Card, Method and Apparatus for Identifying a Barcode

Cross-Reference to Related Application

The present disclosure claims priority to Chinese Patent Application No. 202410103550.X, filed on January 25, 2024 and entitled "Card, Method and Apparatus for Identifying a Barcode, Electronic Device, and Storage Medium", the disclosure of which is hereby incorporated by reference in its entirety.

Technical Field

The present disclosure relates to the technical field of information processing, and in particular, to a card, a method and an apparatus for identifying a barcode.

Background

A card reading device is configured to perform identification and data transmission fora card. For example, the card reading device may acquire data information carried by the card and output the data information to computing control devices such as processors for further processing. Some card reading devices can identify cards that transmit data by means of power-on, inductive identification, etc. Such cards may be, for example, TransFLash (TF) cards, Secure Digital (SD) cards, metal cards or chip cards. There are also some card reading devices, such as children's learning machines, which have the function of no-power identification of the cards inserted therein. No-power identification here refers to the identification of coded information on the card when no current passes through the card. In the related art, no-power identification is usually performed by scanning an area on the card where the coded information such as a barcode and a two-dimensional code are arranged by means of radio frequency reflection to obtain the information in the card. Since the card used for no-power identification does not need to have a built-in metal node or chip, the card is mainly a paper card printed with the coded information such as the barcode and the two-dimensional code, and this type of card has the characteristics of lightness and low cost.

However, the strength and wear resistance of the paper card are limited. For a device that supports multiple insertions and removals of the same card, the service life of the paper card is short. After a long period of use, the coded information on the paper card is likely to be worn out, resulting in the card reading device failing to identify the coded information correctly. To this end, some embodiments of the present specification provide a hard plastic card, as well as method and apparatus for identifying a barcode an electronic device, and a storage medium.

Summary

Some embodiments of the present specification aim to provide a hard and wear-resistant card with a barcode printed thereon, which prolongs the service life of the card to a certain extent. Some embodiments of the present specification further provide method and apparatus for identifying a barcode .

One or more embodiments of the present specification provide a method for identifying a barcode. The barcode includes a spacer block threshold detection area, a data block threshold detection area, and a data area. The spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block. The data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block. The data area includes one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks. The method includes: acquiring a data waveform, where the data waveform is obtained based on a waveform generated by sampling the barcode using a reading apparatus at a preset sampling frequency, with a sampling point sequence number as a horizontal coordinate and the sampling value as a vertical coordinate; acquiring and recording the spacer block threshold based on the sampling value corresponding to the spacer block threshold detection area in the data waveform; acquiring and recording the data block threshold based on the sampling value corresponding to the data block threshold detection area in the data waveform; identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold; and when the number of spacer blocks reaches a preset number, determining a code corresponding to a barcode according to the code values corresponding to the one or more data blocks.

According to the method for identifying a barcode shown in some embodiments of the present specification, the spacer block threshold detection area, the data block threshold detection area, and the data area are sequentially arranged according to a reading order of the reading apparatus. The operation of acquiring and recording the spacer block threshold based on the sampling value corresponding to the spacer block threshold detection area in the data waveform includes: when a fluctuation in the sampling value of the data waveform is detected, acquiring and recording the spacer block threshold based on the sampling value. The operation of acquiring and recording the data block threshold based on the sampling value corresponding to the data block threshold detection area in the data waveform includes: when it is detected that the sampling value of the data waveform exceeds the spacer block threshold, acquiring and recording the data block threshold based on the sampling value. The operation of identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold includes: after the sampling value of the data waveform reaches the spacer block threshold for the second time, identifying the

code values corresponding to the one or more data blocks and the number of spacer blocks according to the sampling value, the spacer block threshold, and the data block threshold.

According to the method for identifying a barcode shown in some embodiments of the present specification, when the sampling value of the data waveform exceeds an initial threshold, it is determined that the fluctuation in the sampling value of the data waveform is detected. The initial threshold is a value range of the sampling value counted before the barcode enters a reading area of the reading apparatus.

According to the method for identifying a barcode shown in some embodiments of the present specification, the operation of identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold includes: identifying the spacer blocks from the sampling values corresponding to the data area in the data waveform according to the spacer block threshold to obtain the number of spacer blocks; and identifying the data blocks from the sampling values corresponding to the data area in the data waveform according to the data block threshold, and determining the code values corresponding to the data blocks.

According to the method for identifying a barcode shown in some embodiments of the present specification, the operation of identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold includes: determining a peak or a trough according to a change trend of the sampling values corresponding to the data area in the data waveform; and determining a data block sampling value corresponding to the peak or the trough as the sampling value corresponding to the spacer block in the data area.

According to the method for identifying a barcode shown in some embodiments of the present specification, the operation of identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold includes: determining a trough or a peak according to a change trend of the sampling values corresponding to the data area in the data waveform; determining whether the sampling value corresponding to the trough or the peak exceeds the data block threshold; when the sampling value corresponding to the trough or the peak exceeds the data block threshold, determining a data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a first type of data block; and when the sampling value corresponding to the trough or the peak does not exceed the data block threshold, determining the data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a second type of data block. The first type of data block corresponds to a first code value, and the second type of data block corresponds to a second code

value.

According to the method for identifying a barcode shown in some embodiments of the present specification, the barcode further includes a reading completion detection area, and the reading completion detection area includes a spacer block arranged after the data area according to the reading order. The method further includes, after the number of spacer blocks reaches the preset number and before determining the code corresponding to the barcode according to the code values corresponding to the one or more data blocks: determining whether the sampling value of the data waveform reaches the spacer block threshold again; when the sampling value reaches the spacer block threshold again, turning to the step of determining the code corresponding to the barcode according to the code values corresponding to the one or more data blocks; and when the sampling value does not reach the spacer block threshold again, generating reading abnormality prompt information.

According to the method for identifying a barcode shown in some embodiments of the present specification, the reading apparatus has the reading area, when the reading apparatus samples from the reading area, the spacer block threshold detection area, the data block threshold detection area, the data area, and the reading completion detection area on the barcode sequentially pass through the reading area, and in a direction of entering the reading area, a length of the spacer block of the reading completion detection area is greater than that of the spacer block of the data area. The operation of determining whether the sampling value of the data waveform reaches the spacer block threshold again includes: when the sampling value reaches the spacer block threshold, counting a duration for which the sampling value reaches the spacer block threshold according to the data waveform to obtain a first duration; comparing the first duration with a second duration, where the second duration is a duration for which the sampling value in the data area, counted according to the data waveform, reaches the spacer block threshold; when the first duration is greater than the second duration, determining that the sampling value reaches the spacer block threshold again; and when the first duration is not greater than the second duration, determining that the sampling value does not reach the spacer block threshold again.

According to the method for identifying a barcode shown in some embodiments of the present specification, the data waveform is obtained by pre-processing the waveform generated by sampling the barcode using the reading apparatus at the preset sampling frequency, with the sampling point sequence number as the horizontal coordinate and the sampling value as the vertical coordinate.

According to the method for identifying a barcode shown in some embodiments of the present specification, the pre-processing includes: sequentially extracting a plurality of sampling values from the waveform in a sliding window manner; and respectively calculating an average of the sampling values extracted each time, and using the average as the sampling value in the data waveform.

One or more embodiments of the present specification provide an apparatus for identifying a barcode. The barcode includes a spacer block threshold detection area, a data block threshold detection area, and a data area. The spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block. The data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block. The data area includes one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks. The apparatus includes: an acquisition module, configured to acquire a data waveform, where the data waveform is obtained based on a waveform generated by sampling the barcode using a reading apparatus at a preset sampling frequency, with a sampling point sequence number as a horizontal coordinate and the sampling value as a vertical coordinate; a spacer block threshold setting module, configured to acquire and record the spacer block threshold based on the sampling value corresponding to the spacer block threshold detection area in the data waveform; a data block threshold setting module, configured to acquire and record the data block threshold based on the sampling value corresponding to the data block threshold detection area in the data waveform; an identification module, configured to identify code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold; and a code determination module, configured to determine, when the number of spacer blocks reaches a preset number, a code corresponding to the barcode according to the code values corresponding to the one or more data blocks.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the spacer block threshold detection area, the data block threshold detection area, and the data area are sequentially arranged according to a reading order of the reading apparatus. The spacer block threshold setting module is further configured to acquire and record, when a fluctuation in the sampling value of the data waveform is detected, the spacer block threshold based on the sampling value. The data block threshold setting module is further configured to acquire and record, when it is detected that the sampling value of the data waveform exceeds the spacer block threshold, the data block threshold based on the sampling value. The identification module is further configured to identify, after the sampling value of the data waveform reaches the spacer block threshold for the second time, the code values corresponding to the one or more data blocks and the number of spacer blocks according to the sampling value, the spacer block threshold, and the data block threshold.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the spacer block threshold setting module is further configured to determine, when the sampling value of the data waveform exceeds an initial threshold, that the fluctuation in the sampling value of the data

waveform is detected. The initial threshold is a value range of the sampling value counted before the barcode enters a reading area of the reading apparatus.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the identification module is further configured to: identify the spacer blocks from the sampling values corresponding to the data area in the data waveform according to the spacer block threshold to obtain the number of spacer blocks; and identify the data blocks from the sampling values corresponding to the data area in the data waveform according to the data block threshold, and determine the code values corresponding to the data blocks.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the identification module is further configured to: determine a peak or a trough according to a change trend of the sampling values corresponding to the data area in the data waveform; and determine a data block sampling value corresponding to the peak or the trough as the sampling value corresponding to the spacer block in the data area.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the identification module is further configured to: determine at rough or a peak according to a change trend of the sampling values corresponding to the data area in the data waveform; determine whether the sampling value corresponding to the trough or the peak exceeds the data block threshold; determine, when the sampling value corresponding to the trough or the peak exceeds the data block threshold, a data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a first type of data block; and determine, when the sampling value corresponding to the trough or the peak does not exceed the data block threshold, the data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a second type of data block. The first type of data block corresponds to a first code value, and the second type of data block corresponds to a second code value.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the barcode further includes a reading completion detection area, and the reading completion detection area includes a spacer block arranged after the data area according to the reading order. The apparatus further includes: a reading completion detection module, configured to determine, after the number of spacer blocks reaches the preset number and before determining the code corresponding to the barcode according to the code values corresponding to the one or more data blocks, whether the sampling value of the data waveformreaches the spacer block threshold again. The code determination module is further configured to determine, when the sampling value reaches the spacer block threshold again, the code corresponding to the barcode according to the code values corresponding to the one or more data blocks. The apparatus further includes a prompt information generation module, configured to generate reading abnormality prompt

information when the sampling value does not reach the spacer block threshold again.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the reading apparatus has the reading area, when the reading apparatus samples from the reading area, the spacer block threshold detection area, the data block threshold detection area, the data area, and the reading completion detection area on the barcode sequentially pass through the reading area, and in a direction of entering the reading area, a length of the spacer block of the reading completion detection area is greater than that of the spacer block of the data area. The reading completion detection module is further configured to: count, when the sampling value reaches the spacer block threshold, a duration for which the sampling value reaches the spacer block threshold according to the data waveform to obtain a first duration; compare the first duration with a second duration, where the second duration is a duration for which the sampling value in the data area, counted according to the data waveform, reaches the spacer block threshold; determine that the sampling value reaches the spacer block threshold again when the first duration is greater than the second duration; and determine that the sampling value does not reach the spacer block threshold again when the first duration is not greater than the second duration.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the acquisition module is further configured to obtain the data waveform by pre-processing the waveform generated by sampling the barcode using the reading apparatus at the preset sampling frequency, with the sampling point sequence number as the horizontal coordinate and the sampling value as the vertical coordinate.

According to the apparatus for identifying a barcode shown in some embodiments of the present specification, the acquisition module is further configured to: sequentially extract a plurality of sampling values from the waveform in a sliding window manner; and respectively calculate an average of the sampling values extracted each time, and use the average as the sampling value in the data waveform.

One or more embodiments of the present specification provide an electronic device, including a processor and a memory. At least one instruction or at least one program is stored in the memory, and the at least one instruction or at least one program is loaded and executed by the processor to implement the method for identifying a barcode as described in one or more embodiments of the present specification.

One or more embodiments of the present specification provide a computer-readable storage medium. At least one instruction or at least one program is stored in the storage medium, and the at least one instruction or the at least one program is loaded and executed by a processor to implement the method for identifying a barcode as described in one or more embodiments of the present specification.

One or more embodiments of the present specification provide a computer program product, including at

least one instruction or at least one program. The at least one instruction or the at least one program is loaded and executed by a processor to implement the method for identifying a barcode as described in one or more embodiments of the present specification.

One or more embodiments of the present specification provide a card. A material of the card includes plastic, a barcode is printed on the card, and the barcode includes a spacer block threshold detection area, a data block threshold detection area, and a data area. The spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block. The data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block. The data area includes one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks.

One or more embodiments provided in the present specification determine the spacer block threshold and the data block threshold based on the dynamically acquired data waveform each time the card is inserted. On this basis, the code values corresponding to the one or more data blocks and the number of spacer blocks are identified according to the spacer block threshold and the data block threshold, and when the number of spacer blocks reaches the preset number, the code corresponding to the barcode on the card is determined according to the code values corresponding to the one or more data blocks. In addition, by determining whether the identified number of spacer blocks reaches the preset number, the integrity of the read barcode data area is verified. It is to be noted that different embodiments may produce different beneficial effects. In different embodiments, the beneficial effects that may be produced may be any one or a combination of the above, or any other beneficial effects that may be obtained.

Brief Description of the Drawings

The present specification will be further illustrated by way of exemplary embodiments, which are described in detail with reference to the drawings. The same numbers in the drawings represent the same structures or steps.

Fig. 1 is a schematic diagram of a card provided in some embodiments of the present specification.

Fig. 2 is a flowchart of method for identifying a barcode provided in some embodiments of the present specification.

Fig. 3 is a schematic diagram of a normal waveform corresponding to a barcode provided in some embodiments of the present specification.

Fig. 4 is a schematic diagram of a measured waveform corresponding to a barcode provided in some embodiments of the present specification.

Fig. 5 is another schematic diagram of a measured waveform corresponding to a barcode provided in some embodiments of the present specification.

Fig. 6 is a flowchart of S140 provided in some embodiments of the present specification.

Fig. 7 is another flowchart of S140 provided in some embodiments of the present specification.

Fig. 8 is still another flowchart of S140 provided in some embodiments of the present specification.

Fig. 9 is a flowchart of method for identifying a barcode provided in other embodiments of the present specification.

Fig. 10 is a structural block diagram of a barcode identification apparatus provided in some embodiments of the present specification.

Detailed Description of the Embodiments

In order to more clearly illustrate the technical solutions of the embodiments of the present specification, the embodiments will be described below in detail in combination with the drawings. It is apparent that the contents described below are some examples or embodiments of the present specification. For those of ordinary skill in the art, the technical solutions or means disclosed in the present specification may also be applied to other scenarios according to these technical contents without creative efforts.

It is to be understood that "system", "apparatus", "unit" and/or "module" used in the present specification are intended to distinguish different components, elements, parts, portions or assemblies at different levels. However, if other words may achieve the same purpose, the words may be substituted by other expressions.

Unless otherwise specified, technical terms used in the present specification to describe components, elements, etc., are not intended to refer exclusively to the singular, but may also include the plural. Generally speaking, terms such as "include", "contain", etc., only indicate the inclusion of explicitly identified steps, elements or components, and these steps, elements, and components do not constitute an exclusive list, such as the method or device described may also include other steps or components.

Flowcharts are used in the present specification to illustrate the operational steps executed by

the apparatus or system of the relevant embodiments, but unless otherwise specified, the order in which the steps are described should not be construed as limiting the order in which the steps are executed. Those of ordinary skill in the art may adjust the execution sequence of these steps according to the knowledge information conveyed by the embodiments of the present specification, and the adjustment includes, but is not limited to, swapping the sequence of the steps, merging multiple steps, and splitting a certain step.

Some embodiments of the present specification provide a hard card, a material thereof may include plastic. The plastic is a polymer compound polymerized by an addition polymerization or polycondensation reaction with a monomer as a raw material, and has an anti-deformation capability between fiber and rubber, and certain rigidity and wear resistance. Specifically, the plastic may further include Polyvinyl Chloride (PVC), Polyethylene Glycol Terephthalate (PET), polypropylene, polystyrene, etc. A barcode is printed on the plastic card, which may effectively solve the problem of short service life of the card. However, the hard plastic card may have the problems such as reflection, resulting in a relatively large deviation between a sampling value of the barcode acquired by a card reading device during no-power identification and an actual value of an area corresponding to the barcode, which is prone to identification errors, non-identification, etc. For this reason, some embodiments of the present specification improve the barcode, and correspondingly provide method and apparatus for identifying a barcode, an electronic device, and a computer-readable storage medium, which can perform no-power identification on the barcode on the card, reduce the influence of materials of the card and the barcode on an identification result to a certain extent, and improve the accuracy of the identification result.

The barcode identification method provided in some embodiments of the present specification may be applied to the electronic device. The electronic device provided in some embodiments of the present specification may be implemented as various types of user terminals such as a learning machine, an audio and video player, a punch card machine, Augmented Reality (AR) glasses, a laptop, a tablet computer, a desktop computer, a set-top box, a mobile device (e.g., a mobile phone, a portable music player, a personal digital assistant, a dedicated messaging device, and a portable gaming device), or a server, which is not limited by the embodiments of the present specification.

The barcode identified by the method for identifying a barcode provided in some embodiments of the present specification includes a spacer block threshold detection area, a data block threshold detection area, and a data area. The spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block. The data block threshold detection area is configured to set

a data block threshold, and the data block threshold represents a value range of sampling values corresponding to the data block. The data area includes one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks. In some embodiments, the aforementioned barcode may be printed on the hard card, such as the plastic card, and the barcode on the card is read or sampled by a reading apparatus to obtain a waveform including sampling values corresponding to a plurality of sampling points.

In some embodiments, the reading apparatus may implement barcode reading or identification based on a photoelectric principle. Specifically, the reading apparatus has a photoelectric reading head and a corresponding reading area, and the photoelectric reading head may acquire a sampling point sequence by sampling the reading area at a preset sampling frequency. The sampling frequency may be, for example, 30 ms each time, 40 ms each time, etc. In some embodiments, the photoelectric reading head and the reading area are fixedly arranged. When the card is inserted into the reading apparatus, each area of the barcode on the card may sequentially pass through the reading area, and then the photoelectric reading head may sample the barcode on the card at the aforementioned sampling frequency to obtain the sampling point sequence. In other embodiments, the card reading apparatus may have a plurality of photoelectric reading heads, each of which is configured to read one data block in the barcode, and the photoelectric reading heads correspond to the data blocks in the barcode one by one. The specific structure and operating principle of the reading apparatus are not limited in the embodiments of the present specification. After acquiring the sampling point sequence composed of the plurality of sampling points, a waveform corresponding to the sampling point sequence may further be obtained. As an example, the waveform can use a sampling point sequence number as a horizontal coordinate and the sampling value as a vertical coordinate. Since the card, or specifically the barcode on the card, enters the card reading area in chronological order, the sampling point sequence number may also reflect sampling timing information corresponding to the sampling point and front and rear position information of the sampling point corresponding to the area on the barcode. As an example, the sampling point with a relatively large sampling point sequence number corresponds to the back area on the barcode.

Fig. 1 is a schematic diagram of a card provided in some embodiments of the present specification. Specifically, as shown in Fig. 1, a barcode is printed on the card, and a spacer block threshold detection area, a data block threshold detection area, and a data area are sequentially arranged on the barcode according to a reading order of a reading apparatus (for example, in a direction in which each area of the barcode on the card sequentially passes through a reading area

when the card is inserted into the reading apparatus). Referring to an example of Fig. 1, the spacer block threshold detection area includes one white block, the data block threshold detection area includes one black block, and the data area includes a plurality of black data blocks, a plurality of gray data blocks, and a plurality of spacer blocks separating adjacent data blocks. The black data block represents 0 in binary, and the gray data block represents 1 in binary. Ten data blocks arranged in different orders may express 2^10, i.e., 1024 pieces of different data.

It is to be noted that, in some embodiments, it is also feasible to enable the black data block to represent 1 in binary and the gray data block to represent 0 in binary. In other embodiments, the spacer blocks are not limited to the above white block, and the data blocks are not limited to the above black block and gray block. The spacer block and the data block may also be other color blocks. In some other embodiments, the types of the data blocks in the data area may also be three or more, and accordingly, a code corresponding to the barcode may represent data based on a numeral system corresponding to the type of the data block in the data area. For example, the data area includes three types of data blocks, and the code corresponding to the barcode may represent the data in ternary. The data area includes four types of data blocks, and the code corresponding to the barcode may represent the data in quaternary. In order to clearly and intuitively understand the technical solution, the embodiments of the present specification are mainly illustrated by taking a case where the data blocks provided are composed of a first type of data block and a second type of data block as an example, but it should not be construed as limiting the embodiments of the present specification.

Fig. 2 is a flowchart of method for identifying a barcode provided in some embodiments of the present specification. In some embodiments, the flow shown in Fig. 2 may be implemented by a barcode identification apparatus shown in Fig. 10. Specifically, as shown in Fig. 2, in some embodiments, the method may include the following steps.

At S110, a data waveform is acquired. The data waveform is obtained based on a waveform generated by sampling a barcode using a reading apparatus at a preset sampling frequency, with a sampling point sequence number as a horizontal coordinate and a sampling value as a vertical coordinate. In some embodiments, S110 may be implemented by an acquisition module 310.

In some embodiments, the data waveform may be the waveform obtained by sampling the barcode on a card using the reading apparatus, or may be a result obtained after pre-processing the waveform. The relevant description of the waveform may be found in the previous text, and the relevant description of the pre-processing may be found in the following text, which will not be repeated here.

As mentioned above, the card may be made of plastic materials with a certain degree of reflectivity, such as PVC and PET. In actual application scenarios, the reflectivity of the card, the color depth of ink on the card, and a distance between the card and a reading head after the card is inserted may affect the waveform read by the barcode.

Fig. 3 is a schematic diagram of a normal waveform (i.e., a waveform obtained without interference of factors such as reflection) corresponding to a barcode provided in some embodiments of the present specification. Specifically, as shown in Fig. 3, a white block is a spacer block and corresponds to the highest level, a black block is a data block and corresponds to the lowest level, with an identified code value being 1, and a gray block is a data block and corresponds to an intermediate level, with an identified code value being 0.

Fig. 4 is a schematic diagram of a measured waveform corresponding to a barcode provided in some embodiments of the present specification. Specifically, as shown in Fig. 4, the sampling values corresponding to the white block, the black block, and the gray block in the barcode are fluctuating. That is to say, for the barcode printed on the card made of the material with a certain reflectivity such as PVC, a detection value of each color block in the barcode read by a photoelectric reading head is a range, rather than a relatively fixed value.

Fig. 5 is another schematic diagram of a measured waveform corresponding to a barcode provided in some embodiments of the present specification. Specifically, as shown in Fig. 5, the left waveform (dashed box 1) corresponds to a card insertion process, and the right waveform (dashed box 2) corresponds to another card insertion process that follows immediately. In the two card insertion processes, the range of a peak value in the left waveform is significantly different from the range of a peak value in the right waveform, while the range of a trough value in the left waveform is close to the range of a peak value in the right waveform. That is to say, in the two card insertion processes, spacer block thresholds detected based on the same spacer block threshold detection area may be different, and data block thresholds detected based on the same data block detection area may also be different.

In order to solve this problem, some embodiments of the present specification acquire the accurate spacer block threshold by executing S120 and acquire the accurate data block threshold by executing S130 in each card insertion process.

At S120, the spacer block threshold is acquired and recorded based on the sampling value corresponding to the spacer block threshold detection area in the data waveform. In some embodiments, S120 may be implemented by a spacer block threshold setting module 320.

Referring to Fig. 1, in some embodiments, the operation that the spacer block threshold is acquired and recorded based on the sampling value corresponding to the spacer block threshold detection area in the data waveform may include the following step of: the sampling values in the data waveform are sequentially processed based on the horizontal coordinate, and when a fluctuation in the sampling value of the data waveform is detected, the spacer block threshold is acquired and recorded based on the sampling value. In some embodiments, when the fluctuation in the sampling value of the data waveform is detected, a plurality of sampling values may be continuously obtained, and an average thereof may be recorded as the spacer block threshold.

The spacer block threshold detection area is configured to determine the spacer block threshold corresponding to each card insertion process, and the spacer block threshold corresponding to each card insertion process is detected based on the same spacer block threshold detection area. That is to say, the spacer block threshold detection area is configured to calibrate a value range of a sampling value of the spacer block in the same card insertion process.

In some embodiments, when the sampling value of the data waveform exceeds an initial threshold, it is determined that the fluctuation in the sampling value of the data waveform is detected. The initial threshold is a value range of the sampling value counted before the barcode enters the reading area.

In some embodiments, a pad is arranged in a reading area of the reading apparatus, the sampling value in an initial state is a sampling value corresponding to the pad read by the reading apparatus before the card is inserted, and an interval between the sampling value corresponding to the pad and a sampling value threshold corresponding to the spacer block may be not less than a preset range. The preset range may be set according to actual needs, and the preset range is preferably such that when the card is inserted, a significant fluctuation in the sampling value can be observed in the detection waveform. In this way, when the card is inserted, the sampling value read by the reading apparatus may have a significant fluctuation, which may be used as a sign that the card enters a reading state.

In some embodiments, the pad in the reading area may be black or approximately black, and the range of the corresponding sampling value is the same as or close to the range of the data block threshold, so that the interval between the ranges of the sampling values of the black data block and the white spacer block is the largest. The pad is arranged to be black or approximately black, so that a significant fluctuation in the sampling value may be observed when the card is inserted. It is to be noted that, in other embodiments, the range of the sampling value corresponding to the pad may also be different from the range of the data block threshold, and other value ranges in which a

significant fluctuation in the sampling value can be observed when the card is inserted may also be applied in the present embodiment.

In the examples corresponding to Fig. 1 and Fig. 3, the spacer block is the white block, the data block is the black block, the pad is black or approximately black, the ranges of the sampling values of the data block and the initial state are the same or approximately the same, and the ranges of the sampling values of the spacer block and the data block are different. In the initial state, the reading apparatus detects the reading area and reads the sampling value corresponding to the pad. When the card is inserted, the reading apparatus reads the sampling value of the spacer block, and the sampling value may be fluctuating greatly. If no large fluctuation in the sampling value is detected, it indicates that the barcode on the card does not enter the reading area, and the reading apparatus continues to perform polling detection on the reading area.

At S130, the data block threshold is acquired and recorded based on the sampling value corresponding to the data block threshold detection area in the data waveform. In some embodiments, S130 may be implemented by a data block threshold setting module 330.

Referring to Fig. 1, in some embodiments, the operation that the data block threshold is acquired and recorded based on the sampling value corresponding to the data block threshold detection area in the data waveform includes: the sampling values in the data waveform continue to be sequentially processed based on the horizontal coordinate, and when it is detected that the sampling value of the data waveform exceeds the spacer block threshold, the data block threshold is acquired and recorded based on the sampling value. In some embodiments, when it is detected that the sampling value of the data waveform exceeds the spacer block threshold, a plurality of sampling values may be continuously obtained, and an average thereof is recorded as the data block threshold.

The data block threshold detection area is configured to determine the data block threshold corresponding to each card insertion process, and the data block threshold corresponding to each card insertion process is detected based on the same data block threshold detection area. The data block thresholds corresponding to different card insertion processes may be the same or different. That is to say, the data block threshold detection area is configured to calibrate a value range of a data block sampling value in the same card insertion process.

At S140, code values corresponding to the one or more data blocks and the number of spacer blocks are identified from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold. In some embodiments, S140 may be implemented by an identification module 340.

Referring to Fig. 1, in some embodiments, the operation that code values corresponding to the one or more data blocks and the number of spacer blocks are identified from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold includes: the sampling values in the data waveform continue to be sequentially processed based on the horizontal coordinate, and after the sampling value of the data waveform reaches the spacer block threshold for the second time, the code values corresponding to the one or more data blocks and the number of spacer blocks are identified according to the sampling value, the spacer block threshold, and the data block threshold.

At S150, when the number of spacer blocks reaches a preset number, a code corresponding to the barcode is determined according to the code values corresponding to the one or more data blocks. In some embodiments, S150 may be implemented by a code determination module 350.

The spacer block in the data area is configured to separate adjacent data blocks. Generally speaking, when the number of coded data bits corresponding to the barcode is determined, the preset number of spacer blocks is also determined. As an example, in the data area of the barcode, the last spacer block in the data area may be arranged after the last data block. Therefore, when the number of spacer blocks detected from the data area reaches the preset number, it means that the identification of the data blocks in the data area is also completed. At this time, the code corresponding to the barcode may be determined based on the code values of the plurality of data blocks acquired. Referring to Fig. 3, the code values corresponding to the data blocks may be sequentially combined to obtain a code "1011011111". As another example, the spacer block belonging to the data area may not be arranged after the last data block in the data area of the barcode. After the number of spacer blocks reaches a preset data certain time (such as 30 ms or 50 ms, etc.), it is determined that the identification of the data blocks in the data area has been completed. The aforementioned certain time may be understood as the time for the reading apparatus to identify the last data block. Further, the code corresponding to the barcode may be determined based on the code values corresponding to the plurality of data blocks acquired.

In some embodiments, the spacer block threshold detection area, the data block threshold detection area, and the data area are sequentially arranged according to a reading order of the reading apparatus. That is to say, when the card enters the card reading apparatus, the reading order of the barcode is the spacer block threshold detection area, the data block threshold detection area, and the data area. In some embodiments, when the interval between the data block threshold and the initial threshold satisfies a determination condition that the barcode enters the reading area, the reading order of the barcode area may also be the data block threshold detection area, the

spacer block threshold detection area, and the data area. The determination condition that the barcode enters the reading area may be that the interval between the data block threshold corresponding to the data block threshold detection area and the initial threshold satisfies a preset range, and the preset range enables the card to be identified by the fluctuation in the sampling value when entering the card reading area.

It is to be noted that the number of spacer block threshold detection areas may be one or more, the number of data block threshold detection areas may be one or more, and the number of data areas may be one or more. In some possible implementations, the number of spacer block threshold detection areas is a plurality and the number of data areas is a plurality, the at least one spacer block threshold detection area is arranged before the data area, and the other spacer block threshold detection areas in the plurality of spacer block threshold detection areas are distributed between adjacent data areas, so that the spacer block threshold may be corrected multiple times in one card insertion process. In some other possible implementations, the number of data block threshold detection areas is a plurality and the number of data areas is a plurality, the at least one data block threshold detection area is arranged before the data area, and the other data block threshold detection areas in the plurality of data block threshold detection areas are distributed between adjacent data areas, so that the data block threshold may be corrected multiple times in one card insertion process. The above examples are only configured to illustrate the possible implementations of the barcode, and should not be construed as limiting the embodiments of the present specification, because the spacer block threshold detection area, the data block threshold detection area, and the data area on the barcode may also have other combinations and distribution forms according to actual needs.

Fig. 6 is a flowchart of S140 provided in some embodiments of the present specification. In some embodiments, the flow shown in Fig. 6 may be implemented by the identification module 340 in the barcode identification apparatus. Specifically, as shown in Fig. 6, in some embodiments, the operation that code values corresponding to the one or more data blocks and the number of spacer blocks are identified from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold may include the following steps.

At S1411, the spacer blocks are identified from the sampling values corresponding to the data area in the data waveform according to the spacer block threshold to obtain the number of spacer blocks. That is to say, the spacer blocks are determined based on a direct comparison between the spacer block threshold and the sampling values, and the number of spacer blocks is counted.

At S1412, the data blocks are identified from the sampling values corresponding to the data area in the data waveform according to the data block threshold, and the code values corresponding to the data blocks are determined. Referring to Fig. 1, in the example of Fig. 1, S1412 may be implemented as follows: the first type of data block is determined based on a direct comparison between the data block threshold and the sampling value, the sampling values of the remaining data blocks in the data area are determined as the second type of data block, and then the code value corresponding to the first type of data block and the code value corresponding to the second type of data block are determined. As shown in Fig. 1, the first type of data block corresponds to the black block, and the second type of data block corresponds to the gray block.

In the present embodiment, the number of spacer blocks and the code value corresponding to each data block in the data area are obtained by directly comparing the spacer block threshold, the data block threshold, and the sampling value.

Fig. 7 is another flowchart of S140 provided in some embodiments of the present specification. In some embodiments, the flow shown in Fig. 7 may be implemented by the identification module 340 in the barcode identification apparatus. Specifically, as shown in Fig. 7, in some embodiments, the operation that code values corresponding to the one or more data blocks and the number of spacer blocks are identified from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold may include the following steps.

At S1421, a peak or a trough is determined according to a change trend of the sampling values corresponding to the data area in the data waveform.

A peak point corresponding to the peak in the data waveform satisfies that a first-stage derivative is 0 and a second-stage derivative is negative, while a trough value corresponding to the trough satisfies that the first-stage derivative is 0 and the second-stage derivative is positive.

At S1422, a data block sampling value corresponding to the peak or the trough is determined as the sampling value corresponding to the spacer block in the data area.

In some embodiments, as shown in Fig. 1, the spacer block corresponds to the peak, and S1421 may be implemented as follows: the peak is determined according to the change trend of the sampling values corresponding to the data area in the data waveform. S1422 may be implemented as follows: the data block sampling value corresponding to the peak is determined as the sampling value corresponding to the spacer block in the data area.

On the contrary, in some embodiments, when the spacer block corresponds to the trough,

S1421 may be implemented as follows: the trough is determined according to the change trend of the sampling values corresponding to the data area in the data waveform. S1422 may be implemented as follows: the data block sampling value corresponding to the trough is determined as the sampling value corresponding to the spacer block in the data area.

Fig. 8 is still another flowchart of S140 provided in some embodiments of the present specification. In some embodiments, the flow shown in Fig. 8 may be implemented by the identification module 340 in the barcode identification apparatus. Specifically, as shown in Fig. 8, in some embodiments, the operation that code values corresponding to the one or more data blocks and the number of spacer blocks are identified from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold may include the following steps.

At S1431, the trough or the peak is determined according to the change trend of the sampling value corresponding to the data area in the data waveform.

At S1432, it is determined whether the sampling value corresponding to the trough or the peak exceeds the data block threshold.

At S1433, when the sampling value corresponding to the trough or the peak exceeds the data block threshold, a data block sampling value corresponding to the trough or the peak is determined as the sampling value corresponding to the first type of data block.

At S1434, when the sampling value corresponding to trough or the peak does not exceed the data block threshold, the data block sampling value corresponding to the trough or the peak is determined as the sampling value corresponding to the second type of data block. The first type of data block corresponds to a first code value, and the second type of data block corresponds to a second code value.

In some embodiments, as shown in Fig. 1, the spacer block corresponds to the peak, and the data block corresponds to the trough. The flow corresponding to Fig. 8 may be implemented as follows: the trough is determined according to the change trend of the sampling values corresponding to the data area in the data waveform. It is determined whether the sampling value corresponding to the trough exceeds the data block threshold. When the sampling value corresponding to the trough exceeds the data block threshold, the data block sampling value corresponding to the trough is determined as the sampling value corresponding to the first type of data block. When the sampling value corresponding to the trough does not exceed the data block threshold, the data block sampling value corresponding to the trough is determined as the sampling

value corresponding to the second type of data block. The first type of data block corresponds to the first code value, and the second type of data block corresponds to the second code value.

On the contrary, in some embodiments, when the spacer block corresponds to the trough and the data block corresponds to the peak, the flow corresponding to Fig. 8 may be implemented as follows: the peak is determined according to the change trend of the sampling values corresponding to the data area in the data waveform. It is determined whether the sampling value corresponding to the peak exceeds the data block threshold. When the sampling value corresponding to the peak exceeds the data block threshold, the data block sampling value corresponding to the peak is determined as the sampling value corresponding to the first type of data block. When the sampling value corresponding to the peak does not exceed the data block threshold, the data block sampling value corresponding to the peak is determined as the sampling value corresponding to the second type of data block. The first type of data block corresponds to the first code value, and the second type of data block corresponds to the second code value.

The method for identifying a barcode shown in some embodiments of the present specification is not limited by the order of the steps described, because according to some embodiments of the present specification, some steps may be executed in other orders or simultaneously. For example, when executing S140, the flows shown in Fig. 7 and Fig. 8 may be performed simultaneously, or the flow shown in Fig. 7 may be performed first and then the flow shown in Fig. 8, or in the opposite order.

In one embodiment, the barcode identified by the method further includes a reading completion detection area, and the reading completion detection area includes a spacer block arranged after the data area according to the reading order.

Fig. 9 is another flowchart of method for identifying a barcode provided in some embodiments of the present specification. In some embodiments, the flow shown in Fig. 9 may be implemented by the barcode identification apparatus shown in Fig. 10. S210 to S240 in the flowchart shown in Fig. 9 are similar to S110 to S140 shown in Fig. 2, and the detailed descriptions thereof refer to the relevant description of Fig. 2, which will not be repeated here. Specifically, as shown in Fig. 9, after the number of spacer blocks reaches the preset number and before determining the code corresponding to the barcode according to the code values corresponding to the one or more data blocks, the method may further include the following steps.

At S250, it is determined whether the number of spacer blocks reaches a preset number; when the number of spacer blocks reaches the preset number,S260 is turned; and whenthe number of spacer blocks does not reachthe preset number,S240 is turned. At S260, it is determined whether

the sampling value of the data waveform reaches the spacer block threshold again; when the sampling value reaches the spacer block threshold again, S270 is turned; and when the sampling value does not reach the spacer block threshold again, S280 is turned. In some embodiments, S260 may be implemented by a reading completion detection module in the barcode identification apparatus.

Referring to Fig. 1, when the number of spacer blocks reaches a preset value, it indicates that the data is fully read. At this time, if the subsequently read sampling value falls into the spacer block threshold, it indicates that the barcode on the card is still in the reading area corresponding to the reading apparatus and the spacer block in the reading completion detection area is read. At this time, the card reading device completes the reading of the barcode on the card. At this time, S270 may be executed to determine the code corresponding to the barcode according to code values corresponding to the one or more data blocks. In some embodiments, S270 may be implemented by the code determination module 350.

There are two possible situations when the sampling value does not reach the spacer block threshold again. One possible situation is that the card is pulled out after being read, and what is subsequently read is actually the sampling value corresponding to the pad, which may not fall within the spacer block threshold. Another possible situation is that the card jitters in the insertion process, that is, intermediate insertion and removal occurs. Intermediate insertion and removal refers to the barcode moving to enter the reading area in a direction of entering the reading area, moving in a direction of exiting the reading area in the barcode reading process, and then continuing to move in the direction of entering the reading area. Intermediate insertion and removal may cause a plurality of data bits in the middle of the read barcode. In this case, when the number of spacer blocks reaches the preset number, what is subsequently read is the sampling value of the data block, which may not fall within the spacer block threshold.

At S280, reading abnormality prompt information is generated. In some embodiments, S280 may be implemented by a prompt information generation module in the barcode identification apparatus.

The reading abnormality prompt information may include card not-in-place prompt information and reading error prompt information. The card not-in-place information is configured to indicate that the card is not in place, and the reading error prompt information is configured to indicate that the intermediate insertion or removal occurs in the barcode reading process. After the number of spacer blocks reaches the preset number, by detecting whether the card is in place and whether the data area is read, the situation where the data area is not completely read can be detected, thereby

improving the accuracy of the identification result to a certain extent. When the card is pulled out without being fully inserted, the reading abnormality can be identified in time, and the reading abnormality prompt information is generated. The reading abnormality prompt information may be displayed in one or a combination of text, image, audio, light, and other manners.

In some embodiments, the reading apparatus has a reading area, when the reading apparatus samples from the reading area, the spacer block threshold detection area, the data block threshold detection area, the data area, and the reading completion detection area on the barcode sequentially pass through the reading area, and in a direction of entering the reading area, a length of the spacer block of the reading completion detection area is greater than that of the spacer block of the data area. Barcode reading is completed when the duration of the read spacer block is longer than the duration of the spacer block read before, regardless of the change in the insertion speed. Specifically, the operation that it is determined whether the sampling value of the data waveform reaches the spacer block threshold again may include the following steps: when the sampling value reaches the spacer block threshold, a duration for which the sampling value reaches the spacer block threshold is counted according to the data waveform to obtain a first duration; the first duration is compared with a second duration, where the second duration is a duration for which the sampling value in the data area, counted according to the data waveform, reaches the spacer block threshold; when the first duration is greater than the second duration, it is determined that the sampling value reaches the spacer block threshold again; and when the first duration is not greater than the second duration, it is determined that the sampling value does not reach the spacer block threshold again.

The method for identifying a barcode provided in some embodiments of the present specification may further include: the waveform generated by sampling the barcode on the card using the reading apparatus is pre-processed, and the pre-processing may include the following steps: a plurality of sampling values are sequentially extracted from the waveform in a sliding window manner; and an average of the sampling values extracted each time is calculated, and the average is used as the sampling value in the data waveform. The length of a sliding window may be set according to actual needs. As an example, the length of the sliding window may be 5 sampling points, 10 sampling points, 100 sampling points, etc. In some embodiments, a moving step of the sliding window may also be set, for example, the moving step may be set to 1 sampling point, 5 sampling points, etc. The pre-processed waveform may be used as the data waveform in the method for identifying a barcode. Due to the pre-processing, the noise or jitter of the original waveform may be eliminated, thereby improving the accuracy of barcode identification. In some embodiments, the aforementioned pre-processing step may be implemented by the acquisition module 310.

Some embodiments of the present specification further provide a barcode identification apparatus. The barcode identified by the barcode identification apparatus includes a spacer block threshold detection area, a data block threshold detection area, and a data area. The spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block. The data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block. The data area includes one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks.

Fig. 10 is a structural block diagram of a barcode identification apparatus provided in some embodiments of the present specification. Specifically, as shown in Fig. 10, in one embodiment, the barcode identification apparatus may include the following modules: an acquisition module 310, configured to acquire a data waveform, where the data waveform is obtained based on a waveform generated by sampling the barcode using a reading apparatus at a preset sampling frequency, with a sampling point sequence number as a horizontal coordinate and the sampling value as a vertical coordinate; a spacer block threshold setting module 320, configured to acquire and record the spacer block threshold based on the sampling value corresponding to the spacer block threshold detection area in the data waveform; a data block threshold setting module 330, configured to acquire and record the data block threshold based on the sampling value corresponding to the data block threshold detection area in the data waveform; an identification module 340, configured to identify code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold; and a code determination module 350, configured to determine, when the number of spacer blocks reaches a preset number, a code corresponding to the barcode according to the code values corresponding to the one or more data blocks.

For more details about each module, referring to the related descriptions of Fig. 2 and Fig. 6 to Fig. 9, which will not be repeated here. It is to be understood that the system and the modules thereof shown in Fig. 10 may be implemented in various manners. For example, in some embodiments, the system and the modules thereof may be implemented by hardware, software, or a combination of software and hardware. The hardware part may be implemented using dedicated logic. The software part may be stored in a memory and executed by an appropriate instruction execution system, such as a microprocessor or dedicated design hardware. Those skilled in the art may understand that the above methods and systems may be implemented using computer

executable instructions and/or control codes contained in a processor, and suck codes are provided in a carrier medium such as a disk, a Compact Disk (CD) or Digital Video Disk-Read Only Memory (DVD-ROM), or a memory of a programmable device. The system and the modules thereof of the present specification may not only be implemented by hardware circuits such as very-large-scale integrated circuits or gate arrays, semiconductors such as logic chips, transistors, etc., or programmable hardware devices such as field programmable gate arrays, programmable logic devices, etc., but may also be implemented by software executed by various types of processors, and may also be implemented by a combination of the above hardware circuits and software (e.g., firmware).

It is to be noted that the above description of the system and the modules thereof is only for convenience of description and does not limit the present specification to the scope of the embodiments cited. It is understandable that those skilled in the art, after understanding the principle of the system, may arbitrarily combine the modules to form a subsystem connected to other modules without deviating from this principle. Or some modules may be split to obtain more modules or a plurality of units under the module. Such variations are all within the scope of the disclosure of the present specification.

Some embodiments of the present specification further provide an electronic device, including a processor and a memory. At least one instruction or at least one program is stored in the memory, and the at least one instruction or at least one program is loaded and executed by the processor to implement the method for identifying a barcode as described in one or more embodiments of the present specification.

Some embodiments of the present specification further provide a non-transitory computer-readable storage medium. At least one instruction or at least one program is stored in the storage medium, and the at least one instruction or the at least one program is loaded and executed by a processor to implement the method for identifying a barcode as described in one or more embodiments of the present specification.

Optionally, in the present embodiment, the storage medium may be located in at least one network server among a plurality of network servers of a computer network. Optionally, in the embodiment, the storage medium may include, but are not limited to, a U disk, a Read-Only Memory(ROM), a Random Access Memory (RAM), a mobile hard disk, a magnetic disk, a compact disc, and other media capable of storing program codes.

One or more embodiments of the present specification provide a computer program product, including at least one instruction or at least one program. The at least one instruction or the at least

one program is loaded and executed by a processor to implement the method for identifying a barcode provided in the above various optional implementations.

One or more embodiments of the present specification provide a card. The card is made of plastic, a barcode is printed on the card, and the barcode includes a spacer block threshold detection area, a data block threshold detection area, and a data area. The spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block. The data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block. The data area includes one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks.

It can be seen from the embodiments of the card, the method and apparatus for identifying a barcode, the electronic device or the storage medium provided in one or more embodiments of the present specification that in some embodiments of the present specification, the spacer block threshold and the data block threshold are determined based on the dynamically acquired data waveform each time the card is inserted, which improves the accuracy of the threshold to a certain extent. On this basis, the code values corresponding to one or more data blocks and the number of spacer blocks are identified according to the spacer block threshold and the data block threshold, and when the number of spacer blocks reaches the preset number, the code corresponding to the barcode on the card is determined according to the code values corresponding to the one or more data blocks. In this way, no-power identification of the barcode on the card is realized, the influence of the materials of the card and the barcode on the identification result is reduced to a certain extent, and the accuracy of the identification result is improved. In addition, by determining whether the identified number of spacer blocks reaches the preset number, the integrity of the read barcode data area is verified, which is also conducive to improving the accuracy of the identification result.

The basic concepts have been described above. It is apparent that, for those skilled in the art, the above detailed disclosure is merely an example and does not constitute a limitation to the present specification. Although not explicitly stated here, those skilled in the art may make various modifications, improvements, and corrections to the present specification. Such modifications, improvements, and corrections are taught in the present specification, so that such modifications, improvements, and corrections still fall within the spirit and scope of the exemplary embodiments of the present specification.

What is claimed is

1. A method for identifying a barcode, wherein the barcode comprises a spacer block threshold detection area, a data block threshold detection area, and a data area, wherein the spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block; the data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block; the data area comprises one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks; the method comprises:

acquiring a data waveform, wherein the data waveform is obtained based on a waveform generated by sampling the barcode using a reading apparatus at a preset sampling frequency, with a sampling point sequence number as a horizontal coordinate and the sampling value as a vertical coordinate;

acquiring and recording the spacer block threshold based on the sampling value corresponding to the spacer block threshold detection area in the data waveform;

acquiring and recording the data block threshold based on the sampling value corresponding to the data block threshold detection area in the data waveform;

identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold; and

when the number of spacer blocks reaches a preset number, determining a code corresponding to the barcode according to the code values corresponding to the one or more data blocks.

2. The method according to claim 1, wherein the spacer block threshold detection area, the data block threshold detection area, and the data area are sequentially arranged according to a reading order of the reading apparatus;

the acquiring and recording the spacer block threshold based on the sampling value corresponding to the spacer block threshold detection area in the data waveform comprises:

when a fluctuation in the sampling value of the data waveform is detected, acquiring and recording the spacer block threshold based on the sampling value;

the acquiring and recording the data block threshold based on the sampling value corresponding to the data block threshold detection area in the data waveform comprises:

when it is detected that the sampling value of the data waveform exceeds the spacer block threshold, acquiring and recording the data block threshold based on the sampling value; and

the identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold comprises:

after the sampling value of the data waveform reaches the spacer block threshold for the second time, identifying the code values corresponding to the one or more data blocks and the number of spacer blocks according to the sampling value, the spacer block threshold, and the data block threshold.

3. The method according to claim 2, wherein, when the sampling value of the data waveform exceeds an initial threshold, it is determined that the fluctuation in the sampling value of the data waveform is detected, wherein the initial threshold is a value range of the sampling value counted before the barcode enters a reading area of the reading apparatus.

4. The method according to claim 1, wherein the identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold comprises:

identifying the spacer blocks from the sampling values corresponding to the data area in the data waveform according to the spacer block threshold to obtain the number of spacer blocks; and

identifying the data blocks from the sampling values corresponding to the data area in the data waveform according to the data block threshold, and determining the code values corresponding to the data blocks.

5. The method according to claim 1, wherein the identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold comprises:

determining a peak or a trough according to a change trend of the sampling values corresponding to the data area in the data waveform; and

determining data block sampling value corresponding to the peak or the trough as the sampling value corresponding to the spacer block in the data area.

6. The method according to claim 1 or 5, wherein the identifying code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold comprises:

Determining at rough or a peak according to a change trend of the sampling values corresponding to the data area in the data waveform;

determining whether the sampling value corresponding to the trough or the peak exceeds the data block threshold;

when the sampling value corresponding to the trough or the peak exceeds the data block threshold, determining a data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a first type of data block; and

when the sampling value corresponding to the trough or the peak does not exceed the data block threshold, determining the data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a second type of data block;

wherein the first type of data block corresponds to a first code value, and the second type of data block corresponds to a second code value.

7. The method according to claim 2, wherein the barcode further comprises a reading completion detection area, and the reading completion detection area comprises a spacer block arranged after the data area according to the reading order; the method further comprises, after the number of spacer blocks reaches the preset number and before determining the code corresponding to the barcode according to the code values corresponding to the one or more data blocks:

determining whether the sampling value of the data waveform reaches the spacer block threshold again;

when the sampling value reaches the spacer block threshold again, turning to the step of determining the code corresponding to the barcode according to the code values corresponding to the one or more data blocks; and

when the sampling value does not reach the spacer block threshold again, generating reading abnormality prompt information.

8. The method according to claim 7, wherein the reading apparatus has a reading area, when the

reading apparatus samples from the reading area, the spacer block threshold detection area, the data block threshold detection area, the data area, and the reading completion detection area on the barcode sequentially pass through the reading area, and in a direction of entering the reading area, a length of the spacer block of the reading completion detection area is greater than that of the spacer block of the data area; the determining whether the sampling value of the data waveform reaches the spacer block threshold again comprises:

when the sampling value reaches the spacer block threshold, counting a duration for which the sampling value reaches the spacer block threshold according to the data waveform to obtain a first duration;

comparing the first duration with a second duration, wherein the second duration is a duration for which the sampling value in the data area, counted according to the data waveform, reaches the spacer block threshold;

when the first duration is greater than the second duration, determining that the sampling value reaches the spacer block threshold again; and

when the first duration is not greater than the second duration, determining that the sampling value does not reach the spacer block threshold again.

9. The method according to claim 1, wherein the data waveform is obtained by pre-processing the waveform generated by sampling the barcode using the reading apparatus at the preset sampling frequency, with the sampling point sequence number as the horizontal coordinate and the sampling value as the vertical coordinate.

10. The method according to claim 9, wherein the pre-processing comprises:

sequentially extracting a plurality of sampling values from the waveform in a sliding window manner; and

respectively calculating an average of the sampling values extracted each time, and using the average as the sampling value in the data waveform.

11. An apparatus for identifying a barcode, wherein the barcode comprises a spacer block threshold detection area, a data block threshold detection area, and a data area, wherein the spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block; the data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block; the data area

comprises one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks; the apparatus comprises:

an acquisition module, configured to acquire a data waveform, wherein the data waveform is obtained based on a waveform generated by sampling the barcode using a reading apparatus at a preset sampling frequency, with a sampling point sequence number as a horizontal coordinate and the sampling value as a vertical coordinate;

a spacer block threshold setting module, configured to acquire and record the spacer block threshold based on the sampling value corresponding to the spacer block threshold detection area in the data waveform;

a data block threshold setting module, configured to acquire and record the data block threshold based on the sampling value corresponding to the data block threshold detection area in the data waveform;

an identification module, configured to identify code values corresponding to the one or more data blocks and the number of spacer blocks from the sampling value corresponding to the data area in the data waveform according to the spacer block threshold and the data block threshold; and

a code determination module, configured to determine, when the number of spacer blocks reaches a preset number, a code corresponding to the barcode according to the code values corresponding to the one or more data blocks.

12. The apparatus according to claim 11, wherein the spacer block threshold detection area, the data block threshold detection area, and the data area are sequentially arranged according to a reading order of the reading apparatus;

the spacer block threshold setting module is further configured to acquire and record, when a fluctuation in the sampling value of the data waveform is detected, the spacer block threshold based on the sampling value;

the data block threshold setting module is further configured to acquire and record, when it is detected that the sampling value of the data waveform exceeds the spacer block threshold, the data block threshold based on the sampling value; and

the identification module is further configured to identify, after the sampling value of the data waveform reaches the spacer block threshold for the second time, the code values corresponding to the one or more data blocks and the number of spacer blocks according to the

sampling value, the spacer block threshold, and the data block threshold.

13. The apparatus according to claim 12, wherein the spacer block threshold setting module is further configured to determine, when the sampling value of the data waveform exceeds an initial threshold, that the fluctuation in the sampling value of the data waveform is detected, wherein the initial threshold is a value range of the sampling value counted before the barcode enters a reading area of the reading apparatus.

14. The apparatus according to claim 11, wherein the identification module is further configured to:

identify the spacer blocks from the sampling values corresponding to the data area in the data waveform according to the spacer block threshold to obtain the number of spacer blocks; and

identify the data blocks from the sampling values corresponding to the data area in the data waveform according to the data block threshold, and determine the code values corresponding to the data blocks.

15. The apparatus according to claim 11, wherein the identification module is further configured to:

determine a peak or a trough according to a change trend of the sampling values corresponding to the data area in the data waveform; and

determine a data block sampling value corresponding to the peak or the trough as the sampling value corresponding to the spacer block in the data area.

16. The apparatus according to claim 11 or 15, wherein the identification module is further configured to:

Determine at rough or a peak according to a change trend of the sampling values corresponding to the data area in the data waveform;

determine whether the sampling value corresponding to the trough or the peak exceeds the data block threshold;

determine, when the sampling value corresponding to the trough or the peak exceeds the data block threshold, a data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a first type of data block; and

determine, when the sampling value corresponding to the trough or the peak does not exceed the data block threshold, the data block sampling value corresponding to the trough or the peak as the sampling value corresponding to a second type of data block;

wherein the first type of data block corresponds to a first code value, and the second type of

data block corresponds to a second code value.

17. The apparatus according to claim 12, wherein the barcode further comprises a reading completion detection area, and the reading completion detection area comprises a spacer block arranged after the data area according to the reading order; the apparatus further comprises:

a reading completion detection module, configured to determine, after the number of spacer blocks reaches the preset number and before determining the code corresponding to the barcode according to the code values corresponding to the one or more data blocks, whether the sampling value of the data waveform reaches the spacer block threshold again;

the code determination module is further configured to determine, when the sampling value reaches the spacer block threshold again, the code corresponding to the barcode according to the code values corresponding to the one or more data blocks; and

the apparatus further comprises a prompt information generation module, configured to generate reading abnormality prompt information when the sampling value does not reach the spacer block threshold again.

18. The apparatus according to claim 17, wherein the reading apparatus has a reading area, when the reading apparatus samples from the reading area, the spacer block threshold detection area, the data block threshold detection area, the data area, and the reading completion detection area on the barcode sequentially pass through the reading area, and in a direction of entering the reading area, a length of the spacer block of the reading completion detection area is greater than that of the spacer block of the data area; the reading completion detection module is further configured to:

count, when the sampling value reaches the spacer block threshold, a duration for which the sampling value reaches the spacer block threshold according to the data waveform to obtain a first duration;

compare the first duration with a second duration, wherein the second duration is a duration for which the sampling value in the data area, counted according to the data waveform, reaches the spacer block threshold;

determine that the sampling value reaches the spacer block threshold again when the first duration is greater than the second duration; and

determine that the sampling value does not reach the spacer block threshold again when the first duration is not greater than the second duration.

19. The apparatus according to claim 11, wherein the acquisition module is further configured to obtain the data waveform by pre-processing the waveform generated by sampling the barcode using the reading apparatus at the preset sampling frequency, with the sampling point sequence number as the horizontal coordinate and the sampling value as the vertical coordinate.

20. The apparatus according to claim 19, wherein the acquisition module is further configured to:

sequentially extract a plurality of sampling values from the waveform in a sliding window manner; and

respectively calculate an average of the sampling values extracted each time, and use the average as the sampling value in the data waveform.

21. A card, wherein a material of the card comprises plastic, a barcode is printed on the card, and the barcode comprises a spacer block threshold detection area, a data block threshold detection area, and a data area, wherein the spacer block threshold detection area is configured to set a spacer block threshold, and the spacer block threshold represents a value range of a sampling value corresponding to a spacer block; the data block threshold detection area is configured to set a data block threshold, and the data block threshold represents a value range of a sampling value corresponding to a data block; and the data area comprises one or more data blocks and one or more spacer blocks arranged in a certain order, and the spacer block in the data area is configured to separate adjacent data blocks.