

CLAIMS

What is claimed is:

1. A two-dimensional code generation method, comprising:
 - obtaining two-dimensional code of a to-be-generated two-dimensional code image;
 - performing error resilient coding on the two-dimensional code by using a coding algorithm with a predetermined error-tolerant rate, to obtain error-tolerant-processed two-dimensional code;
 - determining a code element shape that is corresponding to each data information bit in the error-tolerant-processed two-dimensional code and that is in a generation region of the two-dimensional code image, wherein the code element shape comprises a dot or an arc;
 - determining, according to a predetermined arrangement rule of the two-dimensional code, first position information that is corresponding to each data information bit of the error-tolerant-processed two-dimensional code and that is in the generation region;
 - determining second position information of each positioning point bit in the generation region; and
 - generating the two-dimensional code image based on the first position information, the code element shape corresponding to each data information bit, and the second position information of each positioning point bit,
 - wherein the two-dimensional code image comprises a ring formed by the dot and the arc; and a ring width of each circle of the ring is the same, wherein the two-dimensional code image further comprises an intermediate region, and the intermediate region is concentric with the ring; the intermediate region is used to display a first identifier; adjacent rings have a same interval; and an interval between the intermediate region and a ring formed by adjacent code element shapes is the same as an interval between adjacent rings.
2. The method according to claim 1, wherein the determining a code element shape that is corresponding to each data information bit in the error-tolerant-processed two-dimensional code and that is in a generation region of the two-dimensional code image specifically comprises:
 - determining, for each code bit in the error-tolerant-processed two-dimensional

code, a sequence of the code bit in the error-tolerant-processed two-dimensional code;
determining a position of a data information bit corresponding to the sequence in the two-dimensional code generation region; and

determining a code element shape corresponding to a data information bit of the position according to a value of the code bit.

3. The method according to claim 1, wherein the generation region further comprises mask information; and before the obtaining two-dimensional code of a to-be-generated two-dimensional code image, the method further comprises:

performing mask processing on the two-dimensional code according to the mask information, to obtain a mask-processed two-dimensional code.

4. The method according to claim 1, wherein the positioning point bits comprise first positioning point bits and second positioning point bits; the first positioning point bits are separately distributed in an upper left corner position, an upper right corner position, and a lower left corner position of the generation region; and the second positioning point bits are distributed in a lower right corner position of the generation region.

5. The method according to claim 1, wherein a code element in the two-dimensional code image is coded by using two colors.

6. The method according to claim 1, wherein a region corresponding to a directional positioning point bit is used to display a second identifier; and a display area of the second identifier is less than a display area of a first identifier.

7. A two-dimensional code decoding method, comprising:

obtaining image information of a to-be-recognized two-dimensional code image, wherein the to-be-recognized two-dimensional code image comprises a ring formed by the dot and the arc; and a ring width of each circle of the ring is the same, wherein the to-be-recognized two-dimensional code image further comprises an intermediate region, and the intermediate region is concentric with the ring; the intermediate region is used to display a first identifier; adjacent rings have a same interval; and an interval between the intermediate region and a ring formed by adjacent code element shapes is the same as an interval between adjacent rings;

determining positioning point position information, in the image, of each positioning point bit in the to-be-recognized two-dimensional code image according to the image information of the to-be-recognized two-dimensional code image;

determining position information of each data information bit in the image based

on the positioning point position information;

determining a code element shape corresponding to each data information bit based on the position information of the data information bit in the image, wherein the code element shape comprises a dot or an arc;

generating two-dimensional code according to a predetermined arrangement rule and the code element shape corresponding to each data information bit; and

decoding the two-dimensional code by using a predetermined decoding algorithm, to obtain content information stored in the data information bit.

8. The method according to claim 7, wherein the to-be-recognized two-dimensional code image is in a ring shape; the image comprises first positioning point bits and directional positioning point bits; the first positioning point bits are distributed in an upper left corner position, an upper right corner position, and a lower left corner position of the image; and the directional positioning point bits are distributed in a lower right corner of the image.

9. The method according to claim 7, wherein the determining position information of each data information bit in the image based on the positioning point position information specifically comprises:

determining position information, in the image, of each positioning point bit in the to-be-recognized two-dimensional code image and the position information of each data information in the image by using an adaptive sampling algorithm based on the positioning point position information.

10. The method according to claim 9, wherein the determining the position information of each data information in the image by using an adaptive sampling algorithm based on the positioning point position information specifically comprises:

determining first position information, in an image coordinate system, of each positioning point bit in the to-be-recognized two-dimensional code image based on the positioning point position information;

obtaining second position information of each positioning point bit in a code-based coordinate system;

calculating a transformation matrix between the code-based coordinate system and the image coordinate system based on the first position information and the second position information;

obtaining third position information of each data information bit in the code-based coordinate system;

determining an initial sampling point bit of each data information bit in the image coordinate system based on the transformation matrix and the third position information;

modifying the initial sampling point bit based on the adaptive sampling algorithm, to determine a final sampling point bit of each data information bit in the image coordinate system; and

performing sampling on the to-be-recognized image based on the final sampling point bit to obtain the position information of each data information bit in the image.

11. A two-dimensional code generation apparatus, comprising:

a two-dimensional code acquisition module, configured to obtain two-dimensional code of a to-be-generated two-dimensional code image;

an error resilient coding module, configured to perform error resilient coding on the two-dimensional code by using a coding algorithm with a predetermined error-tolerant rate, to obtain error-tolerant-processed two-dimensional code;

a code element shape determining module, configured to determine a code element shape that is corresponding to each data information bit in the error-tolerant-processed two-dimensional code and that is in a generation region of the two-dimensional code image, wherein the code element shape comprises a dot or an arc;

a first position information determining module, configured to determine, according to a predetermined arrangement rule of the two-dimensional code, first position information that is corresponding to each data information bit of the error-tolerant-processed two-dimensional code and that is in the generation region;

a second position information determining module, configured to determine second position information of each positioning point bit in the generation region; and

a two-dimensional code image generation module, configured to generate the two-dimensional code image based on the first position information, the code element shape corresponding to each data information bit, and the second position information of each positioning point bit,

wherein the two-dimensional code image comprises a ring formed by the dot and the arc; and a ring width of each circle of the ring is the same, wherein the two-dimensional code image further comprises an intermediate region, and the intermediate region is concentric with the ring; the intermediate region is used to display a first identifier; adjacent rings have a same interval; and an interval between the intermediate region and a ring formed by adjacent code element shapes is the same as an interval between adjacent rings.

12. The apparatus according to claim 11, wherein the code element shape determining module is specifically configured to:

determine, for each code bit in the error-tolerant-processed two-dimensional code, a sequence of the code bit in the error-tolerant-processed two-dimensional code;

determine a position of a data information bit corresponding to the sequence in the two-dimensional code generation region; and

determine a code element shape corresponding to a data information bit of the position according to a value of the code bit.

13. A two-dimensional code decoding apparatus, comprising:

an image information acquisition module, configured to obtain image information of a to-be-recognized two-dimensional code image;

a positioning point position information determining module, configured to determine positioning point position information, in the image, of each positioning point bit in the to-be-recognized two-dimensional code image according to the image information of the to-be-recognized two-dimensional code image;

a data information bit position information determining module, configured to determine position information of each data information bit in the image based on the positioning point position information;

a code element shape determining module, configured to determine a code element shape corresponding to each data information bit based on the position information of the data information bit in the image, wherein the code element shape comprises a dot or an arc;

a two-dimensional code generation module, configured to: generate two-dimensional code according to a predetermined arrangement rule and the code element shape corresponding to each data information bit; and

a decoding module, configured to decode the two-dimensional code by using a predetermined decoding algorithm, to obtain content information stored in the data information bit, wherein the to-be-recognized two-dimensional code image comprises a ring formed by the dot and the arc; and a ring width of each circle of the ring is the same, wherein the to-be-recognized two-dimensional code image further comprises an intermediate region, and the intermediate region is concentric with the ring; the intermediate region is used to display a first identifier; adjacent rings have a same interval; and an interval between the intermediate region and a ring formed by adjacent code element shapes is the same as an interval between adjacent rings.

14. The apparatus according to claim 13, wherein the data information bit position information determining module specifically comprises:

a data information bit position information determining unit, configured to determine position information, in the image, of each positioning point bit in the to-be-recognized two-dimensional code image and the position information of each data information in the image by using an adaptive sampling algorithm based on the positioning point position information.

15. The apparatus according to claim 14, wherein the data information bit position information determining unit is specifically configured to:

determine first position information, in an image coordinate system, of each positioning point bit in the to-be-recognized two-dimensional code image based on the positioning point position information;

obtain second position information of each positioning point bit in a code-based coordinate system;

calculate a transformation matrix between the code-based coordinate system and the image coordinate system based on the first position information and the second position information;

obtain third position information of each data information bit in the code-based coordinate system;

determine an initial sampling point bit of each data information bit in the image coordinate system based on the transformation matrix and the third position information;

modify the initial sampling point bit based on the adaptive sampling algorithm, to determine a final sampling point bit of each data information bit in the image coordinate system; and

perform sampling on the to-be-recognized image based on the final sampling point bit to obtain the position information of each data information bit in the image.

16. A two-dimensional code generation device, comprising:

at least one processor; and

a memory communicatively connected to the at least one processor; wherein

the memory stores instructions executable by the at least one processor, and the instructions are executed by the at least one processor, to enable the at least one processor to:

obtain two-dimensional code of a to-be-generated two-dimensional code image, wherein the to-be-generated two-dimensional code image comprises a ring formed by

the dot and the arc; and a ring width of each circle of the ring is the same, wherein the to-be-generated two-dimensional code image further comprises an intermediate region, and the intermediate region is concentric with the ring; the intermediate region is used to display a first identifier; adjacent rings have a same interval; and an interval between the intermediate region and a ring formed by adjacent code element shapes is the same as an interval between adjacent rings;

perform error resilient coding on the two-dimensional code by using a coding algorithm with a predetermined error-tolerant rate, to obtain error-tolerant-processed two-dimensional code;

determine a code element shape that is corresponding to each data information bit in the error-tolerant-processed two-dimensional code and that is in a generation region of the two-dimensional code image, wherein the code element shape comprises a dot or an arc;

determine, according to a predetermined arrangement rule of the two-dimensional code, first position information that is corresponding to each data information bit of the error-tolerant-processed two-dimensional code and that is in the generation region;

determine second position information of each positioning point bit in the generation region; and

generate the two-dimensional code image based on the first position information, the code element shape corresponding to each data information bit, and the second position information of each positioning point bit.

17. A two-dimensional code decoding device, comprising:

at least one processor; and

a memory communicatively connected to the at least one processor; wherein

the memory stores instructions executable by the at least one processor, and the instructions are executed by the at least one processor, to enable the at least one processor to:

obtain image information of a to-be-recognized two-dimensional code image, wherein the to-be-recognized two-dimensional code image comprises a ring formed by the dot and the arc; and a ring width of each circle of the ring is the same, wherein the to-be-recognized two-dimensional code image further comprises an intermediate region, and the intermediate region is concentric with the ring; the intermediate region is used to display a first identifier; adjacent rings have a same interval; and an interval between the intermediate region and a ring formed by adjacent code element shapes is the same

as an interval between adjacent rings;

determine positioning point position information, in the image, of each positioning point bit in the to-be-recognized two-dimensional code image according to the image information of the to-be-recognized two-dimensional code image;

determine position information of each data information bit in the image based on the positioning point position information;

determine a code element shape corresponding to each data information bit based on the position information of the data information bit in the image, wherein the code element shape comprises a dot or an arc;

generate two-dimensional code according to a predetermined arrangement rule and the code element shape corresponding to each data information bit; and

decode the two-dimensional code by using a predetermined decoding algorithm, to obtain content information stored in the data information bit.

18. A computer readable medium on which computer readable instructions are stored, wherein the computer readable instructions can be executed by a processor to implement the method according to any one of claims 1 to 10.