only two positioning graphs are detected, and the identified narrow-strip 2-dimensional bar code has a relatively small area, the solution provided in the present specification has relatively high identification efficiency.

[0060] Corresponding to the previous method for generating a narrow-strip 2-dimensional bar code, some embodiments of the present specification further provide an apparatus for generating a narrow-strip 2-dimensional bar code. As shown in FIG. 6, the apparatus can include:

- 5 [0061] a determining unit 602, configured to determine a rectangular region, where the rectangular region includes blocks to be filled and arranged in a grid shape; and
- [0062] the length of the rectangular region can be greater than the width thereof; and
- [0063] a filling unit 604, configured to separately fill, with two positioning graphs, two square regions at two vertices in the rectangular region determined by the
- 10 determining unit 602, where each positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round.

[0064] The two vertices can be two vertices at two ends of a diagonal line of the rectangular region; or can be two vertices at two ends of a rectangular long side of the

15 rectangular region.

[0065] The filling unit 604 is further configured to: for each positioning graph in the rectangular region determined by the determining unit 602, fill a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region; and

[0066] the filling unit 604 is further configured to fill a data region with a first color

20 block and a second color block that are corresponding to 2-dimensional bar code data, where the data region is a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

[0067] Optionally, a width ratio of the square structure and the enclosure structure is 1:1.

25 [0068] Functions of function modules of the previous apparatus embodiments of the present specification can be implemented by performing the steps in the previous method embodiment. A specific working process of the apparatus provided in some embodiments of the present specification is omitted here.

[0069] An apparatus for generating a narrow-strip 2-dimensional bar code provided

30 in some embodiments of the present specification can generate a small 2-dimensional bar code, so it can be conveniently used when space is relatively small.

[0070] Corresponding to the previous method for identifying a narrow-strip 2-dimensional bar code, some embodiments of the present specification further provide an apparatus for identifying a narrow-strip 2-dimensional bar code. As shown in FIG.

7, the apparatus can include an acquisition unit 702, a detection unit 704, a determining unit 706, and an identification unit 708.

[0071] The acquisition unit 702 is configured to obtain an image of a narrow-strip 2-dimensional bar code;

5 [0072] the detection unit 704 is configured to detect a positioning graph in the image obtained by the acquisition unit 702, where the positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round, and where the positioning graph has an isolation region formed by first color blocks at the periphery;

10 [0073] the detection unit 704 can be specifically configured to:

[0074] detect, in the image, a positioning graph whose width ratio of the square structure and the enclosure structure is 1:1; and

[0075] the determining unit 706 is configured to: when the detection unit 704 detects the two positioning graphs, determine, from the image and based on center positions of the two positioning graphs, a target region that includes a rectangular region
15 corresponding to the narrow-strip 2-dimensional bar code.

[0076] The determining unit 706 can be specifically configured to:

[0077] determine, based on the center positions of the two positioning graphs, a diagonal line of the rectangular region corresponding to the narrow-strip 2-dimensional
20 bar code; and

[0078] determine, from the image and based on the diagonal line, the target region including the rectangular region.

[0079] The determining unit 706 is further configured to determine a data region to be identified from the target region.

25 [0080] The determining unit 706 can be specifically configured to:

[0081] extract a contour of the rectangular region from the target region based on an erode algorithm; and

[0082] determine the data region to be identified based on the extracted contour.

[0083] The identification unit 708 is configured to identify 2-dimensional bar code
30 data of the data region determined by the determining unit 706.

[0084] Optionally, the determining unit 706 can be further specifically configured to:

[0085] iteratively select two points from the extracted contour and calculate a slope of a connection line constructed by the two points;

[0086] after the extracted contour is scanned by one round, count times of occurrence of each slope;

[0087] determine a horizontal direction of the narrow-strip 2-dimensional bar code based on a slope of maximum quantity of occurrences;

5 [0088] determine four vertices of the narrow-strip 2-dimensional bar code based on the center positions of the two positioning graphs and the horizontal direction; and

[0089] determine the data region to be identified based on the determined four vertices.

[0090] Optionally, the determining unit 706 can be further specifically configured to:

10 [0091] construct a central connection line based on the center positions of the two positioning graphs;

[0092] determine an angle of the central connection line relative to the horizontal direction; and

[0093] determine four vertices of the narrow-strip 2-dimensional bar code based on

15 the center positions of the two positioning graphs and the angle.

[0094] An apparatus for identifying a narrow-strip 2-dimensional bar code provided in some embodiments of the present specification can quickly and accurately identify the narrow-strip 2-dimensional bar code.

[0095] Corresponding to the previous method for generating a narrow-strip 2-

20 dimensional bar code, some embodiments of the present specification further provide a device for generating a narrow-strip 2-dimensional bar code. As shown in FIG. 8, the device can include a memory 802, one or more processors 804, and one or more programs. The one or more programs are stored in the memory 802, and are configured to be executed by the one or more processors 804. When the processor 804 executes

25 the program, the following steps are implemented:

[0096] determining a rectangular region, where the rectangular region includes blocks to be filled and arranged in a grid shape;

[0097] separately filling two square regions at two vertices in the rectangular region with two positioning graphs, where each positioning graph includes a central square

30 structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round;

[0098] for each positioning graph in the rectangular region, filling a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region; and

[0099] filling a data region with a first color block and a second color block that are corresponding to 2-dimensional bar code data, where the data region is a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

5 [0100] A device for generating a narrow-strip 2-dimensional bar code provided in some embodiments of the present specification can generate a small 2-dimensional bar code, which can be conveniently used by a user.

[0101] Corresponding to the previous method for identifying a narrow-strip 2-dimensional bar code, some embodiments of the present specification further provide a
10 device for identifying a narrow-strip 2-dimensional bar code. As shown in FIG. 9, the device can include a memory 902, one or more processors 904, and one or more programs. The one or more programs are stored in the memory 902, and are configured to be executed by the one or more processors 904. When the processor 904 executes the program, the following steps are implemented:

15 [0102] obtaining an image of a narrow-strip 2-dimensional bar code;

[0103] detecting a positioning graph in the image, where the positioning graph includes a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round, and where the positioning graph has an isolation region formed by first color
20 blocks at the periphery;

[0104] when the two positioning graphs are detected, determining, from the image and based on center positions of the two positioning graphs, a target region that includes a rectangular region corresponding to the narrow-strip 2-dimensional bar code;

[0105] determining a data region to be identified from the target region; and

25 [0106] identifying 2-dimensional bar code data of the data region.

[0107] A device for identifying a narrow-strip 2-dimensional bar code provided in some embodiments of the present specification can quickly and accurately identify the narrow-strip 2-dimensional bar code.

[0108] The embodiments in the present specification are described in a progressive
30 way. For same or similar parts of the embodiments, references can be made to the embodiments. Each embodiment focuses on a difference from other embodiments. Particularly, a device embodiment is similar to a method embodiment, and therefore is described briefly. For related parts, references can be made to related descriptions in the method embodiment.

[0109] The methods or algorithm steps described with reference to the content disclosed in the present specification can be implemented in a hardware method, or can be implemented in a method in which a processor executes a software instruction. The software instruction can be formed by a corresponding software module, and the software module can be stored in a RAM memory, a flash memory, a ROM memory, an EPROM memory, an EEPROM memory, a register, a hard disk, a removable hard disk, a CD-ROM, or any other form of storage medium well known in the art. An example storage medium is coupled to the processor, so the processor can read information from the storage medium and can write information to the storage medium. Certainly, the storage medium can also be a part of the processor. The processor and the storage medium can be located in an ASIC. In addition, the ASIC can be located in a server. Certainly, the processor and the storage medium can also exist in the server as separate parts.

[0110] A person skilled in the art should be aware that in the previous one or more examples, functions described in the present disclosure can be implemented by hardware, software, firmware, or any combination thereof. When the present disclosure is implemented by software, the functions can be stored in a computer readable medium or transmitted as one or more instructions or code in the computer readable medium. The computer readable medium includes a computer storage medium and a communication medium, where the communication medium includes any medium that facilitates the transfer of a computer program from one place to another. The storage medium can be any available medium accessible to a general-purpose or dedicated computer.

[0111] Specific embodiments of the present specification are described above. Other embodiments fall within the scope of the appended claims. In some situations, the actions or steps described in the claims can be performed in an order different from the order in the embodiments and the desired results can still be achieved. In addition, the process depicted in the accompanying drawings does not necessarily need a particular execution order to achieve the desired results. In some implementations, multi-tasking and concurrent processing is feasible or may be advantageous.

[0112] The objectives, technical solutions, and benefits of the present specification are further described in detail in the earlier-described specific implementations. It should be understood that the earlier-described descriptions are merely specific implementations of the present specification, but are not intended to limit the protection

scope of the present specification. Any modification, equivalent replacement, or improvement made based on the technical solutions of the present specification shall fall within the protection scope of the present specification.

CLAIMS

What is claimed is:

1. A method for generating a narrow-strip 2-dimensional bar code, comprising:
determining a rectangular region, wherein the rectangular region comprises blocks
5 to be filled and arranged in a grid shape;
separately filling two square regions at two vertices in the rectangular region with
only two positioning graphs, wherein each positioning graph comprises a central square
structure formed by a first color block, and an enclosure structure formed by second
color blocks and surrounding the square structure by one round;
10 for each positioning graph in the rectangular region, filling a region surrounding
the positioning graph with first color blocks, to form a corresponding isolation region;
and
filling a data region with a first color block and a second color block that are
corresponding to 2-dimensional bar code data, wherein the data region is a region in the
15 rectangular region excluding the two positioning graphs and corresponding isolation
regions.
2. The method according to claim 1, wherein the two vertices are two vertices at
both ends of a diagonal line of the rectangular region.
3. The method according to claim 1, wherein a width ratio of the square structure
20 and the enclosure structure is 1:1.
4. The method according to claim 1, wherein the length of the rectangular region
is greater than the width thereof.
5. A method for identifying a narrow-strip 2-dimensional bar code, comprising:
obtaining an image of a narrow-strip 2-dimensional bar code;
25 detecting only two positioning graphs in the image, wherein each positioning
graph comprises a central square structure formed by a first color block, and an
enclosure structure formed by second color blocks and surrounding the square structure
by one round, and wherein each positioning graph has an isolation region formed by
first color blocks at the periphery;
30 when the only two positioning graphs are detected, determining, from the image
and based on center positions of the only two positioning graphs, a target region that

comprises a rectangular region corresponding to the narrow-strip 2-dimensional bar code;

determining a data region to be identified from the target region, wherein the data region excludes the two positioning graphs and corresponding isolation regions; and

5 identifying 2-dimensional bar code data of the data region.

6. The method according to claim 5, wherein the determining a data region to be identified from the target region comprises:

extracting a contour of the rectangular region from the target region based on an erode algorithm; and

10 determining the data region to be identified based on the extracted contour.

7. The method according to claim 6, wherein the determining the data region to be identified based on the extracted contour comprises:

iteratively selecting two points from the extracted contour and calculating a slope of a connection line constructed by the two points;

15 after the extracted contour is scanned by one round, counting times of occurrence of each slope;

determining a horizontal direction of the narrow-strip 2-dimensional bar code based on a slope of maximum times of occurrences;

20 determining four vertices of the narrow-strip 2-dimensional bar code based on the center positions of the two positioning graphs and the horizontal direction; and

determining the data region to be identified based on the four vertices.

8. The method according to claim 7, wherein the determining four vertices of the narrow-strip 2-dimensional bar code based on the center positions of the two positioning graphs and the horizontal direction comprises:

25 constructing a central connection line based on the center positions of the two positioning graphs;

determining an angle of the central connection line relative to the horizontal direction; and

30 determining the four vertices of the narrow-strip 2-dimensional bar code based on the center positions of the two positioning graphs and the angle.

9. The method according to claim 5, wherein the detecting a positioning graph in the image comprises:

detecting, in the image, a positioning graph whose width ratio of the square structure and the enclosure structure is 1:1.

10. The method according to claim 5, wherein the determining, from the image and based on center positions of the two positioning graphs, a target region that comprises a rectangular region corresponding to the narrow-strip 2-dimensional bar code comprises:

5 determining, based on the center positions of the two positioning graphs, a diagonal line of the rectangular region corresponding to the narrow-strip 2-dimensional bar code; and

 determining, from the image and based on the diagonal line, the target region comprising the rectangular region.

10 11. A narrow-strip 2-dimensional bar code, comprising:

 only two positioning graphs, wherein the two positioning graphs are located at two vertices of a rectangular region, each positioning graph comprises a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round;

15 two isolation regions, each of which is formed by first color blocks, in the rectangular region, surrounding one of the positioning graphs; and

 a data region, used to form 2-dimensional bar code data and comprising a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

20 12. The narrow-strip 2-dimensional bar code according to claim 11, wherein the two vertices are two vertices at both ends of a diagonal line of the rectangular region.

 13. The narrow-strip 2-dimensional bar code according to claim 11, wherein a width ratio of the square structure and the enclosure structure is 1:1.

25 14. The narrow-strip 2-dimensional bar code according to claim 11, wherein the length of the rectangular region is greater than the width thereof.

 15. An apparatus for generating a narrow-strip 2-dimensional bar code, comprising: a determining unit, configured to determine a rectangular region, wherein the rectangular region comprises blocks to be filled and arranged in a grid shape; and

30 a filling unit, configured to separately fill, with only two positioning graphs, two square regions at two vertices in the rectangular region determined by the determining unit, wherein each positioning graph comprises a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round;

the filling unit is further configured to: for each positioning graph in the rectangular region determined by the determining unit, fill a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region; and

the filling unit is further configured to fill a data region with a first color block and
5 a second color block that are corresponding to 2-dimensional bar code data, wherein the data region is a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.

16. The apparatus according to claim 15, wherein the two vertices are two vertices at both ends of a diagonal line of the rectangular region.

10 17. The apparatus according to claim 15, wherein a width ratio of the square structure and the enclosure structure is 1:1.

18. The apparatus according to claim 15, wherein the length of the rectangular region is greater than the width thereof.

15 19. An apparatus for identifying a narrow-strip 2-dimensional bar code, comprising:

an acquisition unit, configured to obtain an image of a narrow-strip 2-dimensional bar code;

a detection unit, configured to detect only two positioning graphs in the image obtained by the acquisition unit, wherein each positioning graph comprises a central
20 square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round, and wherein each positioning graph has an isolation region formed by first color blocks at the periphery;

a determining unit, configured to: when the detection unit detects the only two
25 positioning graphs, determine, from the image and based on center positions of the only two positioning graphs, a target region that comprises a rectangular region corresponding to the narrow-strip 2-dimensional bar code; wherein

the determining unit is further configured to determine a data region to be identified from the target region, wherein the data region excludes the two positioning
30 graphs and corresponding isolation regions; and

an identification unit, configured to identify 2-dimensional bar code data of the data region determined by the determining unit.

20. The apparatus according to claim 19, wherein the determining unit is specifically configured to:

extract a contour of the rectangular region from the target region based on an erode algorithm; and

determine the data region to be identified based on the extracted contour.

21. The apparatus according to claim 20, wherein the determining unit is further
5 specifically configured to:

iteratively select two points from the extracted contour and calculate a slope of a connection line constructed by the two points;

after the extracted contour is scanned by one round, count times of occurrence of each slope;

10 determine a horizontal direction of the narrow-strip 2-dimensional bar code based on a slope of maximum times of occurrences;

determine four vertices of the narrow-strip 2-dimensional bar code based on the center positions of the two positioning graphs and the horizontal direction; and

determine the data region to be identified based on the four vertices.

15 22. The apparatus according to claim 21, wherein the determining unit is further specifically configured to:

construct a central connection line based on the center positions of the two positioning graphs;

determine an angle of the central connection line relative to the horizontal direction;

20 and

determine the four vertices of the narrow-strip 2-dimensional bar code based on the center positions of the two positioning graphs and the angle.

23. The apparatus according to claim 19, wherein the detection unit is specifically configured to:

25 detect, in the image, a positioning graph whose width ratio of the square structure and the enclosure structure is 1:1.

24. The apparatus according to claim 19, wherein the determining unit is specifically configured to:

30 determine, based on the center positions of the two positioning graphs, a diagonal line of the rectangular region corresponding to the narrow-strip 2-dimensional bar code; and

determine, from the image and based on the diagonal line, the target region comprising the rectangular region.

25. A device for generating a narrow-strip 2-dimensional bar code, comprising:

a memory;
one or more processors; and
one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the program being
5 executed by the processor to implement the following steps:
determining a rectangular region, wherein the rectangular region comprises blocks to be filled and arranged in a grid shape;
separately filling two square regions at two vertices in the rectangular region with only two positioning graphs, wherein each positioning graph comprises a central square
10 structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round;
for each positioning graph in the rectangular region, filling a region surrounding the positioning graph with first color blocks, to form a corresponding isolation region; and
15 filling a data region with a first color block and a second color block that are corresponding to 2-dimensional bar code data, wherein the data region is a region in the rectangular region excluding the two positioning graphs and corresponding isolation regions.
26. A device for identifying a narrow-strip 2-dimensional bar code, comprising:
20 a memory;
one or more processors; and
one or more programs, wherein the one or more programs are stored in the memory and configured to be executed by the one or more processors, the program being executed by the processor to implement the following steps:
25 obtaining an image of a narrow-strip 2-dimensional bar code;
detecting only two positioning graphs in the image, wherein each positioning graph comprises a central square structure formed by a first color block, and an enclosure structure formed by second color blocks and surrounding the square structure by one round, and wherein each positioning graph has an isolation region formed by
30 first color blocks at the periphery;
when the only two positioning graphs are detected, determining, from the image and based on center positions of the only two positioning graphs, a target region that comprises a rectangular region corresponding to the narrow-strip 2-dimensional bar code;

determining a data region to be identified from the target region, wherein the data region excludes the two positioning graphs and corresponding isolation regions; and
identifying 2-dimensional bar code data of the data region.