

Fare Collection Device for Means of Public Transport

Technical Field

[01] The present application relates to the field of information technologies, and in particular, to a fare collection device for a means of public transport.

Background

[02] At present, multiple functions are integrated into mobile terminals, such as cell phones, tablet computers, and the like. A user may process different transactions in different transaction scenarios through these functions integrated in a terminal.

[03] In exemplary applications, a user typically needs to use some fixed transaction processing manners for transaction processing in some transaction scenarios. For example, when the user rides the subway, the user typically needs to use a terminal that supports the Near Field Communication (NFC) function or a subway card having an NFC chip to pay the subway fare, while the user is unable to pay the fare using other payment methods.

[04] On the basis of the current technologies, a more effective payment method is needed.

Summary

[05] Embodiments of the present specification provide a fare collection device for a means of public transport to solve the problem that there are only limited payment methods according to the current technologies and it is inconvenient for users in the payment process.

[06] Embodiments of the present specification adopt the following technical solutions:

[07] a fare collection device for a means of public transport, comprising a first collector, a second collector, and a processor, wherein

[08] the first collector is configured to collect a to-be-recognized image;

[09] the second collector is configured to obtain payment information through a near-field non-contact collection process; and

[10] the processor is configured to trigger a ride fare collection transaction upon determining that there is a target object within a set distance, and when the ride fare collection transaction is triggered, determine whether the first collector has collected a to-be-recognized image; if so, perform payment processing according to payment information obtained through parsing the to-be-recognized image; and if not, turn on the second collector and perform payment processing according to payment information obtained by the second collector.

[11] At least one of the above technical solutions adopted by the embodiments of the present specification can achieve the following beneficial effects:

[12] In one or more embodiments of the present specification, even when it is impossible to collect a to-be-recognized image through the first collector, the second collector may be used to obtain payment information through a near-field non-contact collection process, and then payment processing may be performed according to the obtained payment information. In other words, payment information may be obtained by various of collectors through various of collectors in different manners, and in this way, the fare collection device is capable of obtaining the payment information through various of collectors even when the user can only provide the payment information in a single manner. As a result, it is very convenient for the user during the collection of ride fares from the user.

10 **Brief Description of the Drawings**

[13] The accompanying drawings described herein are used to provide further understanding of the present application and constitute a part of the present application. The exemplary embodiments of the present application and the description thereof are used to describe the present application and do not constitute improper limitations to the present application. In the accompanying drawings:

[14] FIG. 1 is a schematic structural diagram of a fare collection device for a means of public transport according to some embodiments of the present specification;

[15] FIG. 2 is a schematic structural diagram of a camera and an NFC loop antenna according to some embodiments of the present specification;

[16] FIG. 3 is a schematic structural diagram of another fare collection device for a means of public transport according to some embodiments of the present specification;

[17] FIG. 4 is a schematic structural diagram of yet another fare collection device for a means of public transport according to some embodiments of the present specification; and

[18] FIG. 5 is a schematic diagram of a payment flow according to some embodiments of the present specification.

Detailed Description

[19] In exemplary applications, a user typically needs to use some fixed transaction processing manners for transaction processing in some transaction scenarios. For example, when the user rides a subway, the user can pay for the ride only by using the NFC function of a terminal that supports the Near Field Communication (NFC) function or a subway card having an NFC chip, while no other methods may be used to pay for the ride. In other words, the user can provide his/her own payment information to a subway turnstile through the NFC function of the terminal or the subway card, but cannot provide the payment information to the subway turnstile in other manners. Therefore, if the NFC function of the terminal or the

subway card held by the user fails or the terminal does not have the NFC function, the user will not be able to pay the ride fare, which greatly limits payment methods that the user can use to pay the ride fare, leading to inconvenience for the user in the process of paying the ride fare.

5 [20] To this end, the present specification provides a fare collection device for a means of public transport, which activates a second collector to obtain payment information through a near-field non-contact collection process when a to-be-recognized image is not collected by a first collector in a first collection manner. Since the payment information may be collected in various of collection manners, the fare collection device is capable of collecting the payment
10 information in various of collection manners even when the user can only provide the payment information in a single manner. As a result, it is very convenient for the user during the collection of ride fares from the user. The fare collection device solves the problem that there are only limited payment methods according to the current technologies and it is inconvenient for users in the process of paying ride fares.

15 [21] To make the objectives, technical solutions and advantages of the present specification clearer, the technical solutions of the present application will be clearly and thoroughly described below with reference to exemplary embodiments of the present specification and corresponding accompanying drawings. Apparently, the described embodiments are merely some, but not all, embodiments of the present application. All other embodiments obtained,
20 based on some embodiments of the present specification, by one of ordinary skill in the art without creative effort shall fall within the protection scope of the present application.

[22] Technical solutions provided by the embodiments of the present application will be described in detail below with reference to the accompanying drawings.

[23] FIG. 1 illustrates a fare collection device for a means of public transport according to
25 some embodiments of the present specification, comprising a first collector 100, a second collector 102, and a processor 104.

[24] Here, the first collector 100 is configured to collect a to-be-recognized image and the second collector 102 is configured to obtain payment information through a near-field non-contact collection process.

30 [25] When it is determined that there is a target object within a set distance, the processor 104 is configured to trigger a ride fare collection transaction to first collect a to-be-recognized image through the first collector 100 and to determine payment information through parsing the to-be-recognized image, and then perform payment processing according to the payment information; if it is determined that no to-be-recognized image has been collected, obtain

payment information through a near-field non-contact collection process through the second collector 102, and perform payment processing. Here, the performing payment processing in the present specification may comprise: collecting a ride fare.

[26] In one or more embodiments of the present specification, the first collector 100 may at least comprise a camera. It should be noted that the to-be-recognized image in the present specification may comprise a Digital Object Unique Identifier (DOI), such as a 2-D barcode, a barcode, and the like, while an image that does not have DOI is not regarded as a to-be-recognized image.

[27] Therefore, when the to-be-recognized image has been collected, the processor 104 may parse this to-be-recognized image to determine payment information of the user. For example, when the user displays a payment 2-D barcode with a cell phone, the processor 104 may parse a to-be-recognized image that comprises the payment 2-D barcode and is collected by the camera, so as to determine payment information of the user.

[28] In addition, in one or more embodiments of the present specification, the second collector 102 may at least comprise an NFC antenna for collecting NFC signals. Therefore, when the processor 104 activates the NFC antenna, the processor 104 may determine payment information according to the NFC signals collected by the NFC antenna.

[29] In the present specification, the first collector 100 and the second collector 102 are not limited to a certain type of collectors, as long as the first collector 100 can collect a to-be-recognized image, and the second collector 102 can obtain payment information through a near-field non-contact collection process to offer a user with diverse methods for paying ride fares.

[30] Furthermore, in one or more embodiments of the present specification, if the first collector 100 is a camera, the second collector 102 is an NFC antenna. To reduce the volume of the fare collection device, the NFC antenna may be a loop antenna, i.e., an NFC loop antenna, while the camera may be located in an area within the loop of the NFC loop antenna. Moreover, the camera may face in a direction that is the same as the signal receiving direction of the NFC loop antenna, as shown in FIG. 2.

[31] In the schematic diagram of the fare collection device shown in FIG. 2, the camera is located in an area within the loop of the NFC loop antenna, the area within the loop may be equipped with a transparent housing or without a housing, in order not to obstruct the camera from collecting images. The NFC antenna is a rectangular loop antenna, and the direction that the camera faces and the signal receiving direction of the NFC loop antenna are indicated by arrows.

[32] In addition, in a fare collection device that obtains payment information by means of 2-D barcodes according to the current technologies, there is typically a distance between a camera and the housing of the fare collection device, so as to prevent a user from placing a device for providing payment information (e.g., a cell phone, a tablet computer, and the like) so close to the camera that it is impossible for the camera to focus on the 2-D barcode. Therefore, in the present specification, the camera may also be embedded at a distance under the housing of the fare collection device just like in the current technologies. This distance may be set as needed (e.g., no less than the minimum focus distance of the camera), which is not limited in the present specification.

[33] In one or more embodiments of the present specification, when the first collector 100 is a camera, the processor 104 may determine whether there is a target object within a set distance according to an image collected by the camera; if so, trigger a ride fare collection transaction, and if not, not trigger a ride fare collection transaction. After the ride fare collection transaction is triggered, corresponding operations are performed. In one example, the processor 104 may use the same method as the current technologies to determine whether there is a target object within a set distance according to the image collected by the camera, which is not elaborated herein. It should be noted that the camera may be in an activated state by default at this point and continuously collect images.

[34] In addition, in one or more embodiments of the present specification, the fare collection device may further comprise a sensor 106. The sensor 106 may be a camera or a rangefinder. When the sensor 106 is a camera, the above-described method may be used to determine whether there is a target object within a set distance. When the sensor 106 is a rangefinder, the rangefinder may continuously transmit signals (e.g., infrared ray, sound wave, and the like) to the surroundings of the fare collection device (or in one direction toward the fare collection device). When a target object is encountered, the rangefinder may receive a corresponding reflected signal and then monitor the presence of the target object. The fare collection device may further determine a distance between the target object and the fare collection device according to the time difference between transmitting the signal and receiving the reflected signal. When monitoring that the target object is within the set distance, the fare collection device may determine that a user is approaching the fare collection device and the ride fare needs to be collected from the user, thereby triggering the ride fare collection transaction. Here, the set distance may be set as needed, and the target object may be a user or a device of the user that provides payment information.

[35] The embodiments of the present specification provide a schematic diagram of a fare collection device, as shown in FIG. 3, the fare collection device comprising a first collector 100, a second collector 102, a processor 104 and a sensor 106. Here, the first collector 100 is a camera, the second collector 102 is an NFC loop antenna, and the sensor 106 is a
 5 rangefinder located in a region between the camera and the NFC loop antenna for measuring the distance between the target object and the fare collection device. FIG. 3 is merely an example provided by the present specification and does not define a particular position of the sensor 106 on the fare collection device. Here, the processor 104 may be arranged inside the housing of the fare collection device, which is indicated by a dashed line rectangle.

10 [36] Furthermore, since whether to trigger a ride fare collection transaction can be determined through the sensor 106, the first collector 100 may be in a turned off state by default.

[37] In one or more embodiments of the present specification, when a ride fare collection transaction is triggered, the processor 104 may activate the first collector 100 and then determine whether the first collector 100 has collected a to-be-recognized image; if so, parse
 15 the to-be-recognized image to obtain payment information, and collect a ride fare from the user according to the payment information; if not, activate the second collector 102, and obtain payment information through a near-field non-contact collection process, so as to collect a ride fare from the user. Moreover, after determining whether the first collector 100 has collected a to-be-recognized image, the processor 104 may turn off the first collector 100.

20 Here, the determining result comprises: the first collector 100 having collected a to-be-recognized image and the first collector 100 having not collected a to-be-recognized image. In other words, in the present application, the processor 104 may turned off the first collector 100 regardless of whether the first collector 100 has collected a to-be-recognized image. For example, if the first collector 100 has collected a to-be-recognized image, there is
 25 no need to further collect images through the first collector 100, and the first collector 100 may be turned off. If the first collector 100 has not collected a to-be-recognized image, it can be switched to the second collector 102 to obtain payment information. Similarly, there is also no need to collect an image through the first collector 100, and the first collector 100 may be turned off.

30 [38] For example, as described above, when the first collector 100 is a camera, a to-be-recognized image may be collected using this camera, and the processor 104 may parse the to-be-recognized image to obtain payment information of the user. If this camera has not collected a to-be-recognized image, the processor 104 may switch to the second collector 102 to obtain payment information of the user through a near-field non-contact collection process.

[39] Furthermore, in one or more embodiments of the present specification, the second collector 102 may be in a turned off state by default. When the processor 104 has not collected a to-be-recognized image, the processor 104 may activate the second collector 102.

[40] In one example, when the second collector 102 is an NFC antenna, the processor 104 may activate the NFC antenna, so that the NFC antenna broadcasts an NFC excitation signal to terminals in the surroundings. When the NFC chip in a device of a user for providing payment information receives the NFC excitation signal, the NFC chip may broadcast an NFC signal carrying the payment information of the user. As a result, the NFC antenna may receive the NFC signal that is broadcast by the terminal. Therefore, the processor 104 may extract the payment information of the user according to the NFC signal, so as to collect a ride fare from the user.

[41] It should be noted that, in one or more embodiments of the present specification, the fare collection device can only activate one collector within any period of time to collect payment information of a user. For example, when the fare collection device currently activates the first collector 100 to collect payment information of the user, the second collector 102 may be turned off or put into sleep; while the first collector 100 may be turned off or put into sleep when the fare collection device currently activates the second collector 102 to collect payment information of the user. Here, the reason of the fare collection device only activating one collector within any period of time is that, if the fare collection device activates two (or more) collectors at the same time, the process of payment processing by the user may be affected.

[42] For example, assuming that the fare collection device is a subway turnstile and the turnstile activates two collectors at the same time, when the user presents a payment 2-D barcode displayed on a cell phone to a camera of the turnstile for collecting to-be-recognized images, the second collector 102 (e.g., an NFC antenna) may also obtain an NFC signal carrying the payment information of the user that is broadcast by the cell phone. At this moment, the cell phone of the user may correspondingly pop up a page for paying the fare using the NFC function, while this page may cover the page that is used by the user for scanning a code to pay the fare, which may interfere with the process of fare payment by the user through code scanning.

[43] Furthermore, in one or more embodiments of the present specification, after the processor 104 obtains payment information through the second collector 102, the second collector 102 may be turned off or put into sleep, and the first collector 100 may be activated. As a result, when the ride fare collection transaction is triggered again, a to-be-recognized

image is collected through the first collector 100. Alternatively, if the first collector 100 is in a turned off state by default, the processor 104 may keep the first collector 100 in the turned off state.

[44] It can be seen from the above-described method that, even when it is impossible to collect a to-be-recognized image through the first collector 100, the processor 104 may switch to the second collector 102 to obtain payment information through a near-field non-contact collection process, and then collect the ride fare from the user. In other words, since payment information may be collected in various of collections manners, the fare collection device may collect the payment information in various of collections manners even when the user can only provide the payment information in a single manner. As a result, it is very convenient for the user during the process of paying ride fares.

[45] In addition, in one or more embodiments of the present specification, when the first collector 100 is a camera, payment information may not be rapidly recognized even if the user provides a to-be-recognized image (i.e., an image comprising the payment information DOI) in cases where the environment is complex in exemplary application scenarios. For example, the ambient light is too dark or too strong, leading to insufficient contrast of the 2-D barcode. As a result, the image collected by the camera and carrying the 2-D barcode is not clear enough, and it is difficult for the processor 104 to parse this to-be-recognized image to obtain payment information. Therefore, in the present specification, the processor 104 may wait for a preset duration after triggering the ride fare collection transaction, and then switch to the second collector 102 only after determining that no payment information has been parsed out within the preset duration.

[46] For example, in the present specification, the processor 104 may determine whether payment information has been obtained within a preset duration after triggering the ride fare collection transaction. The particular length of the preset duration is not limited in the present specification and may be set as needed. For example, assuming that the fare collection device is a fare collection device on a subway turnstile, and the subway company stipulates that a turnstile needs to complete a determination whether to open the turnstile within 300 ms (i.e., the maximum duration of each ride fare collection transaction may not exceed 300 ms). Then, the preset duration may be less than 300 ms, e.g., 150 ms, so as to reserve a time for the second collector 102 to obtain payment information and for the processor 104 to collect the ride fare from the user.

[47] In addition, in the present specification, the fare collection device may comprise a housing 108 for protecting the fare collection device and a fixing part 110. The fixing part

110 may be connected to the housing 108 to fix the fare collection device onto a means of public transport. The means of public transport may comprise a bus, a tram, a taxi, and the like.

[48] Here, when the first collector 100 is a camera, the housing 108 may comprise a transparent area so as not to block the camera from collecting an image. In addition, when the second collector 102 is an NFC antenna, the NFC antenna may be disposed inside the housing 108 so as to protect the NFC antenna, while the material used by the housing 108 may be a material that does not block radio frequency signals emitted by the NFC antenna.

[49] For example, the present specification provides a fare collection device, comprising a first collector 100, a second collector 102, a processor 104, a sensor 106, a housing 108 and a fixing part 110, as shown in FIG. 4. It can be seen that the fare collection device is disposed inside the housing 108 for the protection by the housing 108. Moreover, the housing 108 is connected to a bus handrail via the connected fixing part 110 so as to be fixed onto the bus.

[50] In addition, on the basis of the fare collection device shown in FIG. 1, the present specification correspondingly further provides a payment method, as shown in FIG. 5.

[51] FIG. 5 is a schematic diagram of a payment flow based on the fare collection device shown in FIG. 1 that is provided by the present specification. The method may, for example, comprise the following steps.

[52] S200: when detecting that a target object is within a set distance, the fare collection device for a means of public transport triggers a ride fare collection transaction.

[53] S202: when the ride fare collection transaction is triggered, the fare collection device for a means of public transport determines whether a to-be-recognized image has been collected.

[54] S204: when confirming that a to-be-recognized image has been collected, the to-be-recognized image is parsed to obtain payment information of the user.

[55] S206: when confirming that no to-be-recognized image has been collected, payment information of the user is obtained through a near-field non-contact collection process.

[56] S208: payment processing is performed according to the payment information obtained through parsing the image or through the near-field non-contact collection process.

[57] In the embodiments of the present specification, the payment flow may be implemented by the fare collection device shown in FIG. 1. For example, when triggering a ride fare collection transaction, the processor 100 may monitor whether the first collector has collected a to-be-recognized image; when confirming that a to-be-recognized image has been collected, determine payment information by parsing the to-be-recognized image, and then collect a ride fare from the user; when confirming that no to-be-recognized image has been collected,

activate the second collector to obtain payment information through a near-field non-contact collection process, and collect a ride fare from the user according to the payment information. [58] To further describe the payment method according to the present specification, a detailed example is used below to describe the entire process that the payment method relates to.

5 [59] For example, it is assumed that the fare collection device is a fare collection device on a means of public transport, such as a card reader on a bus. When a user takes the bus, the fare collection device may emit a signal via a provided rangefinder to the surroundings to detect whether a target object is approaching the card reader. When the user approaches the card reader, the processor may determine, according to the emitted signal and a signal returned by
10 the user, that a user is approaching the card reader at present, and when determining that the distance between the user and the fare collection device is less than a set distance, determine to trigger a ride fare collection transaction.

[60] The user may invoke a payment 2-D barcode carrying payment information of the user from a cell phone in his/her hand, and the user may present the payment 2-D barcode
15 displayed on the cell phone interface to the card reader for scanning.

[61] The fare collection device is provided with a first collector (e.g., a camera) capable of collecting a to-be-recognized image. When the user moves the screen of a cell phone displaying a payment 2-D barcode close to the camera, the camera collects the payment 2-D barcode displayed by the cell phone, such that the processor can parse the payment 2-D
20 barcode. When the processor successfully obtains payment information of the user by parsing the payment 2-D barcode, the processor can determine a fare to be paid by the user for riding the bus according to the payment information, and execute a corresponding deduction operation.

[62] When the processor determines that no to-be-recognized image has been collected, the
25 processor may activate a second collector (e.g., an NFC antenna) provided in the fare collection device, here, the NFC antenna is typically in a turned off or sleeping state.

[63] The processor may obtain, via the NFC antenna, an NFC signal carrying the payment information of the user that is broadcast by the terminal, and extract the payment information from the NFC signal. Then, the processor may execute a corresponding deduction operation
30 according to the payment information.

[64] When the processor completes the deduction operation, the NFC antenna may be turned off or put into sleep.

[65] It should be noted that the above description uses a process of using a card reader on a bus to perform payment processing as an example. However, in some cases, the deduction

operation may be completed when a user swipes a card at the time of getting off the bus. At this moment, the processor may determine to execute a corresponding deduction operation by obtaining the payment information twice (i.e., the payment information obtained by the fare collection device when a passenger gets on the bus, and the payment information obtained when the passenger gets off the bus). Here, the manners in which the payment information is obtained in the two times may not be completely the same, and how to particularly execute the deduction operation is not limited in the present specification.

[66] For example, when the fare collection device is a fare collection device on a subway turnstile, a user presents his/her own payment 2-D barcode to a subway turnstile (a turnstile located at a station where the user enters the subway) when entering a station, while the subway turnstile can obtain payment information of the user by parsing the payment 2-D barcode, and then send the payment information as identification information to a server, such that the server identifies the starting station that the user takes the subway according to the payment information and the subway turnstile that sends the payment information. When exiting a station, the user may activate the NFC module of the cell phone, to cause a subway turnstile (a turnstile located at a station where the user exits the subway) to obtain an NFC signal broadcast by the user's cell phone, and then extract the payment information of the user from the NFC signal. The fare collection device may send the extracted payment information to the server, such that the server determines a fare to be paid by the user for taking the subway according to the payment information and executes a corresponding deduction operation. In other words, the fare collection device located on the entering station turnstile may collect a to-be-recognized image through a collector when the user enters a station, and then parse the to-be-recognized image to obtain payment information of the user; while the fare collection device located on the exiting station turnstile may collect payment information of the user through another collector when the user exits a station, and execute the deduction operation on the user.

[67] In the present specification, the first collector and the second collector are relative concepts, and the present specification does not limit the fare collection device to be a particular collector. For different fare collection devices, the first collector and the second collector may not be completely the same. Collectors and collection manners that can be supported by the fare collection device are not limited only to the above-described two types, but may also be, for example, other manners such as a Bluetooth antenna and Bluetooth payment. In other words, the fare collection device may support various of collectors. When one collector cannot collect payment information of a user, it can be switched to the next

collector to collect the payment information of the user. If the payment information of the user still cannot be collected, it can be switched again to the next collector.

[68] In the 1990s, an improvement to a technology can be obviously differentiated into a hardware improvement (e.g., an improvement to a circuit structure, such as a diode, a

5 transistor, a switch, etc.) or a software improvement (an improvement to a flow of a method).

With the technological development, however, many current improvements to method flows may be deemed as direct improvements to hardware circuit structures. Designers almost

always obtain a corresponding hardware circuit structure by programming an improved

method flow into a hardware circuit. Therefore, it cannot be concluded that an improvement

10 to a method flow cannot be realized with a hardware module. For example, Programmable

Logic Device (PLD) (e.g., Field Programmable Gate Array (FPGA)) is such integrated circuit of which logic functions are determined by a user through programming the device. A

designer programs on his/her own to “integrate” a digital system onto one piece of PLD, who does not need to request a chip manufacturer to design and manufacture a dedicated IC chip.

15 At present, moreover, this type of programming has mostly been implemented through “logic compiler” software, rather than manually manufacturing the IC chips. The logic compiler

software is similar to a software compiler used for program development and writing, while a particular programming language must be used for writing source codes prior to compiling,

which is referred to as a Hardware Description Language (HDL). There is not just one, but

20 many types of HDL, such as ABEL (Advanced Boolean Expression Language), AHDL

(Altera Hardware Description Language), Confluence, CUPL (Cornell University

Programming Language), HDCal, JHDL (Java Hardware Description Language), Lava, Lola,

MyHDL, PALASM, RHDL (Ruby Hardware Description Language), etc. The most

commonly used right now includes VHDL (Very-High-Speed Integrated Circuit Hardware

25 Description Language) and Verilog. One of ordinary skill in the art should also be aware that

it would be very easy to obtain a hardware circuit to implement a logic method flow by using

the above HDLs to carry out a little bit logic programming on the method flow and program

the method flow into an IC.

[69] A controller may be implemented in any proper manner. For example, a controller may

30 be in, for example, a form of a microprocessor or processor, as well as a computer readable

medium that stores computer readable program codes (e.g., software or firmware) capable of

being executed by the (micro) processor, a logic gate, a switch, an Application Specific

Integrated Circuit (ASIC), a programmable logic controller, and an embedded

microcontroller. Examples of the controller include, but are not limited to, the following

microcontrollers: ARC 625D, Atmel AT91SAM, Microchip PIC18F26K20, and Silicone Labs C8051F320. A memory controller may further be implemented as a part of control logic of a memory. One of ordinary skill in the art should also be aware that, in addition to that a controller is implemented in a manner of pure computer readable program codes, it is totally feasible to perform logic programming on steps of a method to enable a controller to implement the same functions in a form of a logic gate, a switch, an ASIC, a programmable logic controller, an embedded microcontroller, etc. Therefore, such controller may be deemed as a hardware part, while devices comprised in the controller and configured to achieve various functions may also be deemed as a structure inside the hardware part. Alternatively, devices configured to achieve various functions may even be deemed as both software modules to implement a method and a structure inside a hardware part.

[70] The system, apparatus, module, or unit described in the above embodiments may be implemented, for example, by a computer chip or entity, or implemented by a product having a function. A typical implementation device is a computer. In one example, a computer may be, for example, a personal computer, a laptop computer, a cellular phone, a camera phone, a smart phone, a personal digital assistant, a medium player, a navigation device, an email device, a game console, a tablet computer, a wearable device, or a combination of any devices in these devices.

[71] For convenience of description, the above device is divided into various units according to functions for description. Functions of the units may be implemented in one or more pieces of software and/or hardware when the present application is implemented.

[72] One of ordinary skill in the art should understand that the embodiments of the present invention may be provided as a method, a system, or a computer program product. Therefore, the present invention may be implemented as a complete hardware embodiment, a complete software embodiment, or an embodiment combining software and hardware. Moreover, the present invention may be in the form of a computer program product implemented on one or more computer usable storage media (including, but not limited to, a magnetic disk memory, CD-ROM, an optical memory, etc.) comprising computer usable program codes.

[73] The present invention is described with reference to flowcharts and/or block diagrams of the method, device (system), and computer program product according to the embodiments of the present invention. It should be understood that a computer program instruction may be used to implement each process and/or block in the flowcharts and/or block diagrams and a combination of processes and/or blocks in the flowcharts and/or block diagrams. These computer program instructions may be provided for a general-purpose computer, a

special-purpose computer, an embedded processor, or a processor of other programmable data processing devices to generate a machine, causing the instructions executed by a computer or a processor of other programmable data processing devices to generate an apparatus for implementing a function specified in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[74] These computer program instructions may also be stored in a computer readable memory that can instruct a computer or other programmable data processing devices to work in a particular manner, causing the instructions stored in the computer readable memory to generate a manufactured article that includes an instruction apparatus. The instruction apparatus implements a function specified in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[75] These computer program instructions may also be loaded onto a computer or other programmable data processing devices, causing a series of operational steps to be performed on the computer or other programmable devices, thereby generating computer-implemented processing. Therefore, the instructions executed on the computer or other programmable devices provide steps for implementing a function specified in one or more processes in the flowcharts and/or in one or more blocks in the block diagrams.

[76] In a typical configuration, the computation device includes one or more processors (CPUs), input/output interfaces, network interfaces, and a memory.

[77] The memory may include computer readable media, such as a volatile memory, a Random-Access Memory (RAM), and/or a non-volatile memory, e.g., a Read-Only Memory (ROM) or a flash RAM. The memory is an example of a computer readable medium.

[78] Computer readable media include permanent, volatile, mobile, and immobile media, which can implement information storage through any method or technology. The

information may be computer readable instructions, data structures, program modules, or other data. Examples of storage media of computers include, but are not limited to,

Phase-change Random Access Memories (PRAMs), Static Random Access Memories (SRAMs), Dynamic Random Access Memories (DRAMs), other types of Random Access Memories (RAMs), Read-Only Memories (ROMs), Electrically Erasable Programmable

Read-Only Memories (EEPROMs), flash memories or other memory technologies, Compact Disk Read-Only Memories (CD-ROMs), Digital Versatile Discs (DVDs) or other optical memories, magnetic cassettes, cassette and disk memories or other magnetic memory devices, or any other non-transmission media, which can be used for storing information accessible to

a computation device. According to the definitions in the specification, the computer readable media do not include transitory media, such as modulated data signals and carriers.

[79] It should be further noted that the terms of “including”, “comprising” or any other variants of the terms are intended to encompass a non-exclusive inclusion, causing a process, method, commodity, or device comprising a series of elements to not only comprise these elements, but also comprise other elements that are not clearly listed, or further comprise elements that are inherent to the process, method, commodity, or device. When there is no further restriction, elements defined by the statement “comprising one...” does not exclude that a process, method, commodity, or device comprising the above elements further comprises additional identical elements.

[80] One of ordinary skill in the art should understand that the embodiments of the present application may be provided as a method, a system, or a computer program product.

Therefore, the present application may be implemented as a complete hardware embodiment, a complete software embodiment, or an embodiment combining software and hardware.

Moreover, the present application may be in the form of a computer program product implemented on one or more computer usable storage media (including, but not limited to, a magnetic disk memory, CD-ROM, an optical memory, etc.) comprising computer usable program codes.

[81] The present application may be described in a regular context of a computer executable instruction that is executed by a computer, such as a program module. Generally, the program module comprises a routine, a program, an object, a component, a data structure, etc. for executing a particular task or implementing a particular abstract data type. The present application may also be practiced in distributed computing environments. In these distributed computing environments, remote processing devices connected via communication networks carry out tasks. In the distributed computing environments, a program module may be located in local and remote computer storage media, including storage devices.

[82] The embodiments in this specification are described in a progressive manner with each embodiment focused on differences from other embodiments, and the embodiments may be mutually referenced for identical or similar parts. In particular, the system embodiment is described in a relatively simple manner, as the system embodiment is substantially similar to the method embodiment. The description of the method embodiment may be referenced for the related parts.

[83] The above-described is only embodiments of the present application, which are not used to limit the present application. To one of ordinary skill in the art, the present application may

have various modifications and changes. Any modification, equivalent substitution, or improvement made within the spirit and principle of the present application shall be encompassed by the claims of the present application.

What is claimed is:

1. A fare collection device for a public transport means, comprising a first collector, a second collector, and a processor, wherein:

the first collector is configured to collect a to-be-recognized image;

5 the second collector is configured to obtain payment information through a near-field non-contact collection process; and

the processor is configured to:

trigger a ride fare collection transaction upon determining that a target object is within a set distance, and

10 when the ride fare collection transaction is triggered, determine whether the first collector has collected the to-be-recognized image;

if yes, perform payment processing according to payment information obtained through parsing the to-be-recognized image; and

15 if not, turn on the second collector and perform payment processing according to payment information obtained by the second collector.

2. The fare collection device according to claim 1, wherein the first collector at least comprises a camera; and

the second collector at least comprises a Near Field Communication (NFC) antenna.

20 3. The fare collection device according to claim 2, wherein the NFC antenna is an NFC loop antenna; and

the camera is located in an area within a loop of the NFC loop antenna, and the camera faces in a direction same as a signal receiving direction of the NFC loop antenna.

4. The fare collection device according to claim 2, wherein the to-be-recognized image comprises a Digital Object Unique Identifier (DOI); and

25 the processor is configured to determine whether the payment information has been obtained through parsing the to-be-recognized image within a preset duration after triggering the ride fare collection transaction; if yes, deduct a ride fare according to the payment information; if not, turn on the NFC antenna to obtain payment information.

30 5. The fare collection device according to claim 2, wherein the NFC antenna is configured to collect an NFC signal; and

the processor is configured to extract the payment information from the NFC signal and deduct a ride fare according to the extracted payment information.

6. The fare collection device according to claim 5, wherein the second collector is in a turned off state by default; and

after turning on the second collector and deducting a ride fare according to the payment information obtained by the second collector, the processor is configured to turn off the second collector.

7. The fare collection device according to claim 1, further comprising:

5 a sensor configured to monitor a distance between the target object and the fare collection device, wherein the sensor at least comprises one of a camera and a rangefinder.

8. The fare collection device according to claim 7, wherein the first collector is in a turned off state by default; and

10 when triggering the ride fare collection transaction, the processor is configured to activate the first collector and after determining whether the first collector has collected the to-be-recognized image, the processor is configured to turn off the first collector.

9. The fare collection device according to claim 1, further comprising: a housing protecting the fare collection device and a fixing part connected to the housing.

15 10. The fare collection device according to claim 9, wherein the fare collection device is fixed to the public transport means by the fixing part.