TWO-DIMENSIONAL CODE DISPLAY METHOD AND APPARATUS, AND COMPUTER SYSTEM

TECHNICAL FIELD

[0001] One or more embodiments of this specification relate to the field of computer technologies, and in particular, to a two-dimensional code display method and apparatus, and a computer system.

BACKGROUND

[0002] There are several mainstream payment methods in the modern payment system, one of which is that after a user places an order, a merchant provides a two-dimensional code of a corresponding amount for the user to scan for payment. In this payment method, the user only needs to scan the two-dimensional code to check order information and complete payment. This greatly simplifies a user operation and improves transaction convenience.

[0003] However, currently, a service link involved in providing the two-dimensional code by the merchant cannot meet a higher requirement in actual application. Therefore, a solution is needed to optimize the service link, thereby better meeting an actual application requirement. For example, a time consumed for the merchant to provide the two-dimensional code is reduced, thereby reducing waiting duration of the user and further improving user experience.

SUMMARY

[0004] One or more embodiments of this specification describe a two-dimensional code display method and a corresponding apparatus, so as to meet a higher requirement for two-dimensional code display efficiency in actual application.

[0005] According to a first aspect, a two-dimensional code display method is provided, and is performed by an acquiring institution. The method includes: receiving a first code sending request for a target amount from a target merchant; determining a target code value that matches the target amount from several standby code values, where the several standby code values are obtained by

the acquiring institution through advance application from a code sending institution for the target merchant; and providing the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value.

[0006] According to a second aspect, a two-dimensional code display apparatus is provided, and is integrated into an acquiring institution. The apparatus includes: a code sending request receiving module, configured to receive a first code sending request for a target amount from a target merchant; a target code value determining module, configured to determine a target code value that matches the target amount from several standby code values, where the several standby code values are obtained by the acquiring institution through advance application from a code sending institution for the target merchant; and a target code value providing module, configured to provide the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value.

[0007] According to a third aspect, a computer system is provided, and includes a memory, a processor, and a computer program that is stored in the memory and that is capable of running on the processor, where the processor is integrated into an acquiring institution. The processor performs the following steps: receiving a first code sending request for a target amount from a target merchant; determining a target code value that matches the target amount from several standby code values, where the several standby code values are obtained by the acquiring institution through advance application from a code sending institution for the target merchant; and providing the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value.

[0008] According to a fourth aspect, a computing device is provided, and includes a memory and a processor. The memory stores executable code, and when the processor executes the executable code, the method according to the first aspect is implemented.

[0009] Using the method and the apparatus provided in the embodiments of this specification can greatly reduce a time consumed for the acquiring institution to request a code value from the code sending institution in real time, thereby resolving a problem of high time consumption caused by instability of a code sending interface of the code sending institution, effectively reducing waiting duration of a user group, improving user payment experience, and reducing transaction closure or loss.

BRIEF DESCRIPTION OF DRAWINGS

[0010] To describe the technical solutions in the embodiments of the present invention more clearly, the following briefly describes the accompanying drawings needed for describing the embodiments. Clearly, the accompanying drawings in the following descriptions show merely some embodiments of the present invention, and a person of ordinary skill in the art can still derive other drawings from these accompanying drawings without creative efforts.

[0011] FIG. 1 shows a conventional service link involved in providing a two-dimensional code by a merchant;

[0012] FIG. 2 is a schematic interaction diagram of applying for a code value in advance by an acquiring institution from a code sending institution disclosed in an embodiment of this specification;

[0013] FIG. 3 shows an improved service link involved in providing a two-dimensional code by a merchant disclosed in an embodiment of this specification;

[0014] FIG. 4 is a schematic structural diagram of a function of a two-dimensional code display apparatus integrated into an acquiring institution disclosed in an embodiment of this specification; and

[0015] FIG. 5 is a schematic structural diagram of a computer system according to an embodiment of this specification.

DESCRIPTION OF EMBODIMENTS

[0016] The solutions provided in this specification are described below with reference to the accompanying drawings.

[0017] As described above, currently, a service link involved in providing the two-dimensional code by the merchant cannot meet a higher requirement in actual application. Specifically, FIG. 1 shows a conventional service link, where the following interaction steps between a plurality of parties are involved:

[0018] 1. A user purchases a product and triggers a payment process. For example, after purchasing an item in an online shopping mall of a merchant, the user performs an operation of submitting an order, thereby triggering the payment process. For another example, after selecting a to-be-purchased product, the user selects a payment method of code scanning payment, thereby

triggering the payment process.

[0019] 2. In response to the triggering of the payment process, the merchant sends a code sending request to an acquiring station (or referred to as an acquiring institution). For example, the code sending request includes a merchant identifier, a to-be-paid amount, and a transaction currency.

[0020] 3. The acquiring station forwards the code sending request to a code sending institution.

[0021] 4. The code sending institution generates a corresponding code value based on content obtained by parsing the code sending request, and returns the code value to the acquiring station.

[0022] 5. The acquiring station returns the code value to the merchant.

[0023] 6. The merchant renders the corresponding code value into a two-dimensional code, and then displays the two-dimensional code to the user.

[0024] The applicant observes that when the above conventional service link is used, a proportion of transaction closure due to failure to complete payment by the user is relatively high. It is found through analysis that, a case in which the user fails to complete payment is mainly as follows: After the user triggers the payment process, the merchant cannot display a two-dimensional code of a corresponding amount for a long time (for example, 6s), and as a result, the user cannot make payment or waives payment. The main reason is that a code sending interface of the code sending institution is of poor quality or unstable, or the code sending institution does not have a strong capability to process the code sending request, and consequently, a time consumed for step 4 is excessively long, leading to an excessively long time consumed for the entire conventional service link.

[0025] In addition, the applicant further finds that when the acquiring institution applies for a code value from the code sending institution, a main change in information that needs to be provided lies in a transaction amount. However, there is actually a specific type of merchant that provides a prepayment or recharge service of a fixed amount, such as game time card sales, call charge card sales, or transportation card recharging. It should be understood that the fixed amount is an amount that is relatively fixed and basically does not change within a relatively long period of time, and is generally one of a small number of optional fixed amounts corresponding to one order. In addition, for clarity and brevity of description, a set formed by a specific type of merchant is referred to as a predetermined merchant set or a specific merchant set.

[0026] Based on the above observation and analysis, the applicant proposes that for a merchant

in the specific merchant set, the acquiring institution may apply for a code value from the code sending institution in advance based on a fixed amount corresponding to a service provided by the merchant. Later, when the user selects a service of a fixed amount, the acquiring institution directly returns a code value of a corresponding amount from the code value that has been obtained through application. In this way, a time consumed for the acquiring institution to request a code value from the code sending institution in real time may be eliminated, thereby resolving a problem of high time consumption caused by instability of a code sending interface of the code sending institution, greatly reducing a waiting time of the user, improving user payment experience, and avoiding transaction closure or loss.

[0027] To facilitate understanding, the following first describes the process of applying for a code value in advance by the acquiring institution from the code sending institution, and then describes an entire improved service link.

[0028] FIG. 2 is a schematic interaction diagram of applying for a code value in advance by an acquiring institution from a code sending institution disclosed in an embodiment of this specification. It may be understood that the acquiring institution and the code sending institution each may be implemented as any apparatus, platform, server, device cluster, or the like that has a computing and processing capability. As shown in FIG. 2, applying for a code value in advance includes the following interaction steps:

[0029] First, in step S21, the acquiring institution determines m standby transaction amounts for a first merchant, and a transaction quantity c_i corresponding to any i^{th} standby transaction amount x_i.

[0030] It should be noted that, similar terms such as "first" in "first merchant" and "first" and "second" elsewhere in this specification are used to distinguish between similar things, and do not have another limitation function such as sorting.

[0031] In an implementation case A, the first merchant may refer to any merchant in the above specific merchant set. In this case, in a service of a fixed amount provided by the first merchant, several optional fixed amounts may be directly used as m standby transaction amounts. It should be noted that "several" in this specification means one or more.

[0032] Further, in an embodiment, the transaction quantity c_i corresponding to the standby transaction amount x_i may be obtained by performing statistical analysis on historical transaction data of the first merchant. For example, a historical average transaction quantity of the amount x_i

in a unit time period may be determined based on the historical transaction data, and is used as the transaction quantity c_i. A length of the unit time period may be unit interval duration in which the acquiring institution applies for standby code values in batches in advance from the code sending institution.

[0033] In another embodiment, the transaction quantity c_i may be independently set by the first merchant based on a quota provided by the acquiring institution. A limit in the quota may be for a transaction quantity, or may be for a transaction amount. The quota may be configured by the acquiring institution after performing comprehensive evaluation based on a transaction amount and a transaction quantity of each merchant in the above specific merchant set, a processing capability upper limit of the code sending institution, and the like.

[0034] The foregoing describes a manner of performing this step when the first merchant is limited to belonging to the specific merchant set in the implementation case A. Based on the implementation case A, the applicant further proposes that an AI algorithm may be introduced to predict an amount proportion and a magnitude of a subsequent transaction of a merchant. In this case, the first merchant does not need to be limited to a merchant in the specific merchant set, but may alternatively be another merchant, for example, a store that sells clothing, electrical appliances, and the like in an e-commerce platform. The following provides description with reference to an implementation case B.

[0035] In the implementation case B, the first merchant is any merchant that is not limited to belonging to the specific merchant set. In this case, a trained prediction model may be used to predict transaction information of the first merchant, including a standby transaction amount x_i and a corresponding transaction quantity c_i.

[0036] In an embodiment, the prediction model may be a time series model (time series model). It should be understood that the time series model is mainly used to analyze and predict data points arranged in chronological order. There are many model implementation algorithms, for example, an autoregressive integrated moving average model (Autoregressive Integrated Moving Average model, ARIMA model for short), a seasonal ARIMA model, and a long short-term memory (Long Short-Term Memory, LSTM for short) network.

[0037] Based on the above description, a transaction feature of the first merchant in each of T historical time periods may be first obtained to form a transaction feature sequence. It should be understood that a value of T may be set by an operator based on an actual requirement, and duration

d_1 of each time period may be set based on unit interval duration d_2 in which the acquiring institution applies for standby code values in batches in advance from the code sending institution, for example, $d_1=d_2$ is set or $d_1=10d_2$ is set. Factors such as a code sending limit of the code sending institution needs to be considered for the configuration of d_2. For example, the code sending institution restricts the acquiring institution to invoke a code sending interface for a maximum of 1000 times per minute. For example, d_2=1 minute, d_1 is set to be equal to $10d_2$, that is, 10 minutes, and T is set to be a quantity of periods of 10 minutes that are obtained by dividing duration of one week.

[0038] In addition, the transaction features in each historical time period may be obtained through statistics collection based on transaction data in a corresponding time period. For example, the transaction features may include several historical transaction amounts in the historical time period and a historical transaction quantity corresponding to each historical transaction amount.

[0039] Further, the transaction feature sequence may be input into a trained time series model, to obtain m transaction amounts predicted for a future $(T+1)^{th}$ time period and a transaction quantity corresponding to each transaction amount as the predicted transaction information.

[0040] In another embodiment, the prediction model may alternatively be a deep learning model that is not specially used to analyze time series data. In this case, the historical transaction data of the first merchant may be input into a prediction model to obtain the transaction information predicted for a future time period. It should be understood that the historical transaction data may include a transaction amount, a transaction moment, a product category, and the like of each historical transaction. In addition, duration d_3 of the future time period may be set based on unit interval duration d_2 in which the acquiring institution applies for standby code values in batches in advance from the code sending institution, for example, $d_3=d_2$ is set or $d_3=8d_2$ is set.

[0041] The foregoing describes the implementation case B in which the trained prediction model is used to determine the standby transaction amount x_i and the corresponding transaction quantity c_i. It should be noted that, for description of the training manner of the prediction model, reference may be made to the above description of performing prediction reasoning by using the prediction model. A main difference between the two phases is that a sample used in the training phase is additionally marked with a label, and a model parameter needs to be updated for the prediction model, whereas a sample in the reasoning phase is not marked with a label and the model parameter does not need to be updated.

[0042] The foregoing describes the execution of this step with reference to the implementation case A and the implementation case B by using an example. Actually there are not only these two implementation cases. For example, the first merchant may be only a merchant that provides a recharge or prepayment service of a fixed amount. In addition, the trained prediction model may be used to predict the transaction information of the first merchant.

[0043] Based on the above description, the acquiring institution may determine m standby transaction amounts for the first merchant, and a transaction quantity c_i corresponding to any i^{th} standby transaction amount x_i.

[0044] Next, in step S22, the acquiring institution sends n second code sending requests to the code sending institution, where each second code sending request includes a merchant identifier of the first merchant and a standby transaction amount.

[0045] It should be understood that, each second code sending request is generated based on the merchant identifier and the corresponding standby transaction amount. In addition, standby transaction amounts in different second code sending requests may be the same or different. The following relationship exists among the quantity n of the second code sending requests, the quantity m of the standby transaction amounts, and the transaction quantity c_i:

$$n = \sum_{i=1}^{m} c_i \qquad (1)$$

[0046] For example, each second code sending request may further include a transaction currency and the like.

[0047] For implementation of this step, the acquiring institution may send n second code sending requests to the code sending institution at one single time. Alternatively, the n second code sending requests may be divided into a plurality of batches, and then the second code sending requests are sent to the code sending institution by batch based on a unit time interval d_2. A quantity of batches may be determined to be a multiple of d_2 for duration (for example, d_1 or d_3) of the prediction time period corresponding to the n second code sending requests. For batch division, requests corresponding to the same standby amount in the n second code sending requests may be equally allocated to the batches as far as possible.

[0048] For example, it is assumed that n second code sending requests are 50 code sending requests, and duration of a prediction time period corresponding to the n second code sending requests is 10 minutes. In addition, a unit time interval d_2 is 1 minute. In this case, the 50 code sending requests may be divided into 10 batches, and each batch includes 5 second code sending

requests. Then, the second code sending requests corresponding to one batch are sent to the code sending institution every 1 minute.

[0049] Based on the above description, the acquiring institution may send a corresponding second code sending request to the code sending institution based on the determined transaction quantity c_i corresponding to the standby transaction amount x_i.

[0050] Then, in step S23, the code sending institution processes the n second code sending requests, and correspondingly generates n code values.

[0051] Specifically, for each second code sending request, the code sending institution obtains, through parsing, information such as a merchant identifier and a transaction amount that are included in the second code sending request, and then encodes the information into a correspondingly generated code value. It should be understood that, for details about how the code sending institution processes the code sending request and generates the code value, reference may be made to descriptions of related conventional technologies, and details are not described herein.

[0052] Then, in step S24, the acquiring institution receives the correspondingly returned n code values from the code sending institution as a backup.

[0053] Specifically, the acquiring institution may associatively store the n code values and returned related documents. Generally, the related documents record a transaction amount associated with a corresponding code value.

[0054] In summary, by using the method shown in FIG. 2, the acquiring institution may apply for a standby code value in advance from the code sending institution.

[0055] Next, an entire improved service link is described with reference to FIG. 3 and more embodiments. FIG. 3 shows an improved service link involved in providing a two-dimensional code by a merchant disclosed in an embodiment of this specification. It should be understood that, like an acquiring station and a code sending institution, a target merchant may also be implemented as any apparatus, platform, server, device cluster, or the like that has a computing and processing capability. As shown in FIG. 3, the improved service link includes the following interaction steps:

[0056] First, in step S310, the user initiates a payment process for a target order to the target merchant. It should be understood that the target merchant is any merchant and the target order is any order.

[0057] The user may purchase a product, submit an order, and initiate a payment request based on a terminal application. A specific operation method depends on a function design of the terminal

application.

[0058] In an embodiment, the terminal application may be a merchant application (such as a game application or an online shopping mall application) installed in the user's terminal (such as a computer or a mobile phone). In this case, the user may perform an order submission operation based on a product added to a shopping cart. Further, in a specific embodiment, after submitting the order, the user may select a payment method of scanning a two-dimensional code of the merchant from a plurality of payment methods, so as to initiate a payment request. In another specific embodiment, it is assumed that the merchant APP supports only the payment method of scanning the two-dimensional code of the merchant. In this case, the order submission operation may directly trigger the payment process.

[0059] In another embodiment, the terminal application may be a cashier application installed on an Internet of Things device in a real-world physical store of the merchant. In this case, the user may scan a barcode of a product by using the cashier application, so as to enter information about the product to be purchased. After the information is entered, the user taps a payment icon in an interface of the cashier application. In this case, the cashier application creates an order, or the cashier application sends the product information to a server for order creation, and then a payment process is triggered.

[0060] It should be noted that, for description of this step, reference may be further made to the above description of step 1 in FIG. 1.

[0061] Based on the above description, the server of the target merchant may receive a payment request initiated by the user for the target order. The payment request indicates that the selected payment method is scanning a two-dimensional code provided by the merchant.

[0062] Next, in step S320, the target merchant sends a first code sending request for a target amount to the acquiring institution.

[0063] It may be understood that the target amount is a to-be-paid amount corresponding to the target order. The first code sending request includes at least the target amount and a merchant identifier (that is, a merchant ID) of the target merchant. For example, the first code sending request may further include a transaction currency.

[0064] In step S330, the acquiring institution determines a target code value that matches the target amount from several standby code values, where the several standby code values are obtained by the acquiring institution through advance application from the code sending institution

for the target merchant.

[0065] It should be noted that, for a process of the advance application, reference may be made to the above description of FIG. 2. Several standby code values mentioned in this step include n code values shown in FIG. 2 as a backup. For example, a moment at which the acquiring institution receives the first code sending request belongs to the $(T+1)^{th}$ time period in the above embodiment. In this case, a target code value that matches the target amount may be determined from n code values that are applied for in advance for the $(T+1)^{th}$ time period.

[0066] In the one hand, when the acquiring institution applies for a standby code value in advance only for a merchant in the above specific merchant set, before this step, step S325 (not shown in FIG. 3) further needs to be performed: The acquiring institution determines whether the target merchant belongs to the predetermined merchant set. Each merchant in the merchant set provides a prepayment or recharge service of a fixed amount. Further, step S330 is performed only when it is determined that the target merchant belongs to the predetermined merchant set. Otherwise, the first code sending request is forwarded to the code sending institution, so that the code sending institution generates a code value in real time for the first code sending request. In this case, a procedure after step S325 corresponds to steps 3 to 6 shown in FIG. 1.

[0067] On the other hand, execution of this step may include: first determining several unused candidate code values that match the target amount from the several standby code values.

[0068] Further, in an embodiment, a candidate code value that does not exceed a first validity period may be selected from the several candidate code values as the target code value, where the first validity period is set by the code sending institution. Specifically, for each candidate code value, duration from a generation timestamp of the candidate code value to a current moment may be determined. When the duration is less than the first validity period, it is determined that the candidate code value does not exceed the first validity period.

[0069] In another embodiment, a candidate code value that does not exceed a second validity period may be selected from the above several candidate code values as the target code value. The second validity period is a difference between the first validity period and user payment duration obtained through statistics collection for the target merchant, and the first validity period is set by the code sending institution.

[0070] Based on the above description, in this step, the acquiring institution may determine a target code value that matches the target amount from several standby code values.

[0071] Then, in step S340, the acquiring institution provides the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value. This greatly shortens a time for displaying the two-dimensional code by the target merchant.

[0072] According to an embodiment in another aspect, it is assumed that step S330 fails to be performed, that is, the acquiring institution does not determine a target code value that meets a requirement. In this case, step S340 is not performed, but the acquiring institution forwards the first code sending request to the code sending institution, so that the code sending institution generates a code value in real time for the first code sending request.

[0073] In summary, by using the two-dimensional code display method disclosed in the embodiments of this specification, the acquiring institution may apply for several standby code values for each merchant in advance from the code sending institution. Later, when the user initiates transaction payment, the acquiring institution directly returns a code value of a corresponding transaction amount from the code value that has been obtained through application. In this way, a time consumed for the acquiring institution to request a code value from the code sending institution in real time may be eliminated, thereby resolving a problem of high time consumption caused by instability of a code sending interface of the code sending institution, greatly reducing a waiting time of the user, improving user payment experience, and avoiding transaction closure or loss.

[0074] Corresponding to the above display method, an embodiment of this specification further discloses a display apparatus. FIG. 4 is a schematic structural diagram of a function of a two-dimensional code display apparatus integrated into an acquiring institution disclosed in an embodiment of this specification. As shown in FIG. 4, the apparatus 400 includes the following modules:

a code sending request receiving module 410, configured to receive a first code sending request for a target amount from a target merchant; a target code value determining module 420, configured to determine a target code value that matches the target amount from several standby code values, where the several standby code values are obtained by the acquiring institution through advance application from a code sending institution for the target merchant; and a target code value providing module 430, configured to provide the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value.

[0075] In some embodiments, the first code sending request is generated based on a payment operation that is triggered by the user for a target order, and the target amount is a to-be-paid amount corresponding to the target order.

[0076] In some embodiments, the apparatus 400 further includes an advance application module 440, which specifically includes the following units: a code sending request sending unit 441, configured to send several second code sending requests to the code sending institution, where each second code sending request includes a merchant identifier of the target merchant and a standby transaction amount; and a standby code value receiving unit 442, configured to receive the correspondingly returned several standby code values from the code sending institution.

[0077] Further, in some specific embodiments, the advance application module 440 further includes: a transaction information determining unit 443, configured to predict transaction information of the target merchant by using a trained prediction model, where the transaction information includes each standby transaction amount and a corresponding transaction quantity; and a code sending request generation unit 444, configured to generate the several second code sending requests based on the transaction information.

[0078] Still further, in an example, the transaction information determining unit 443 is specifically configured to: obtain a transaction feature of the target merchant in each of T historical time periods to form a transaction feature sequence; and input the transaction feature sequence into a trained time series model to obtain a transaction amount and a corresponding transaction quantity that are predicted for a $(T+1)^{th}$ time period, and use the transaction amount and the corresponding transaction quantity as the transaction information.

[0079] In a more specific embodiment, the code sending request receiving module 410 is specifically configured to receive the first code sending request in the $(T+1)^{th}$ time period.

[0080] In some embodiments, the apparatus 400 further includes a determining module 450, configured to determine whether the target merchant belongs to a predetermined merchant set, where each merchant in the merchant set provides a prepayment or recharge service of a fixed amount.

[0081] In some embodiments, the target code value determining module 420 is specifically configured to: determine several unused candidate code values that match the target amount from the several standby code values; and select a candidate code value that does not exceed a first validity period from the several candidate code values as the target code value, where the first

validity period is set by the code sending institution.

[0082] In some embodiments, the target code value determining module 420 is specifically configured to: determine several unused candidate code values that match the target amount from the several standby code values; and select a candidate code value that does not exceed a second validity period from the several candidate code values as the target code value, where the second validity period is a difference between a first validity period and user payment duration obtained through statistics collection for the target merchant, and the first validity period is set by the code sending institution.

[0083] In some embodiments, the apparatus 400 further includes a code sending request forwarding module 460, configured to: when the target code value is not determined, forward the first code sending request to the code sending institution, so that the code sending institution generates a code value for the first code sending request.

[0084] It should be understood that for ease of description, the above apparatus is described by dividing functions into modules. Certainly, during implementation of this specification, functions of all modules may be implemented in one or more pieces of software and/or hardware.

[0085] The specification also provides a computer-readable non-transitory storage medium, wherein the storage medium stores a computer program, which, when executed by a processor, can be used to perform one or more steps of one or more methods described or illustrated herein or provides functionality described or illustrated herein. Herein, the computer-readable non-transitory storage medium or media may include one or more semiconductor-based or other integrated circuits (ICs) (such, as for example, field-programmable gate arrays (FPGAs) or application-specific ICs (ASICs)), hard disk drives (HDDs), hybrid hard drives (HHDs), optical discs, optical disc drives (ODDs), magneto-optical discs, magneto-optical drives, floppy diskettes, floppy disk drives (FDDs), magnetic tapes, solid-state drives (SSDs), RAM-drives, SECURE DIGITAL cards or drives, any other suitable computer-readable non-transitory storage media, or any suitable combination of two or more of these, where appropriate. A computer-readable non-transitory storage medium may be volatile, non-volatile, or a combination of volatile and non-volatile, where appropriate.

[0086] The specification also provides a computer system. FIG. 5 illustrates an example computer system 500. In particular embodiments, one or more computer systems 500 perform one or more steps of one or more methods described or illustrated herein. In particular embodiments,

one or more computer systems 500 provide functionality described or illustrated herein. In particular embodiments, software running on one or more computer systems 500 performs one or more steps of one or more methods described or illustrated herein or provides functionality described or illustrated herein. Particular embodiments include one or more portions of one or more computer systems 500. Herein, reference to a computer system may encompass a computing device, and vice versa, where appropriate. Moreover, reference to a computer system may encompass one or more computer systems, where appropriate.

[0087] This disclosure contemplates any suitable number of computer systems 500. This disclosure contemplates computer system 500 taking any suitable physical form. As example and not by way of limitation, computer system 500 may be an embedded computer system, a system-on-chip (SOC), a single-board computer system (SBC) (such as, for example, a computer-on-module (COM) or system-on-module (SOM)), a desktop computer system, a laptop or notebook computer system, an interactive kiosk, a mainframe, a mesh of computer systems, a mobile telephone, a personal digital assistant (PDA), a server, a tablet computer system, or a combination of two or more of these. Where appropriate, computer system 500 may include one or more computer systems 500; be unitary or distributed; span multiple locations; span multiple machines; span multiple data centers; or reside in a cloud, which may include one or more cloud components in one or more networks. Where appropriate, one or more computer systems 500 may perform without substantial spatial or temporal limitation one or more steps of one or more methods described or illustrated herein. As an example and not by way of limitation, one or more computer systems 500 may perform in real time or in batch mode one or more steps of one or more methods described or illustrated herein. One or more computer systems 500 may perform at different times or at different locations one or more steps of one or more methods described or illustrated herein, where appropriate.

[0088] In particular embodiments, computer system 500 includes a processor 502, memory 504, storage 506, an input/output (I/O) interface 508, a communication interface 510, and a bus 512. Although this disclosure describes and illustrates a particular computer system having a particular number of particular components in a particular arrangement, this disclosure contemplates any suitable computer system having any suitable number of any suitable components in any suitable arrangement.

[0089] In particular embodiments, processor 502 includes hardware for executing instructions,

such as those making up a computer program. As an example and not by way of limitation, to execute instructions, processor 502 may retrieve (or fetch) the instructions from an internal register, an internal cache, memory 504, or storage 506; decode and execute them; and then write one or more results to an internal register, an internal cache, memory 504, or storage 506. In particular embodiments, processor 502 may include one or more internal caches for data, instructions, or addresses. This disclosure contemplates processor 502 including any suitable number of any suitable internal caches, where appropriate. As an example and not by way of limitation, processor 502 may include one or more instruction caches, one or more data caches, and one or more translation lookaside buffers (TLB s). Instructions in the instruction caches may be copies of instructions in memory 504 or storage 506, and the instruction caches may speed up retrieval of those instructions by processor 502. Data in the data caches may be copies of data of 50 in memory 504 or storage 506 for instructions executing at processor 502 to operate on; the results of previous instructions executed at processor 502 for access by subsequent instructions executing at processor 502 or for writing to memory 504 or storage 506; or other suitable data. The data caches may speed up read or write operations by processor 502. The TLBs may speed up virtual-address translation for processor 502. In particular embodiments, processor 502 may include one or more internal registers for data, instructions, or addresses. This disclosure contemplates processor 502 including any suitable number of any suitable internal registers, where appropriate. Where appropriate, processor 502 may include one or more arithmetic logic units (ALUs); be a multi-core processor; or include one or more processors 502. Although this disclosure describes and illustrates a particular processor, this disclosure contemplates any suitable processor.

[0090] In particular embodiments, memory 504 includes main memory for storing instructions for processor 502 to execute or data for processor 502 to operate on. As an example and not by way of limitation, computer system 500 may load instructions from storage 506 or another source (such as, for example, another computer system 500) to memory 504. Processor 502 may then load the instructions from memory 504 to an internal register or internal cache. To execute the instructions, processor 502 may retrieve the instructions from the internal register or internal cache and decode them. During or after execution of the instructions, processor 502 may write one or more results (which may be intermediate or final results) to the internal register or internal cache. Processor 502 may then write one or more of those results to memory 504. In particular embodiments, processor 502 executes only instructions in one or more internal registers or internal

caches or in memory 504 (as opposed to storage 506 or elsewhere) and operates only on data in one or more internal registers or internal caches or in memory 504 (as opposed to storage 506 or elsewhere). One or more memory buses (which may each include an address bus and a data bus) may couple processor 502 to memory 504. Bus 512 may include one or more memory buses, as described below. In particular embodiments, one or more memory management units (MMUs) reside between processor 502 and memory 504 and facilitate accesses to memory 504 requested by processor 502. In particular embodiments, memory 504 includes random access memory (RAM). This RAM may be volatile memory, where appropriate. Where appropriate, this RAM may be dynamic RAM (DRAM) or static RAM (SRAM). Moreover, where appropriate, this RAM may be single-ported or multi-ported RAM. This disclosure contemplates any suitable RAM. Memory 504 may include one or more memories 504, where appropriate. Although this disclosure describes and illustrates particular memory, this disclosure contemplates any suitable memory.

[0091] In particular embodiments, storage 506 includes mass storage for data or instructions. As an example and not by way of limitation, storage 506 may include a hard disk drive (HDD), a floppy disk drive, flash memory, an optical disc, a magneto-optical disc, magnetic tape, or a Universal Serial Bus (USB) drive or a combination of two or more of these. Storage 506 may include removable or non-removable (or fixed) media, where appropriate. Storage 506 may be internal or external to computer system 500, where appropriate. In particular embodiments, storage 506 is non-volatile, solid-state memory. In particular embodiments, storage 506 includes read-only memory (ROM). Where appropriate, this ROM may be mask-programmed ROM, programmable ROM (PROM), erasable PROM (EPROM), electrically erasable PROM (EEPROM), electrically alterable ROM (EAROM), or flash memory or a combination of two or more of these. This disclosure contemplates mass storage 506 taking any suitable physical form. Storage 506 may include one or more storage control units facilitating communication between processor 502 and storage 506, where appropriate. Where appropriate, storage 506 may include one or more storages 506. Although this disclosure describes and illustrates particular storage, this disclosure contemplates any suitable storage.

[0092] In particular embodiments, I/O interface 508 includes hardware, software, or both, providing one or more interfaces for communication between computer system 500 and one or more I/O devices. Computer system 500 may include one or more of these I/O devices, where appropriate. One or more of these I/O devices may enable communication between a person and

computer system 500. As an example and not by way of limitation, an I/O device may include a keyboard, keypad, microphone, monitor, mouse, printer, scanner, speaker, still camera, stylus, tablet, touch screen, trackball, video camera, another suitable I/O device or a combination of two or more of these. An I/O device may include one or more sensors. This disclosure contemplates any suitable I/O devices and any suitable I/O interfaces 508 for them. Where appropriate, I/O interface 508 may include one or more device or software drivers enabling processor 502 to drive one or more of these I/O devices. I/O interface 508 may include one or more I/O interfaces 508, where appropriate. Although this disclosure describes and illustrates a particular I/O interface, this disclosure contemplates any suitable I/O interface.

[0093] In particular embodiments, communication interface 510 includes hardware, software, or both providing one or more interfaces for communication (such as, for example, packet-based communication) between computer system 500 and one or more other computer systems 500 or one or more networks. As an example and not by way of limitation, communication interface 510 may include a network interface controller (NIC) or network adapter for communicating with an Ethernet or other wire-based network or a wireless NIC (WNIC) or wireless adapter for communicating with a wireless network, such as a WI-FI network. This disclosure contemplates any suitable network and any suitable communication interface 510 for it. As an example and not by way of limitation, computer system 500 may communicate with an ad hoc network, a personal area network (PAN), a local area network (LAN), a wide area network (WAN), a metropolitan area network (MAN), or one or more portions of the Internet or a combination of two or more of these. One or more portions of one or more of these networks may be wired or wireless. As an example, computer system 500 may communicate with a wireless PAN (WPAN) (such as, for example, a BLUETOOTH WPAN), a WI-FI network, a WI-MAX network, a cellular telephone network (such as, for example, a Global System for Mobile Communications (GSM) network), or other suitable wireless network or a combination of two or more of these. Computer system 500 may include any suitable communication interface 510 for any of these networks, where appropriate. Communication interface 510 may include one or more communication interfaces 510, where appropriate. Although this disclosure describes and illustrates a particular communication interface, this disclosure contemplates any suitable communication interface.

[0094] In particular embodiments, bus 512 includes hardware, software, or both coupling components of computer system 500 to each other. As an example and not by way of limitation,

bus 512 may include an Accelerated Graphics Port (AGP) or other graphics bus, an Enhanced Industry Standard Architecture (EISA) bus, a front-side bus (FSB), a HYPERTRANSPORT (HT) interconnect, an Industry Standard Architecture (ISA) bus, an INFINIBAND interconnect, a low-pin-count (LPC) bus, a memory bus, a Micro Channel Architecture (MCA) bus, a Peripheral Component Interconnect (PCI) bus, a PCI-Express (PCIe) bus, a serial advanced technology attachment (SATA) bus, a Video Electronics Standards Association local (VLB) bus, or another suitable bus or a combination of two or more of these. Bus 512 may include one or more buses 512, where appropriate. Although this disclosure describes and illustrates a particular bus, this disclosure contemplates any suitable bus or interconnect.

[0095] A person skilled in the art should be aware that in the above one or more examples, functions described in the present invention may be implemented by hardware, software, firmware, or any combination thereof. When being implemented by software, these functions may be stored in a computer-readable medium or transmitted as one or more instructions or code on a computer-readable medium.

[0096] In the above specific implementations, the objectives, technical solutions, and beneficial effects of the present invention are further described in detail. It should be understood that the above descriptions are merely specific implementations of the present invention, but are not intended to limit the protection scope of the present invention. Any modification, equivalent replacement, improvement, or the like made based on the technical solutions of the present invention shall fall within the protection scope of the present invention.

CLAIMS

What is claimed is:

1. A two-dimensional code display method, performed by an acquiring institution, comprising:

receiving a first code sending request for a target amount from a target merchant;

determining a target code value that matches the target amount from several standby code values, wherein the several standby code values are obtained by the acquiring institution through advance application from a code sending institution for the target merchant; and

providing the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value.

2. The method according to claim 1, wherein the first code sending request is generated based on a payment operation that is triggered by the user for a target order, and the target amount is a to-be-paid amount corresponding to the target order.

3. The method according to claim 1, wherein the advance application comprises the following steps:

sending several second code sending requests to the code sending institution, wherein each second code sending request comprises a merchant identifier of the target merchant and a standby transaction amount; and

receiving the correspondingly returned several standby code values from the code sending institution.

4. The method according to claim 3, wherein before the sending several second code sending requests to the code sending institution, the advance application further comprises:

predicting transaction information of the target merchant by using a trained prediction model, wherein the transaction information comprises each standby transaction amount and a corresponding transaction quantity; and

generating the several second code sending requests based on the transaction information.

5. The method according to claim 4, wherein the predicting transaction information of the target merchant by using a trained prediction model comprises:

obtaining a transaction feature of the target merchant in each of T historical time periods to form a transaction feature sequence; and

inputting the transaction feature sequence into a trained time series model to obtain a

transaction amount and a corresponding transaction quantity that are predicted for a $(T+1)^{th}$ time period, and using the transaction amount and the corresponding transaction quantity as the transaction information.

6. The method according to claim 5, wherein the receiving a first code sending request for a target amount from a target merchant comprises:

receiving the first code sending request in the $(T+1)^{th}$ time period.

7. The method according to claim 1, wherein after the receiving a first code sending request for a target amount from a target merchant, and before the determining a target code value that matches the target amount from several standby code values, the method further comprises:

determining whether the target merchant belongs to a predetermined merchant set, wherein each merchant in the merchant set provides a prepayment or recharge service of a fixed amount.

8. The method according to claim 1, wherein the determining a target code value that matches the target amount from several standby code values comprises:

determining several unused candidate code values that match the target amount from the several standby code values; and

selecting a candidate code value that does not exceed a first validity period from the several candidate code values as the target code value, wherein the first validity period is set by the code sending institution.

9. The method according to claim 1, wherein the determining a target code value that matches the target amount from several standby code values comprises:

determining several unused candidate code values that match the target amount from the several standby code values; and

selecting a candidate code value that does not exceed a second validity period from the several candidate code values as the target code value, wherein the second validity period is a difference between a first validity period and user payment duration obtained through statistics collection for the target merchant, and the first validity period is set by the code sending institution.

10. The method according to claim 1, further comprising:

when the target code value is not determined, forwarding the first code sending request to the code sending institution, so that the code sending institution generates a code value for the first code sending request.

11. A two-dimensional code display apparatus, integrated into an acquiring institution,

wherein the apparatus comprises:

a code sending request receiving module, configured to receive a first code sending request for a target amount from a target merchant;

a target code value determining module, configured to determine a target code value that matches the target amount from several standby code values, wherein the several standby code values are obtained by the acquiring institution through advance application from a code sending institution for the target merchant; and

a target code value providing module, configured to provide the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value.

12. A computer system, comprising a memory, a processor, and a computer program that is stored in the memory and that is capable of running on the processor, wherein the processor is integrated into an acquiring institution, and the processor performs the following steps:

receiving a first code sending request for a target amount from a target merchant;

determining a target code value that matches the target amount from several standby code values, wherein the several standby code values are obtained by the acquiring institution through advance application from a code sending institution for the target merchant; and

providing the target code value to the target merchant, so that the target merchant displays, to a user, a collection two-dimensional code obtained by rendering the target code value.

13. The computer system according to claim 12, wherein the first code sending request is generated based on a payment operation that is triggered by the user for a target order, and the target amount is a to-be-paid amount corresponding to the target order.

14. The computer system according to claim 12, wherein the advance application comprises the following steps:

sending several second code sending requests to the code sending institution, wherein each second code sending request comprises a merchant identifier of the target merchant and a standby transaction amount; and

receiving the correspondingly returned several standby code values from the code sending institution.

15. The computer system according to claim 14, wherein before the sending several second code sending requests to the code sending institution, the advance application further comprises:

predicting transaction information of the target merchant by using a trained prediction model, wherein the transaction information comprises each standby transaction amount and a corresponding transaction quantity; and

generating the several second code sending requests based on the transaction information.

16. The computer system according to claim 15, wherein the predicting transaction information of the target merchant by using a trained prediction model comprises:

obtaining a transaction feature of the target merchant in each of T historical time periods to form a transaction feature sequence; and

inputting the transaction feature sequence into a trained time series model to obtain a transaction amount and a corresponding transaction quantity that are predicted for a $(T+1)^{th}$ time period, and using the transaction amount and the corresponding transaction quantity as the transaction information.

17. The computer system according to claim 16, wherein the receiving a first code sending request for a target amount from a target merchant comprises:

receiving the first code sending request in the $(T+1)^{th}$ time period.

18. The computer system according to claim 12, wherein the determining a target code value that matches the target amount from several standby code values comprises:

determining several unused candidate code values that match the target amount from the several standby code values; and

selecting a candidate code value that does not exceed a first validity period from the several candidate code values as the target code value, wherein the first validity period is set by the code sending institution.

19. The computer system according to claim 12, wherein the determining a target code value that matches the target amount from several standby code values comprises:

determining several unused candidate code values that match the target amount from the several standby code values; and

selecting a candidate code value that does not exceed a second validity period from the several candidate code values as the target code value, wherein the second validity period is a difference between a first validity period and user payment duration obtained through statistics collection for the target merchant, and the first validity period is set by the code sending institution.

20. A computer-readable nonvolatile storage medium, wherein the storage medium stores a

computer program, and the computer program is executed by a processor to implement the method according to any one of claims 1 to 10.