METHODS AND DEVICES FOR BARCODE BASED COMMUNICATION AND PAYMENT IMPLEMENTATION

TECHNICAL FIELD

[0001] The present application relates to the field of network communications technologies, and in particular, to methods and devices for barcode based communication and payment implementation.

BACKGROUND

[0002] A barcode includes a group of lines and spacing symbols that are arranged based on a specific coding rule, and is used to indicate information about a specific character, digit, or symbol. Examples of barcodes include one-dimensional barcodes and two-dimensional barcodes. The one-dimensional barcode is used to express information by arranging a plurality of black lines and spacings with different widths based on a certain rule. The two-dimensional barcode (also referred to as a quick response code) is used to record information by using a pattern with black and white geometric figures alternated on a (two-dimensional) plane based on a certain rule.

[0003] With development of mobile Internet technologies and popularization of intelligent terminals, barcodes are widely applied to various near field services based on user accounts. Two users can implement services such as mobile payment and information sharing between accounts by scanning a one-dimensional barcode or a two-dimensional code.

[0004] In the existing technology, barcode scanning communication between two devices is unidirectional communication, and a device that displays the barcode cannot obtain a processing result of information in the barcode from a device that scans the barcode. In response to determining that a service is performed by using the barcode, such unidirectional communication can cause information asymmetry between two communication parties and affect service security and integrity.

[0005] For example, in response to determining that a payment service is performed by using a barcode, a merchant cashier terminal with a code scanner

obtains a user account after scanning a payment two-dimensional code displayed by a user terminal, and initiates a payment request to a payment server by using the user account, a merchant account, and an amount. After completing a transfer between the user account and the merchant account, the payment server separately sends a payment result to the merchant cashier terminal and the user terminal. In response to determining that a user is in an area such as a new development area, an underground store, or a foreign country that is not covered by a mobile data network, the user terminal cannot immediately receive the payment result while the merchant cashier terminal can receive the payment result because the merchant cashier terminal and the payment server usually communicate with each other through a wired network and can successfully complete the payment. Because of the previous information asymmetry, the user cannot confirm a payment amount and whether the payment is successful. Therefore, it is difficult to ensure the payment security of the user.

SUMMARY

[0006] In view of this, the present application provides a barcode-based communication method, including: rendering first transmission information into a first barcode, and displaying the first barcode for scanning by a peer device; and scanning a second barcode displayed by the peer device, to obtain second transmission information included in the second barcode, where the second transmission information is obtained by the peer device based on a processing result of the first transmission information.

[0007] The present application provides a barcode-based communication method, including: scanning a first barcode displayed by a peer device, to obtain first transmission information included in the first barcode; generating second transmission information based on a processing result of the first transmission information; and rendering the second transmission information into a second barcode, and displaying the second barcode for scanning by the peer device.

[0008] The present application further provides a payment implementation method, and the method is applied to a payer device and includes: rendering payer information including payer account information into a payment barcode, and displaying the payment barcode for scanning by a payee device; and scanning a payment result barcode displayed by the payee device, to obtain a payment result

included in the payment result barcode, where the payment result is sent by a payment server to the payee device after the payment server makes a payment from a payer account to a payee account based on a payment request including the payer account information.

[0009] The present application provides a payment implementation method, and the method is applied to a payee device and includes: scanning a payment barcode displayed by a payer device, to obtain payer information that is included in the payment barcode and that includes payer account information; sending a payment request to a payment server, and receiving, from the payment server, a payment response that includes a payment result, where the payment request includes the payer account information, payee account information, and a payment amount, and the payment result is generated by the payment server after the payment server makes a payment from a payer account to a payee account based on the payer account information, the payee account information, and the payment amount; and rendering the payment result into a payment result barcode, and displaying the payment result barcode for scanning by the payer device.

[0010] The present application further provides a barcode-based communication apparatus, including: a first barcode display unit, configured to render first transmission information into a first barcode, and display the first barcode for scanning by a peer device; and a second barcode scanning unit, configured to scan a second barcode displayed by the peer device, to obtain second transmission information included in the second barcode, where the second transmission information is obtained by the peer device based on a processing result of the first transmission information.

[0011] The present application provides a barcode-based communication apparatus, including: a first barcode scanning unit, configured to scan a first barcode displayed by a peer device, to obtain first transmission information included in the first barcode; a second transmission information unit, configured to generate second transmission information based on a processing result of the first transmission information; and a second barcode display unit, configured to render the second transmission information into a second barcode, and display the second barcode for scanning by the peer device.

[0012] The present application further provides a payment implementation apparatus, and the apparatus is applied to a payer device and includes: a payment

barcode display unit, configured to render payer information including payer account information into a payment barcode, and display the payment barcode for scanning by a payee device; and a payment result barcode scanning unit, configured to scan a payment result barcode displayed by the payee device, to obtain a payment result included in the payment result barcode, where the payment result is sent by a payment server to the payee device after the payment server makes a payment from a payer account to a payee account based on a payment request including the payer account information.

[0013] The present application provides a payment implementation apparatus, and the apparatus is applied to a payee device and includes: a payment barcode scanning unit, configured to scan a payment barcode displayed by a payer device, to obtain payer information that is included in the payment barcode and that includes payer account information; a payment result receiving unit, configured to send a payment request to a payment server, and receive, from the payment server, a payment response that includes a payment result, where the payment request includes the payer account information, payee account information, and a payment amount, and the payment result is generated by the payment server after the payment server makes a payment from a payer account to a payee account based on the payer account information, the payee account information, and the payment amount; and a payment result barcode display unit, configured to render the payment result into a payment result barcode, and display the payment result barcode for scanning by the payer device.

[0014] The present application further provides a code scanner, including an image acquisition module, where the image acquisition module is configured to obtain an image signal of a barcode displayed by a peer device, and further includes a processing module, a communications module, and a display module; where the processing module is configured to decode the image signal obtained by the image acquisition module into input information, upload the input information to a host by using the communications module, render output information delivered by the host by using the communications module into a barcode, and transmit the barcode to the display module; the communications module is configured to upload the input information to the host, and receive the output information delivered by the host; and the display module is configured to display the barcode obtained by randering the output information.

[0015] It can be seen from the previous technical solutions that in the implementations of the barcode-based communication method and apparatus in the present application, after a communication party scans a first barcode displayed by the other communication party, and obtains first transmission information from the first barcode, the communication party generates second transmission information based on a processing result of the first transmission information, and renders the second transmission information into a second barcode for scanning by the other communication party. Therefore, both of the communication parties can perform bidirectional information transmission by using barcodes, to alleviate information asymmetry caused by unidirectional communication, and improve service integrity and security.

[0016] In the implementations of the payment implementation method and apparatus in the present application, after scanning the payment barcode that is of the payer device and that includes the payer account information, the payee device sends the payment request to the payment server by using the payer account information, receives the payment result, and renders the payment result into the payment result barcode for scanning by the payer device, so that the payer device can confirm a payment amount and the payment result without connecting to the payment server. Therefore, payment service integrity is ensured, and payment security of a user is improved.

[0017] In the implementation of the code scanner in the present application, the processing module renders the output information delivered by the host into the barcode and then displays the barcode on a display screen, so that the code scanner implements a function of displaying a barcode for scanning to a communication peer end, and the code scanner can perform barcode-based bidirectional communication, to provide an implementation basis for improving integrity and security of a service process.

BRIEF DESCRIPTION OF DRAWINGS

[0018] FIG. 1 is a flowchart of a barcode-based communication method that is applied to a communication party, according to Implementation 1 of the present application;

[0019] FIG. 2 is a flowchart of a barcode-based communication method that is

applied to the other communication party, according to Implementation 1 of the present application;

[0020] FIG. 3 is a network structure diagram of an application scenario, according to Implementation 2 of the present application;

[0021] FIG. 4 is a flowchart of a payment implementation method that is applied to a payer device, according to Implementation 2 of the present application;

[0022] FIG. 5 is a flowchart of a payment implementation method that is applied to a payee device, according to Implementation 2 of the present application;

[0023] FIG. 6 is a schematic structural diagram of a code scanner, according to Implementation 3 of the present application;

[0024] FIG. 7 is a structural diagram of hardware of a device, according to Implementation 1 or Implementation 2 of the present application;

[0025] FIG. 8 is a logical structural diagram of a barcode-based communication apparatus that is applied to a communication party, according to an implementation of the present application;

[0026] FIG. 9 is a logical structural diagram of a barcode-based communication apparatus that is applied to the other communication party, according to an implementation of the present application;

[0027] FIG. 10 is a logical structural diagram of a payment implementation apparatus that is applied to a payer device, according to an implementation of the present application; and

[0028] FIG. 11 is a logical structural diagram of a payment implementation apparatus that is applied to a payee device, according to an implementation of the present application.

DESCRIPTION OF IMPLEMENTATIONS

[0029] Implementation 1 of the present application provides a barcode-based communication method. Assume that a communication party is device A, and the other communication party is device B. Device A displays, to device B, a first barcode obtained by rendering first transmission information. After obtaining the first transmission information through scanning, device B generates second transmission information based on a processing result of the first transmission information, renders the second transmission information into a second barcode, and displays the second

barcode to device A for scanning. Device A obtains the second transmission information after scanning the second barcode. As such, barcode-based bidirectional communication between device A and device B is implemented, information asymmetry between device A and device B that is caused by unidirectional communication is alleviated, and a problem in the existing technology is alleviated.

[0030] In the present implementation, device A and device B serving as two communication parties can be any device that has computing, storage, display, and barcode scanning functions, for example, a mobile phone, a tablet computer, a notebook computer, or a personal computer (PC) that has a photographing function or an external barcode scanner.

[0031] In the present implementation, a procedure in which the barcode-based communication method is applied to device A is shown in FIG. 1, and a procedure in which the barcode-based communication method is applied to device B is shown in FIG. 2.

[0032] Step 110: Device A renders first transmission information into a first barcode, and displays the first barcode for scanning by a peer device.

[0033] Step 210: Device B scans the first barcode displayed by the peer device, and obtains the first transmission information included in the first barcode.

[0034] Device A renders the first transmission information to be transmitted to device B into the first barcode and then displays the first barcode. Device B scans the first barcode, and extracts the first transmission information from image data of the scanned first barcode.

[0035] For a specific method for rendering information into a barcode and extracting the information from image data of the barcode, references can be made to the existing technology. In addition, the barcode in the present implementation can be a one-dimensional barcode or a two-dimensional barcode.

[0036] Specific content of the first transmission information can be determined based on information that needs to be transmitted in a service procedure related to device A and device B in an actual application scenario, and is not limited in the present implementation. The first transmission information can include one or more types of service information, device control information, and communication control information.

[0037] The service information is service data related to a service procedure.

[0038] The device control information is used to control a working status

parameter of device B, or control device B to perform a specified function operation, or not only control a working status parameter of device B but also control device B to perform a specified function operation. The working status parameter includes various parameter values or status values such as screen brightness of device B, a barcode display time duration or a barcode display area and location that can be set or modified by a running unit such as an application, a process, or a thread on device B. The function operation includes various functions such as turning on/off a camera, photographing, recording, lighting up a screen, and turning off the screen that can be started, run, and disabled by a running unit such as an application, a procedure, or a thread on device B.

[0039] The communication control information is used to notify device B of a current progress, a subsequent procedure, or a current progress and a subsequent procedure of information exchange. The current progress is an information exchange step that is in progress or completed on device A. For example, information 1 is received, or information 2 is being processed. The subsequent procedure is a requirement of device A for device B in subsequent communication, for example, returning an information receiving acknowledgement, or returning an information processing result.

[0040] Step 220: Device B generates second transmission information based on a processing result of the first transmission information.

[0041] After extracting the first transmission information, device B processes the first transmission information based on a requirement of a service procedure in an actual application scenario, to obtain the second transmission information. The second transmission information can be generated after device B locally processes the first transmission information; or device B can send the first transmission information to another device, and then a processing result returned by the another device is used as the second transmission information; or device B can process the first transmission information, send an intermediate processing result to another device, and generate the second transmission information based on a response returned by the another device. Implementations are not limited thereto.

[0042] As described above, the first transmission information can include one to more types of the service information, the device control information, and the communication control information. In response to determining that the first transmission information includes the device control information, after device B

extracts the first transmission information, device B performs at least one of the following: changing the working status parameter of device B, or performing the specified function operation on device B based on the device control information in the first transmission information. For example, in response to determining that the first transmission information includes device control information "increasing screen brightness", the screen brightness of device B is increased in response to determining that the screen brightness of device B does not reach a maximum value; or in response to determining that the first transmission information includes device control information "turning off a camera", device B turns off the camera of device B.

[0043] In response to determining that the first transmission information includes the communication control information, device B learns of at least one of the current progress or the subsequent procedure of the information exchange with device A based on the communication control information in the first transmission information; and generates the second transmission information based on at least one of the current progress or the subsequent procedure of the information exchange. For example, in response to determining that the first transmission information includes communication control information "returning a receiving acknowledgement", device B generates second transmission information "information is received"; or in response to determining that the first transmission information includes communication control information "returning an information processing result", device B uses the processing result as the second transmission information after processing the first transmission information ends.

[0044] Step 230: Device B renders the second transmission information into a second barcode, and displays the second barcode for scanning by the peer device.

[0045] Step 120: Device A scans the second barcode displayed by the peer device, to obtain the second transmission information included in the second barcode, where the second transmission information is generated by the peer device based on the processing result of the first transmission information.

[0046] Device B renders the generated second transmission information into the second barcode, and displays the second barcode. Device A scans the second barcode displayed by device B, and extracts the second transmission information from image data of the second barcode.

[0047] Similarly, device B can encapsulate at least one of the device control information or the communication control information in the second transmission

information. In response to determining that the second transmission information includes device control information, after device A extracts the device control information, device A performs at least one of the following: changing a working status parameter of device A, or performing a specified function operation based on the device control information; or in response to determining that the second transmission information includes communication control information, after device A extracts the communication control information, device A performs at least one of the following: learning of a current progress of information exchange with device B, or performing a subsequent process of the information exchange with device B based on the communication control information.

[0048] For example, in response to determining that the second transmission information includes communication control information "continuing to scan the next barcode", device A continues to invoke a camera to scan a screen of device B until the next barcode (a barcode different from the currently received barcode, a barcode displayed after the screen of device B is turned off and lit up again, or the subsequently displayed barcode) is scanned.

[0049] By using the previous steps, bidirectional communication between device A and device B can be performed by scanning barcodes. After the communication between the two parties ends, device A and device B can send prompt signals such as a prompt tone or vibration to respective users, to notify the users that the communication ends. Device A and device B can notify, by using communication control information in the barcode, each other that the communication ends, or a running unit such as an application or a process that runs a service procedure can end the communication. Implementations are not limited thereto.

[0050] It can be seen that in the present implementation, device A displays, to device B, the first barcode obtained by rendering the first transmission information. Device B scans the first barcode displayed by device A and obtains the first transmission information from the first barcode, generates the second transmission information based on the processing result of the first transmission information, and renders the second transmission information into the second barcode for scanning by Device A. As such, barcode-based bidirectional communication between device A and device B is implemented, information asymmetry between device A and device B that is caused by unidirectional communication is alleviated, and service integrity and security are improved.

[0051] Implementation 2 of the present application provides a payment implementation method. A payee device scans a payment barcode, of a payer device, that includes payer account information. After requesting a payment from a payment server by using the payer account information, the payee device renders a payment result into a payment result barcode, and displays the payment result barcode to the payer device for scanning, so that the payer device can immediately learn of the payment result without connecting to the payment server. Therefore, payment security of a user is improved, and a problem in the existing technology is alleviated.

[0052] FIG. 3 shows a network structure of an application scenario, according to the present implementation. The payee device and the payment server can access each other through a communications network, and the payer device and the payee device perform near field communication by scanning a barcode. The payee device and the payer device can be any device that has computing, storage, display, and barcode scanning functions, for example, a mobile phone, a tablet computer, a notebook computer, or a personal computer (PC) that has a photographing function or an external barcode scanner. The payee device can be a cashier terminal that has a barcode scanning and display function. The payment server can be one physical or logical server, or can be two or more physical or logical servers that take different responsibilities and cooperate with each other to implement functions of the payment server in the present implementation.

[0053] In the present implementation, a procedure in which a payment implementation method is applied to the payer device is shown in FIG. 4, and a procedure in which the payment implementation method is applied to the payee device is shown in FIG. 5. For content in the present implementation that is the same as that in Implementation 1, details are omitted here for simplicity. For details, references can be made to Implementation 1.

[0054] Step 410: The payer device renders payer information including payer account information into a payment barcode, and displays the payment barcode for scanning by the payee device.

[0055] Step 510: The payee device scans the payment barcode displayed by the payer device, to obtain the payer information that is included in the payment barcode and that includes the payer account information.

[0056] After receiving a payment operation performed by a user serving as a payer, the payer device generates the payer information, and the payer information

includes the payer account information. The payer account information can be any information that can uniquely represent the payer account on a payment server, such as a registered user name of the payer, or an account code of a payer account in a payment system. In addition, the payer device can further add at least one of device control information or communication control information to the payer information. The payer device renders the payer information into the payment barcode, and displays the barcode on a screen for scanning by the payee device.

[0057] The payee device scans the payment barcode displayed by the payer device, obtains the payer information by parsing image data of the payment barcode, and extracts the payer account information from the payer information.

[0058] For a specific method for rendering information into a barcode and extracting the information from image data of the barcode, references can be made to the existing technology. In addition, the barcode in the present implementation can be a one-dimensional barcode, a two-dimensional barcode, or another type of barcode.

[0059] Step 520: The payee device sends a payment request to a payment server, and receives, from the payment server, a payment response that includes a payment result, where the payment request includes the payer account information, payee account information, and a payment amount, and the payment result is generated by the payment server after the payment server makes a payment from a payer account to a payee account based on the payer account information, the payee account information, and the payment amount.

[0060] The payee device encapsulates the payer account information, the payee account information, and the payment amount from the payer to a payee in the payment request, and sends the payment request to the payment server. Similarly, the payee account information can be any information that can uniquely represent the payee account on the payment server.

[0061] The payment server transfers an amount equal to the payment amount from the payer account to the payee account. After the transfer succeeds, a payment success is used as the payment result. In response to determining that the transfer fails due to an abnormal state of the payee account or the payer account, an insufficient balance of the payer account, etc., a payment failure is used as the payment result. The payment server encapsulates the payment result in the payment response, and sends the payment response to the payee device.

[0062] Step 530: The payee device renders the payment result into a payment

result barcode, and displays the payment result barcode for scanning by the payer device.

[0063] Step 420: The payer device scans the payment result barcode displayed by the payee device, to obtain the payment result included in the payment result barcode, where the payment result is sent by the payment server to the payee device after the payment server makes the payment from the payer account to the payee account based on the payment request including the payer account information.

[0064] The payee device receives the payment response, extracts the payment result from the payment response, performs corresponding service processing based on whether the payment is successful, renders the payment result into the payment result barcode, and displays the payment result barcode on a screen.

[0065] The payer device scans the payment result barcode displayed on the screen of the payee device, and obtains the payment result by parsing image data of the payment result barcode.

[0066] After the payee device scans the payment barcode displayed by the payer device, it takes the payee device a long time to display the payment result barcode for scanning by the payer device. In this period, the payer device keeps scanning the screen of the payee device and consumes a lot of power. The payer device is usually a mobile device of a user, and power consumption is a key indicator.

[0067] Therefore, in an example, after obtaining the payer information included in the payment barcode, the payee device can render waiting process control information into a waiting process control barcode, and display the waiting process control barcode on the screen for scanning by the payer device. The waiting process control information includes device control information, and the device control information is used to perform the at least one of the following: changing a working status parameter of the payer device, or performing a specified function operation. For example, the waiting process control information can be adjusting screen brightness, turning off a camera for a predetermined time and then turning on the camera, or a combination thereof. After scanning the waiting process control barcode, the payer device performs at least one of the following: changing the working status parameter of the payer device, or performing the specified function operation based on the device control information included in the waiting process control barcode, to save power.

[0068] In response to determining that the payee device displays the waiting process control barcode after obtaining the payer information, to reduce power

consumption of the payer device, the payer device further needs to continue to scan the payment result barcode of the payee device. It can be specified in a payment procedure of the payer and a cashier procedure of the payee that after scanning the payment barcode, the payee device successively displays two barcodes to the payer device, to respectively transmit control information and the payment result, and the payer device scans, under control of a running unit such as an application or a process that runs the payment procedure, the two barcodes successively displayed by the payee device; or the payee device can add communication control information to the waiting process control information, the communication control information includes a notification message instructing the payer device to continue to scan the next barcode, and, after scanning the waiting process control barcode, the payer device extracts the communication control information and can learn that the payee can further display the next barcode for scanning by the payer device.

[0069] In another example, after the payment barcode is displayed for a predetermined display time, the payer device can start to scan the payment result barcode. Specifically, the payer device can start a timer in response to determining to display the payment barcode on the screen, the predetermined display time is set on the timer, and the payer device starts to scan the payment result barcode in response to determining that the timer expires. The predetermined display time can be determined based on factors such as a processing speed of the payee device, or a time required for information exchange between the payee and the payment server. Delaying the start of scanning can save power of the payer device.

[0070] In some application scenarios, in response to determining that the payer device can normally communicate with the payment server, the payment server can directly send the payment result to the payer device. A method in which the payer device is notified of the payment result by using the payment result barcode in the present implementation is used only in response to determining that the payer device cannot communicate with the payment server. The following two implementations can be used in these application scenarios:

[0071] Implementation 1: In response to determining that the payer device cannot normally communicate with the payment server, in response to determining that the payer device generates the payer information, the payer device adds, to the payer information, communication control information instructing to return the payment result. The communication control information is used to request the payee device to

feed back the payment result to the payer device by using a barcode. In addition, after displaying the payment barcode, the payer device scans the screen of the payee device, to receive information returned by the payee device by using the barcode. In response to determining that the payer device can normally communicate with the payment server, the payer device does not add, to the payer information, communication control information instructing to return the payment result, and does not need to scan the payment result barcode of the payee device. In response to determining that the payer information includes the communication control information instructing to return the payment result, the payee device renders the payment result into the payment result barcode, and displays the payment result barcode for scanning by the payer device; otherwise, the payee device does not need to generate or display the payment result barcode.

[0072] Implementation 2: In response to determining that the payer device cannot normally communicate with the payment server, after the payer device displays the payment barcode, the payer device scans the payment result barcode displayed by the payee device, to obtain the payment result included in the payment result barcode; otherwise, the payer device does not need to scan the payment result barcode of the payee device. In response to determining that the payment server cannot normally communicate with the payer device, and the payment server generates the payment response, the payment server encapsulates, in the payment response, a notification indicating that the payer device goes offline. In response to determining that the payment response received from the payment server includes the notification indicating that the payer device goes offline, the payee device renders the payment result into the payment result barcode, and displays the payment result barcode for scanning by the payer device; otherwise, the payee device does not need to generate or display the payment result barcode.

[0073] It can be seen that in the present implementation, the payee device scans the payment barcode that is of the payer device and that includes the payer account information, sends the payment request to the payment server by using the payer account information, receives the payment result, renders the payment result into the payment result barcode, and displays the payment result barcode to the payer device for scanning, so that the payer device can confirm a payment amount and the payment result without connecting to the payment server. As such, payment service integrity and payment security of the user are improved.

[0074] In the existing technology, a code scanner used by a payee can usually only scan a barcode on another object or device, and does not have a display screen or a function of generating and displaying a barcode. Such a code scanner or a host connected to the code scanner cannot be used as a party that performs bidirectional communication by using barcodes in the present application. Therefore, Implementation 3 of the present application provides a code scanner. The code scanner has a display screen, and has a function of receiving information delivered by a host and rendering the information into a barcode for display. In the present implementation of the present invention, such a code scanner or a host connected to the code scanner can be used as a party of bidirectional communication, to alleviate information asymmetry caused by unidirectional communication.

[0075] The code scanner in the present implementation is connected to the host by using a wired or wireless communications interface, and can upload information to the host and receive information delivered by the host. The host can be any device that has computing and storage functions. In the present implementation, a type of the host, a communication method between the host and the code scanner, and a communications protocol are not limited.

[0076] In the present implementation, a structure of the code scanner is shown in FIG. 6, and includes an image acquisition module, a display module, a processing module, and a communications module.

[0077] The image acquisition module is configured to obtain an image signal of a barcode displayed by a communication peer device.

[0078] The processing module is configured to decode the image signal obtained by the image acquisition module into input information, upload the input information to the host by using the communications module, render output information delivered by the host by using the communications module into a barcode, and transmit the barcode to the display module.

[0079] The communications module is configured to upload the input information to the host, and receive the output information delivered by the host.

[0080] The display module is configured to display the barcode obtained by randering the output information.

[0081] Specifically, during scanning, the image acquisition module obtains, through photographing, reflection based imaging, etc., the image signal of the barcode displayed by the communication peer device, and transmits the image signal to the

processing module. The processing module decodes the image signal obtained by the image acquisition module into the input information, and transmits the input information to the communications module. The communications module uploads the input information from the processing module to the host. To display the barcode, the host delivers the output information to the communications module. The communications module transmits the received output information to the processing module. The processing module renders the output information delivered by the host into the barcode, and then transmits the barcode to the display module. The display module displays the generated barcode on a display screen (the display module includes the display screen).

[0082] The previous constituent modules of the code scanner are usually encapsulated inside a housing of the code scanner. In some application scenarios, one side of the housing of the code scanner is an open side or a side made of a transparent material, the display screen is disposed inside an opposite side of the open side or the transparent side, and a distance between the display screen and the open side or the transparent side is determined based on a focal length of a front-facing camera of a mainstream mobile phone model.

[0083] Specifically, a housing with an open side forms a horizontally placed barrel-type structure. An unclosed side of a barrel forms the open side of the housing. A cross-sectional shape of the barrel can be a rectangle, a round rectangle, a circle, an ellipse, etc., and is not limited. The display screen in the display module is installed on the opposite side (the opposite side can be considered as a bottom of the horizontally placed barrel) of the open side, and is installed inside the housing. In other words, content displayed on the display screen can be seen from the open side. Another side of a housing having a transparent side can or cannot be made of a transparent material. The display screen is installed on an opposite side of the open side or the transparent side, and is installed inside the housing. In other words, content displayed on the display screen can be seen through the transparent side.

[0084] Focal lengths of front-facing cameras of various mainstream mobile phone models are collected, and a distance close to the focal lengths is used as a distance between the display screen and the open side or the transparent side, so that in response to determining that a user places a screen of a mobile phone near the open side or the transparent side, a barcode displayed on the display screen can be conveniently displayed, to facilitate an operation of the user.

[0085] It can be seen that in the present implementation, the code scanner can not only scan the barcode of the communication peer device to obtain the input information, but also render the output information to be transmitted to the peer device into a barcode for display, so that the peer device scans the barcode. The code scanner has a function of performing a barcode-based bidirectional communication, to provide an implementation basis for improving integrity and security of a service process.

[0086] In an application example of the present application, a merchant cashier terminal is externally connected to the code scanner in Implementation 3, scans a payment two-dimensional code displayed by a payment application (app) of a third-party payment platform on the mobile phone of the user, and performs mobile payment by using a payment server of the third-party payment platform. A payment procedure is as follows:

[0087] The user opens the payment app on the mobile phone and confirms a payment operation. In response to determining that the payment app can communicate with the payment server, user account information is used as payer information; otherwise, user account information and communication control information instructing to return a payment result are used as payer information. The payment app renders the payer information into a payment two-dimensional code and displays the payment two-dimensional code on the screen of the mobile phone. In response to determining that the payment app cannot communicate with the payment server, the payment app turns on a front-facing camera, to start to scan the two-dimensional code.

[0088] The user aims the screen of the mobile phone at a code scanner of a merchant. A cashier person of the merchant starts the code scanner, to scan the payment two-dimensional code. The code scanner uploads the payer information obtained through decoding to the merchant cashier terminal.

[0089] The merchant cashier terminal extracts the user account information from the payer information, encapsulates, in a payment request, the user account information, merchant account information, and order information including a payment amount, and sends the payment request to the payment server, to request deduction for such a transaction.

[0090] The payment server transfers the payment amount from a user account to a merchant account. The payment result is a payment success. The payment result is

encapsulated in a payment response and is sent to the merchant cashier terminal. In addition, the payment result is pushed to the payment app of the mobile phone of the user. In response to determining that the payment server cannot normally communicate with the payment app, the payment app cannot receive in time a push message including the payment result.

[0091] The merchant cashier terminal receives the payment response from the payment server, obtains the payment result from the payment response, and performs a service processing procedure after payment succeeds. In response to determining that the payer information from the mobile phone of the user does not include the communication control information instructing to return the payment result, the payment procedure ends; otherwise, the merchant cashier terminal sends the payment result to the code scanner as the output information, and the code scanner renders the payment result into a payment result two-dimensional code and displays the payment result two-dimensional code on the display screen of the code scanner.

[0092] The payment app of the mobile phone of the user scans the payment result two-dimensional code, obtains the payment result after decoding the payment result two-dimensional code, and displays, to the user, a message indicating the payment amount and a successful payment.

[0093] Corresponding to the procedure implementations in Implementation 1 and Implementation 2, implementations of the present application further provide a barcode-based communication apparatus applied to a communication party, a barcode-based communication apparatus applied to the other communication party, a payment implementation apparatus applied to a payer device, and a payment implementation apparatus applied to payee device. All the four apparatuses can be implemented by using software, hardware, or a combination of software and hardware. Software implementation is used as an example. As a logical apparatus, the software is formed after a central processing unit (CPU) in a device in which the software is located reads a corresponding computer program instruction to a memory for running. In terms of hardware, in addition to a CPU, a memory, and a nonvolatile memory shown in FIG. 7, the device in which the apparatus is located usually further includes at least one of other hardware such as a chip for sending or receiving a radio signal, or other hardware such as a card configured to implement a network communication function.

[0094] FIG. 8 shows a barcode-based communication apparatus, according to an

implementation of the present application. The apparatus includes a first barcode display unit and a second barcode scanning unit. The first barcode display unit is configured to render first transmission information into a first barcode, and display the first barcode for scanning by a peer device. The second barcode scanning unit is configured to scan a second barcode displayed by the peer device, to obtain second transmission information included in the second barcode. The second transmission information is obtained by the peer device based on a processing result of the first transmission information.

[0095] Optionally, the first transmission information includes at least one of device control information or communication control information, the device control information is used to perform at least one of the following: controlling a working status parameter of the peer device, or performing a specified function operation, and the communication control information is used to notify the peer device of at least one of a current progress or a subsequent procedure of information exchange.

[0096] Optionally, the second transmission information includes at least one of device control information or communication control information. The apparatus further includes a device and communication control unit, where the device and communication control unit is configured to perform at least one of the following: changing a working status parameter of a local device, or performing a specified function operation based on the device control information in the second transmission information; or learning of a current progress of information exchange with the peer device, or performing a subsequent procedure of the information exchange with the peer device based on the communication control information in the second transmission information.

[0097] Optionally, the apparatus further includes a communication end prompt unit, where the communication end prompt unit is configured to send a prompt signal after communication with the peer device ends.

[0098] FIG. 9 shows a barcode-based communication apparatus, according to an implementation of the present application. The apparatus is applied to a device of the other communication party, and includes a first barcode scanning unit, a second transmission information unit, and a second barcode display unit. The first barcode scanning unit is configured to scan a first barcode displayed by a peer device, to obtain first transmission information included in the first barcode. The second transmission information unit is configured to generate second transmission

information based on a processing result of the first transmission information. The second barcode display unit is configured to render the second transmission information into a second barcode, and display the second barcode for scanning by the peer device.

[0099] Optionally, the first transmission information includes device control information. The apparatus further includes a device control unit, where the device control unit is configured to perform at least one of the following: changing a working status parameter of a local device, or performing a specified function operation based on the device control information in the first transmission information.

[0100] Optionally, the first transmission information includes communication control information. The second transmission information unit is configured to learn of at least one of a current progress or a subsequent procedure of information exchange with the peer device based on the communication control information in the first transmission information; and generate the second transmission information based on at least one of the current progress or the subsequent procedure of the information exchange.

[0101] Optionally, the second transmission information includes at least one of device control information or communication control information, the device control information is used to perform at least one of the following: controlling a working status parameter of the peer device, or performing a specified function operation, and the communication control information is used to notify the peer device of at least one of a current progress or a subsequent procedure of information exchange.

[0102] Optionally, the apparatus further includes a communication end prompt unit, where the communication end prompt unit is configured to send a prompt signal after communication with the peer device ends.

[0103] FIG. 10 shows a payment implementation apparatus, according to an implementation of the present application. The apparatus is applied to a payer device, and includes a payment barcode display unit and a payment result barcode scanning unit. The payment barcode display unit is configured to render payer information including payer account information into a payment barcode, and display the payment barcode for scanning by a payee device. The payment result barcode scanning unit is configured to scan a payment result barcode displayed by the payee device, to obtain a payment result included in the payment result barcode. The payment result is sent by a payment server to the payee device after the payment server makes a payment from

a payer account to a payee account based on a payment request including the payer account information.

[0104] Optionally, the payment result barcode scanning unit is configured to start to scan the payment result barcode after the payment barcode is displayed for a predetermined display time.

[0105] In an implementation, the payment result barcode scanning unit is configured to: in response to determining that the payer device cannot communicate with the payment server, scan the payment result barcode displayed by the payee device, to obtain the payment result included in the payment result barcode.

[0106] In another implementation, in response to determining that the payer device cannot communicate with the payment server, the payer information further includes: communication control information instructing to return the payment result, to instruct the payee device to generate and display the payment result barcode.

[0107] In an example, the apparatus further includes a waiting process control barcode scanning unit, where the waiting process control barcode scanning unit is configured to: before the payment result barcode displayed by the payee device is scanned, scan a waiting process control barcode displayed by the payee device, and perform at least one of the following: changing a working status parameter of the payer device, or performing a specified function operation based on device control information included in the waiting process control barcode.

[0108] In the previous example, the device control information includes at least one of the following: turning down screen brightness, or turning off a camera for a predetermined time and then turning on the camera.

[0109] In the previous example, the waiting process control barcode further includes communication control information, and the communication control information includes a notification message that instructs the payer device to continue to scan the next barcode.

[0110] FIG. 11 shows a payment implementation apparatus, according to an implementation of the present application. The apparatus is applied to a payee device, and includes a payment barcode scanning unit, a payment result receiving unit, and a payment result barcode display unit. The payment barcode scanning unit is configured to scan a payment barcode displayed by a payer device, to obtain payer information that is included in the payment barcode and that includes payer account information. The payment result receiving unit is configured to send a payment request to a

payment server, and receive, from the payment server, a payment response that includes a payment result, where the payment request includes the payer account information, payee account information, and a payment amount, and the payment result is generated by the payment server after the payment server makes a payment from a payer account to a payee account based on the payer account information, the payee account information, and the payment amount. The payment result barcode display unit is configured to render the payment result into a payment result barcode, and display the payment result barcode for scanning by the payer device.

[0111] In an implementation, the payer information further includes communication control information instructing to return the payment result. The payment result barcode display unit is configured to: in response to determining that the payer information includes the communication control information instructing to return the payment result, render the payment result into the payment result barcode, and display the payment result barcode for scanning by the payer device.

[0112] In another implementation, the payment response further includes a notification indicating that the payer device goes offline. The payment result barcode display unit is configured to: in response to determining that the payment response includes the notification indicating that the payer device goes offline, render the payment result into the payment result barcode, and display the payment result barcode for scanning by the payer device.

[0113] In an example, the apparatus further includes a waiting process control barcode display unit, where the waiting process control barcode display unit configured to: after the payer information included in the payment barcode is obtained, render waiting process control information into a waiting process control barcode, and display the waiting process control barcode for scanning by the payer device. The waiting process control information includes device control information used to perform at least one of the following: changing a working status parameter of the payer device, or performing a specified function operation.

[0114] In the previous example, the device control information includes at least one of the following: turning down screen brightness, or turning off a camera for a predetermined time and then turning on the camera.

[0115] In the previous example, the waiting process control barcode further includes communication control information, and the communication control information includes a notification message that instructs the payer device to continue

to scan the next barcode.

[0116] The previous descriptions are merely preferred implementations of the present application, but are not intended to limit the present application. Any modification, equivalent replacement, or improvement made without departing from the spirit and principle of the present application should fall within the protection scope of the present application.

[0117] In a typical configuration, a computing device includes one or more processors (CPUs), one or more input/output interfaces, one or more network interfaces, and one or more memories.

[0118] The memory can include at least one of a non-persistent memory, a random access memory (RAM), or a nonvolatile memory in a computer readable medium, for example, a read-only memory (ROM) or a flash memory (flash RAM). The memory is an example of the computer readable medium.

[0119] The computer readable medium includes persistent, non-persistent, removable, and irremovable media that can store information by using any method or technology. The information can be a computer readable instruction, a data structure, a program module, or other data. Examples of the computer storage medium include but are not limited to a phase-change random access memory (PRAM), a static random access memory (SRAM), a dynamic random access memory (DRAM), a random access memory (RAM) of another type, a read-only memory (ROM), an electrically erasable programmable read-only memory (EEPROM), a flash memory or another memory technology, a compact disc read-only memory (CD-ROM), a digital versatile disc (DVD), or another optical storage, a cassette, a cassette magnetic disk storage, or another magnetic storage device or any other non-transmission medium. The computer storage medium can be configured to store information that can be accessed by the computing device. As described in the present specification, the computer readable medium does not include computer readable transitory media (transitory media) such as a modulated data signal and a carrier.

[0120] It is worthwhile to further note that, the terms "include", "comprise", or their any other variants are intended to cover a non-exclusive inclusion, so a process, a method, a product, or a device that includes a list of elements not only includes those elements but also includes other elements which are not expressly listed, or further includes elements inherent to such a process, method, product, or device. Without more constraints, an element preceded by "includes a …" does not preclude

the existence of additional identical elements in the process, method, product, or device that includes the element.

[0121] A person skilled in the art should understand that an implementation of the present application can be provided as a method, a system, or a computer program product. Therefore, the present application can use a form of hardware-only implementations, software-only implementations, or implementations with a combination of software and hardware. In addition, the present application can use a form of a computer program product that is implemented on one or more computer-usable storage media (including but not limited to a disk memory, a CD-ROM, an optical memory, etc.) that include computer-usable program code.

CLAIMS

1. A method for barcode-based communication between a payer device and a payee device during a payment service procedure, the method comprising:

rendering, at the payer device, payer information into a payment barcode, wherein the payer information comprises payer account information, wherein the payer information is generated at the payer device;

displaying, at the payer device, the payment barcode for scanning by the payee device;

scanning, by the payee device, the payment barcode and obtaining the payer information included in the payment barcode by parsing image data of the payment barcode;

extracting, by the payee device, the payer account information from the payer information,

requesting, by the payee device, a payment from a payment server by using the payer account information included in the payment barcode, wherein a payment result included in a payment response is sent by the payment server to the payee device, wherein the payment result is generated by the payment server after the payment server makes a payment from a payer account to a payee account based on the payer account information, payee account information, and a payment amount, wherein a payment request sent from the payee device to the payment server includes the payer account information, the payee account information, and the payment amount,

rendering, by the payee device, the payment result into the payment barcode and displaying the payment barcode for scanning by the payer device to obtain payment result without connecting to the payment server;

scanning, by the payer device, the payment barcode displayed by the payee device to obtain the payment result included in the payment barcode, wherein the payment result is sent by the payment server to the payee device after the payment server makes the payment from the payer account to the payee account based on the payment request comprising the payer account information; and

obtaining, by the payer device, the payment result included in the payment barcode without connecting to the payment server.

2. The method according to claim 1, wherein the payer device is configured to add at least

one of device control information or communication control information to the payer information.

3. The method according to claim 1, wherein after obtaining the payer information included in the payment barcode, the payee device renders waiting process control information into a waiting process control barcode, and displays the waiting process control barcode on a screen of the payee device for scanning by the payer device, wherein the waiting process control information includes device control information, wherein after scanning the waiting process control barcode, the payer device is configured to perform at least one of the following: changing a working status parameter of the payer device, or performing a specified function operation, for example, adjusting screen brightness, turning off a camera for a predetermined time and then turning on the camera, or a combination thereof, to save power of the payer device.

4. The method according to claim 3, further comprising:

in response to determining that the payee device displays the waiting process control barcode after obtaining the payer information, proceeding to scan the payment barcode of the payee device by the payer device; and

after scanning the payment barcode, the payee device successively displays two barcode to the payer device to respectively transmit control information and the payment result, scanning by the payer device the two barcodes successively displayed by the payee device, or adding communication control information to the waiting process control information by the payee device, where the communication control information includes a notification message instructing the payer device to continue to scan the next barcode, and after scanning the waiting process control barcode, the payer device extracts the communication control information and leans that the payee further displays the next barcode for scanning by the payer device.

5. The method according to claim 1 further comprising:

sending, by the payer device, a prompt signal after communication with the payee device ends.

6. The method according to claim 1, wherein the scanning the payment barcode displayed by the payee device comprises:

starting to scan the payment barcode after the payment barcode is displayed for a predetermined display time.

7. The method according to claim 1, wherein the scanning the payment barcode displayed by the payee device, to obtain the payment result comprised in the payment barcode comprises:

in response to determining that the payer device cannot communicate with the payment server, scanning a payment result barcode displayed by the payee device, to obtain the payment result comprised in the payment barcode.

8. The method according to claim 7, wherein in response to determining that the payer device cannot communicate with the payment server, the payer information further comprises communication control information instructing to return the payment result, wherein the communication control information is used to instruct the payee device to generate and display the payment result barcode.

9. The method according to claim 3, wherein the device control information comprises at least one of the following: turning down a screen brightness, or turning off a camera for a predetermined time and then turning on the camera.

10. An apparatus for barcode-based communication, the apparatus comprising a plurality of modules configured to perform the computer-implemented method of any one of claims 1 to 9.