

CLAIMS

What is claimed is:

1. A method for generating a machine-readable identification code, comprising:
determining a center;
5 determining several concentric circles based on the center, and determining, based on the center and a specified radius, several position detection patterns whose distance from the center is the radius, wherein the several position detection patterns are not completely the same;
determining a start pattern from each position detection pattern;
10 dividing the concentric circles into a plurality of groups of concentric arcs based on positions of the position detection patterns and the center; and
encoding, on the concentric arcs based on a position of the start pattern following a pre-determined writing direction, N-ary characters corresponding to to-be-encoded content to obtain a machine-readable identification code, wherein codes corresponding
15 to adjacent and same characters in the N-ary characters form an arc line segment, a code corresponding to a character that is different from both adjacent characters in the N-ary characters is a point, codes corresponding to different characters in the N-ary characters have different colors, and N is a positive integer not less than two.
2. The method according to claim 1, wherein the determining, based on the center
20 and a specified radius, several position detection patterns whose distance from the center is the radius specifically comprises:
selecting a concentric circle whose radius is the specified radius, and determining several position detection patterns on the selected concentric circle; or
selecting any concentric circle from the several concentric circles, and determining
25 several position detection patterns on the selected concentric circle.
3. The method according to claim 1, wherein the determining several concentric circles based on the center specifically comprises:
obtain several radii by increasing and/or reducing the radius by a predetermined
step; and
30 determining the concentric circles based on the center and the obtained radii.
4. The method according to claim 1, wherein the determining, based on the center and a specified radius, several position detection patterns whose distance from the

center is the radius specifically comprises:

establishing a polar coordinate system by using the center as an origin;

determining a circle based on the center and the specified radius; and

determining, on the determined circle according to several specified polar angles,

5 several position detection patterns with equal spacings.

5. The method according to claim 4, wherein the determining a start pattern from each position detection pattern specifically comprises:

determining the start pattern from each position detection pattern based on the polar angles corresponding to the position detection patterns.

10 6. The method according to claim 5, wherein the several specified polar angles comprise 45 degrees, 135 degrees, 225 degrees, and 315 degrees; and

the determining the start pattern from each position detection pattern based on the polar angles corresponding to the position detection patterns specifically comprise:

15 determining a position detection pattern corresponding to the polar angle of 135 degrees as the start pattern.

7. The method according to claim 1, wherein the position detection patterns comprise isometric concentric circles and a regular hexagon; and

20 a line thickness of each concentric circle in the isometric concentric circles is a predetermined width, and line colors of two adjacent concentric circles in the isometric concentric circles are different.

8. The method according to claim 1, wherein the encoding, on the concentric arcs based on a position of the start pattern, N-ary characters corresponding to to-be-encoded content specifically comprises:

25 encoding, on the concentric arcs based on the position of the start pattern, the N-ary characters corresponding to the to-be-encoded content in a counterclockwise or clockwise direction.

9. The method according to claim 1, wherein the encoding, on the concentric arcs based on a position of the start pattern, N-ary characters corresponding to to-be-encoded content specifically comprises:

30 encoding the N-ary characters corresponding to the to-be-encoded content on each group of concentric arcs in a counterclockwise or clockwise sequence based on the position of the start pattern, and continuing encoding on a next group of concentric arcs when the group of concentric arcs is full.

10. The method according to claim 1, wherein the to-be-encoded content

comprises functional data; and

the encoding N-ary characters corresponding to to-be-encoded content specifically comprises:

5 encoding the N-ary characters corresponding to the functional data to a specified position.

11. The method according to claim 1, wherein the encoding N-ary characters corresponding to to-be-encoded content specifically comprises:

for each concentric arc, successively encoding the N-ary characters corresponding to the to-be-encoded content based on a predetermined polar angle spacing, so that
10 spacings of two adjacent codes on the concentric arc are the same.

12. The method according to claim 11, wherein the encoding, on the concentric arcs based on a position of the start pattern, N-ary characters corresponding to to-be-encoded content specifically comprises:

encoding, on the several concentric arcs, the N-ary characters corresponding to the
15 to-be-encoded content from a polar angle R as a starting point in a counterclockwise or clockwise direction; wherein

when encoding is performed in a counterclockwise direction, $R=135^{\circ}+\alpha \cdot \theta$,
when encoding is performed in a clockwise direction, $R=135^{\circ}-\alpha \cdot \theta$, wherein α is a
predetermined parameter, and θ is a predetermined polar spacing.

20 13. The method according to claim 1, wherein the determining several concentric circles based on the center specifically comprises:

determining a predetermined quantity of concentric circles based on the center,
wherein

the predetermined quantity comprises at least one of 3, 4, or 5.

25 14. The method according to claim 1, wherein the identification code further comprises non-encoded content;

the non-encoded content is located in an area surrounded by a concentric circle with a smallest radius in the several concentric circles; and

the non-encoded content comprises at least one of a text, a symbol, or a pattern.

30 15. A machine-readable identification code generation apparatus, comprising:

a first determining module, configured to determine a center;

a second determining module, configured to determine several concentric circles based on the center, and determine, based on the center and a specified radius, several

position detection patterns whose distance from the center is the radius, wherein the several position detection patterns are not completely the same;

a third determining module, configured to determine a start pattern from the position detection patterns; and

5 a generation module, configured to divide the concentric circles into a plurality of groups of concentric arcs based on positions of the position detection patterns and the center, and configured to encode, on the concentric arcs based on a position of the start pattern following a pre-determined writing direction, N-ary characters corresponding to to-be-encoded content to obtain a machine-readable identification code, wherein
10 codes corresponding to adjacent and same characters in the N-ary characters form an arc line segment, a code corresponding to a character that is different from both adjacent characters in the N-ary characters is a point, codes corresponding to different characters in the N-ary characters have different colors, and N is a positive integer not less than two.

15 16. A server, comprising one or more processors and a memory, wherein the memory stores a program, configured to be executed by the one or more processors to perform the following steps:

determining a center;

determining several concentric circles based on the center, and determining, based
20 on the center and a specified radius, several position detection patterns whose distance from the center is the radius, wherein the several position detection patterns are not completely the same;

determining a start pattern from each position detection pattern;

dividing the concentric circles into a plurality of groups of concentric arcs based
25 on positions of the position detection patterns and the center; and

encoding, on the concentric arcs based on a position of the start pattern following a pre-determined writing direction, N-ary characters corresponding to to-be-encoded content to obtain a machine-readable identification code, wherein codes corresponding to adjacent and same characters in the N-ary characters form an arc line segment, a code
30 corresponding to a character that is different from both adjacent characters in the N-ary characters is a point, codes corresponding to different characters in the N-ary characters have different colors, and N is a positive integer not less than two.