

METHOD AND DEVICE FOR IN-VEHICLE PAYMENT

TECHNICAL FIELD

[0001] The present disclosure relates to the field of network technologies, and in particular, to a method and device for in-vehicle payment.

5

BACKGROUND

[0002] With the rapid development of Internet technologies, the operation mode of the taxi industry is also changing. For example, when wanting to take a taxi, a user can use taxi hailing software to hail a taxi and make payment after getting off the taxi. The taxi hailing software provides great convenience for traveling. However, the user
10 needs to bring a mobile phone or a wallet and install the taxi hailing software on the mobile phone for operations related to taxi hailing and payment. Otherwise, it is not convenient to hail a taxi.

SUMMARY

[0003] In view of this, the present disclosure provides a method and device for
15 in-vehicle payment so that it is more convenient to pay during traveling by vehicle.

[0004] The present disclosure is implemented by using the following technical solutions.

[0005] According to a first aspect, a method for in-vehicle payment is provided, and the method includes the following: obtaining a face image of an in-vehicle user
20 and a geographic location of the in-vehicle user at an endpoint of a ride route; obtaining an image set associated with the geographic location from an image database based on the geographic location, where the image set includes face images of a plurality of users; comparing the face image of the in-vehicle user with each face image in the image set to recognize the in-vehicle user's identity and obtain a fare
25 deduction account corresponding to the in-vehicle user; and deducting a fare of a present ride from the fare deduction account.

[0006] According to a second aspect, a system for in-vehicle payment is provided,

and the system includes the following: a base disposed in a vehicle used by a user; and a smart terminal device supported by the base, where an application (APP) for in-vehicle payment is installed on the smart terminal device, and the APP for in-vehicle payment is used to perform the method for in-vehicle payment described in the present disclosure.

[0007] According to a third aspect, a device for in-vehicle payment is provided, and the device includes the following: a data acquisition module, configured to obtain a face image of an in-vehicle user and a geographic location of the in-vehicle user at an endpoint of a ride route; an image acquisition module, configured to obtain an image set associated with the geographic location from an image database based on the geographic location, where the image set includes face images of a plurality of users; an identity recognition module, configured to compare the face image of the in-vehicle user with each face image in the image set to recognize the in-vehicle user's identity and obtain a fare deduction account corresponding to the in-vehicle user; and a fare deduction module, configured to deduct a fare of a present ride from the fare deduction account.

[0008] According to the method and device for in-vehicle payment in the present disclosure, face recognition is performed on the in-vehicle user to obtain the user's identity and automatically deduct the fare. As such, it is more convenient to pay during traveling by vehicle. The fare can be deducted even if the user does not bring a mobile phone and a wallet.

BRIEF DESCRIPTION OF DRAWINGS

[0009] FIG. 1 is diagram illustrating an application scenario of in-vehicle payment, according to an implementation of the present disclosure;

[0010] FIG. 2 is a flowchart illustrating in-vehicle payment, according to an implementation of the present disclosure;

[0011] FIG. 3 is a schematic diagram illustrating a mobile phone disposing method, according to an implementation of the present disclosure;

[0012] FIG. 4 is a schematic diagram illustrating a base structure, according to an implementation of the present disclosure;

[0013] FIG. 5 is a schematic structural diagram illustrating a device for in-vehicle payment, according to an implementation of the present disclosure; and

[0014] FIG. 6 is a schematic structural diagram illustrating a device for in-vehicle payment, according to an implementation of the present disclosure.

DESCRIPTION OF IMPLEMENTATIONS

[0015] A method for in-vehicle payment provided in an example of the present disclosure can be applied, for example, to taxi fare payment.

[0016] A taxi is used as an example for description in the application scenario shown in FIG. 1. An image collection device 12 can be disposed in a taxi 11. The image collection device 12 has a camera. The camera can be used to collect a face image of an in-vehicle user who takes the taxi. The image collection device 12 can transmit the obtained face image to a server 13 at the back end. The server 13 performs processing based on the face image and automatically deducts the fare of the present ride of the in-vehicle user.

[0017] FIG. 2 illustrates the flow of performing in-vehicle payment by the server 13 in an example.

[0018] Step 201: Obtain a face image of an in-vehicle user and a geographic location of the in-vehicle user at an endpoint of a ride route.

[0019] For example, the image collection device 12 in FIG. 1 can not only obtain the face image of the in-vehicle user, but also locate the in-vehicle user to obtain the geographic location of the in-vehicle user at the endpoint of the ride route. The endpoint of the ride route here can be the place where the user gets on the taxi or the place where the user gets off the taxi.

[0020] In addition, the geographic location obtained by the server 13 in the present step can be obtained by the image collection device 12 through positioning or collected by another device by using another method, provided that the server 13 can obtain the location.

[0021] In an example, the image collection device 12 can be a smart terminal device such as a smartphone. The smartphone can be provided by the driver of the taxi. The smartphone can be disposed to the passenger seat position in the taxi so that the face image of the user who takes the taxi can be collected in the position. FIG. 3 illustrates a mobile phone disposing method. A smartphone 31 can be supported by a base 32. The base 32 is disposed in a certain position in the taxi, for example, the shelf in front of the passenger seat. In the present example, the camera of the

smartphone 31 can be used to collect the face image of the in-vehicle user.

[0022] As shown in FIG. 3, an application (APP) for in-vehicle payment is installed on the smartphone 31. The APP is equivalent to a client software of the APP for in-vehicle payment. The client software can transmit the collected face image to the server 13 at the back end. In addition, in an example, the base 32 can include a multi-degree-of-freedom clip module 33. The multi-degree-of-freedom clip module 33 can flexibly rotate under the control of the APP for in-vehicle payment so that the camera of the smartphone can collect the face image of the in-vehicle user. For example, when identifying that the camera does not directly face the user's face, the APP can control the multi-degree-of-freedom clip module 33 to rotate so that the face image can be better collected. In another example, the multi-degree-of-freedom clip module 33 can also have 0 degrees of freedom and be secured to a position facing the user's face at a medium height.

[0023] The APP client software in the present step can further collect the geographic location of the in-vehicle user at the endpoint of the ride route. For example, when the user gets off the taxi, the APP can transmit the obtained geographic location to the server 13 at the back end. The server 13 can store the geographic location transmitted by the APP in association with the user's face image. References can be made to the example shown in FIG. 1. Many people live a routine life from Monday to Friday and get on and off vehicles in relatively stable locations. Therefore, it is easy to collect statistics about the locations. However, because many people get on and off vehicles in the same location, a plurality of face images correspond to the same geographic location. "Geographic location A - image set a" illustrated in FIG. 1 indicates that a plurality of users get on and off vehicles in geographic location A. Image set a includes face images of the plurality of users. Similarly, "geographic location B - image set b" is another association relationship indicating that the users corresponding to the face images in image set b often get on and off vehicles in geographic location B.

[0024] Step 202: Obtain an image set associated with the geographic location from an image database based on the geographic location, where the image set includes face images of a plurality of users.

[0025] The image set can be obtained from a stored image database based on the geographic location of the in-vehicle user as determined in step 201. That is, the users corresponding to the face images in the image set often get on and off vehicles in the

geographic location. In this case, the current in-vehicle user can be one of these users. The current in-vehicle user's identity can be recognized by using step 203.

[0026] Step 203: Compare the face image of the in-vehicle user with each face image in the image set to recognize the in-vehicle user's identity and obtain a fare deduction account corresponding to the in-vehicle user.

[0027] In the present step, the face recognition technology is used to recognize the face image of the current in-vehicle user from the image set obtained in step 202. The face images in the image database can be collected when in-vehicle users register with the APP for in-vehicle payment in advance. In addition, the users can further associate their personal information such as fare deduction accounts, ages, names, and occupations with their face images during registration. In the present step, the face image of the current in-vehicle user can be recognized from the image set, that is, the user's identity is learned, and the corresponding fare deduction account is obtained, through face image comparison.

[0028] In an example, the geographic location of the in-vehicle user can be located in more detail to reduce the quantity of images in the image set during face image comparison in the present step and improve the comparison efficiency. For example, when obtaining the geographic location of the in-vehicle user in step 201, the server can not only receive the location sent by the APP, but also combine location information obtained by using another method. For example, there can be some network access points such as Bluetooth and Wi-Fi around the place where the in-vehicle user gets on and off the taxi. The user's smart terminal device can connect to these network access points. The user's smart terminal device or the network access points reports or report connection information to the server. Based on the locations of the network access points connected to the smart terminal device, the server assists the APP in locating the user to determine the geographic location of the user when the user uses the taxi. The geographical location determined in this way is more detailed. The locations of the network access points can be in a predetermined range around the endpoint of the ride route, for example, in a range with a diameter of 200 meters around the place where the user gets on the taxi. The location in more detail reduces the quantity of images in the image set and improves the face recognition efficiency. Correspondingly, the face images in the image database can be stored in association with more detailed geographic locations. It is worthwhile to note that the smart terminal device of the in-vehicle user, for example, the user's mobile phone, belongs

to the in-vehicle user. The in-vehicle smart terminal device in the present example, for example, the smartphone 31 supported by the base 32 in FIG. 3 does not belong to the in-vehicle user and can be a mobile phone provided by the driver. The two smart terminal devices are different.

5 **[0029]** Step 204: Deduct the fare of the present ride from the fare deduction account.

10 **[0030]** In the present step, the fare can be deducted from the user's fare deduction account. In addition, a password-free payment with a limit can be made because the taxi fare is not very high. In an example, a payment can be made by using a password
if the user wants to authorize the fare deduction. In addition, some security measures can assist in the payment. For example, the voiceprint of the in-vehicle user can be collected during password-free payment. When the collected voiceprint is consistent with the voiceprint collected when the user registers in advance, it is confirmed that the in-vehicle user is the user of the fare deduction account, and the password-free
15 payment with a limit is allowed.

20 **[0031]** According to the method and device for in-vehicle payment in the present example, face recognition is performed on the in-vehicle user to obtain the user's identity and automatically deduct the fare. As such, it is more convenient to pay during traveling by vehicle. The fare can be deducted even if the user does not bring a
mobile phone and a wallet.

25 **[0032]** In another example, the application of the present disclosure in vehicles can be further enriched. For example, what shown in FIG. 3 can be referred to as a system for in-vehicle payment. The system can include a base 32 disposed in a vehicle taken by a user and a smart terminal device 31 supported by the base 32. A client
software of an APP for in-vehicle payment is installed on the smart terminal device 31. The APP can perform the method for in-vehicle payment previously described in the present disclosure.

30 **[0033]** For example, the base can be designed as shown in FIG. 4. The base can include the following modules: a power supply module 41, configured to extract 5 V direct-current power from a vehicle battery; a first charging module 42, connected to the power supply module 41 and configured to charge the smart terminal device on the base, where the smart terminal device can be a smartphone secured on an N-degree-of-freedom clip module; and a second charging module 43, connected to the power supply module 41 and configured to charge another smart terminal device,

where the another smart terminal device can be, for example, the in-vehicle user's smartphone, and the second charging module 43 can include an insertion detection circuit that automatically starts charging when the user inserts a mobile phone. As such, the base can function as a charger, facilitating charging for the user who takes
5 the taxi.

[0034] For another example, the smart terminal device can include an in-vehicle audio control module 44, configured to push audio of the APP for in-vehicle payment on the smartphone to a vehicle audio device 45. After getting on the taxi, the user can order some music or videos on the smartphone. The smartphone can use the in-vehicle
10 audio control module 44 to push the audio ordered by the user to the vehicle audio device 45 for playing. For example, the in-vehicle audio control module 44 can push the audio through FM transmission or Bluetooth to Aux IN. The design enables the user to order and control the content played by the vehicle audio device. Compared with the conventional method of controlling audio content by the driver, it provides
15 better ride experience for the user.

[0035] For another example, the collected face image of the in-vehicle user can be fully utilized. As shown in FIG. 4, the server 13 at the back end can obtain a user attribute feature, such as the gender and age, of the in-vehicle user based on the face image, and push a corresponding advertisement to the APP based on the attribute
20 feature. For example, the server can push cosmetics and clothes advertisements for female passengers and health-related advertisements for elderly passengers. The advertisement pushing method allows more accurate advertisement pushes. In addition, the advertisements played by the APP can be superimposed on the floating layer without affecting user entertainment.

[0036] As can be seen from the above, the system for in-vehicle payment in the present disclosure can be a system integrating payment and entertainment. The system can not only automatically complete fare payment by recognizing the face image, but also charge the in-vehicle user's mobile phone and accurately push advertisements to the in-vehicle user based on the recognized face image. In addition, the vehicle audio
25 device can play the entertainment content ordered by the user. As such, the user can enjoy better ride experience.

[0037] Compared with the existing technology, on the one hand, the system changes the entertainment mode. There is no need to install a display screen behind the passenger seat, saving the cost and preventing hazards to rear-seat passengers.

Passengers can select entertainment content that they are interested in, improving the interest of the passengers in taking taxis. On the other hand, the existing method of playing advertisements on the screen behind the passenger seat is not targeted, while according to the method in the present example, different advertisements can be pushed to different passengers based on collected face images to achieve a better advertising effect. In addition, the user does not need to perform complicated operations for payment. The server can collect the face image to recognize the user and perform automatic fare deduction.

[0038] An execution sequence of the steps in the procedure shown in FIG. 2 is not limited to the sequence in the flowchart. In addition, descriptions of steps can be implemented as a form of software, hardware, or a combination thereof. For example, a person skilled in the art can implement the descriptions in a form of software code, and the code can be a computer executable instruction that can implement logical functions corresponding to the steps. When implemented in a software form, the executable instruction can be stored in a memory and executed by a processor in a device.

[0039] For example, the present disclosure simultaneously provides a device corresponding to the method. The device can include a processor and a memory. The processor and the memory usually connect to each other by using an internal bus. In another possible implementation, the device can further include an external interface so that the device can communicate with another device or component. Further, the memory stores control logic for in-vehicle payment. A computer instruction is stored on the memory and can run on the processor. The processor is configured to implement the control logic for in-vehicle payment by executing the instruction. Logical modules divided based on functions from the control logic can be in the structure shown in FIG. 5. As shown in FIG. 5, the device for in-vehicle payment can include a data acquisition module 51, an image acquisition module 52, an identity recognition module 53, and a fare deduction module 54.

[0040] The data acquisition module 51 is configured to obtain a face image of an in-vehicle user and a geographic location of the in-vehicle user at an endpoint of a ride route.

[0041] The image acquisition module 52 is configured to obtain an image set associated with the geographic location from an image database based on the geographic location, where the image set includes face images of a plurality of users.

[0042] The identity recognition module 53 is configured to compare the face image of the in-vehicle user with each face image in the image set to recognize the in-vehicle user's identity and obtain a fare deduction account corresponding to the in-vehicle user.

5 **[0043]** The fare deduction module 54 is configured to deduct the fare of the present ride from the fare deduction account.

[0044] In an example, the data acquisition module 51 is configured to obtain the geographic location of the in-vehicle user at the endpoint of the ride route, including obtaining a geographic location collected by an APP client software when the
10 in-vehicle user gets on the vehicle, where a smart terminal device that the APP client software runs on is disposed inside the vehicle used by the in-vehicle user.

[0045] In an example, as shown in FIG. 6, the device can further include a feature acquisition module 55 and an advertisement pushing module 56.

[0046] The feature acquisition module 55 is configured to obtain a user attribute
15 feature of the in-vehicle user based on the face image of the in-vehicle user.

[0047] The advertisement pushing module 56 is configured to push an advertisement corresponding to the user attribute feature to the APP client software.

[0048] In an example, the data acquisition module 51 is configured to obtain the geographic location of the in-vehicle user at the endpoint of the ride route, including
20 determining the geographic location of the in-vehicle user based on a location of a network access point connected to a smart terminal device of the in-vehicle user, where the location of the network access point is in a predetermined range around the endpoint of the ride route.

[0049] In addition, the password input procedure illustrated in FIG. 2 can be
25 included in a computer readable storage medium. The medium stores a machine readable instruction corresponding to the control logic for in-vehicle payment. The medium can connect to a processing device that executes the instruction. The instruction stored on the medium can be executed by the processing device. The machine readable instruction that corresponds to the control logic for in-vehicle
30 payment and is stored on the medium is used to perform the following operations: obtaining a face image of an in-vehicle user, and a geographic location of the in-vehicle user at an endpoint of a ride route; obtaining an image set associated with the geographic location from an image database based on the geographic location, where the image set includes face images of a plurality of users; comparing the face

image of the in-vehicle user with each face image in the image set to recognize the in-vehicle user's identity and obtain a fare deduction account corresponding to the in-vehicle user; and deducting the fare of the present ride from the fare deduction account.

5 **[0050]** In the present disclosure, the computer readable storage medium can have a plurality of forms. For example, in different examples, the machine readable storage medium can be a random access memory (RAM), a volatile memory, a non-volatile memory, a flash memory, a storage drive (such as a hard disk drive), a solid-state drive, a storage disk of any type (such as an optical disc and a DVD), a similar storage
10 medium, or a combination of these media. In a special case, the computer readable medium can be alternatively paper or another suitable medium that can be used to print a program. Using these media, the programs can be obtained electronically (for example, optically scanned), compiled, interpreted, and processed in a suitable way, and then stored in a computer medium.

15 **[0051]** The devices or modules described in the previous implementations can be implemented by a computer chip or an entity, or can be implemented by a product with a certain function. A typical implementation device is a computer, and the computer can be a personal computer, a laptop computer, a cellular phone, a camera phone, an intelligent phone, a personal digital assistant, a media player, a navigation
20 device, an email receiving and sending device, a game console, a tablet computer, a wearable device, or any combination of these devices.

[0052] For ease of description, the previous device is described by dividing the functions into various modules. Certainly, when the present disclosure is implemented, the functions of each module can be implemented in one or more pieces of software
25 and/or hardware.

[0053] In the implementations of the present application, biometric recognition can be used during fare deduction after the in-vehicle user's identity is determined, to ensure that the fare deduction is performed by the user of the fare deduction account and further enhance the security of the user's fund. For example, the biometric
30 recognition can be used to trigger a confirmation from the user for the fare deduction. The biometrics involved in the biometric recognition can include eye features, voiceprints, fingerprints, palm prints, heartbeats, pulse, chromosome, DNA, bite marks, etc. The eye features can include iris, sclera, etc. For example, the user's voiceprint can be recognized, and the fare is deducted when the voiceprint matches

the pre-registered voiceprint.

[0054] The previous descriptions are merely example implementations of the present disclosure, but are not intended to limit the present disclosure. Any modification, equivalent replacement, or improvement made without departing from
5 the spirit and principle of the present disclosure should fall in the protection scope of the present disclosure.

CLAIMS

1. A computer-implemented method for in-vehicle payment, the computer-implemented method comprising:

5 receiving, using a smart terminal device, a face image of a user and a geographic location of the user;

transmitting, from the smart terminal device to an image database, a request for an image set associated with the geographic location, wherein the request comprises one or more coordinates that correspond to the geographic location;

10 receiving, on the smart terminal device from the image database in response to the request, an image set associated with the one or more coordinates that correspond to the geographic location, wherein the image set comprises face images of a plurality of users; and

comparing, using the smart terminal device, the face image of the user with face images in the image set to determine an identity of the user.

15

2. The computer-implemented method according to claim 1, wherein receiving the geographic location of the user comprises:

retrieving the geographic location collected by an application (APP) client software when the user gets on a vehicle, wherein a smart terminal device that the APP client software runs on is

20 disposed inside the vehicle used by the user.

3. The computer-implemented method according to claim 2, further comprising:

retrieving a user attribute feature of the user based on the face image of the user; and

pushing an advertisement corresponding to the user attribute feature to the APP client

25 software.

4. The computer-implemented method according to claim 1, wherein receiving the geographic location of the user comprises:

determining the geographic location of the user based on a location of a network access

point connected to the smart terminal device of the user, wherein the location of the network access point is in a predetermined range around an endpoint of a ride route of the user.

5 5. The computer-implemented method according to claim 4, wherein the predetermined range defines a diameter of an area around the endpoint of the ride route.

10 6. The computer-implemented method according to claim 1, further comprising:
retrieving the geographic location of the user at an endpoint of a ride route of the user; and
storing the geographic location in association with the face image of the user.

10 7. The computer-implemented method according to claim 4, further comprising:
collecting a voiceprint of the user; and
determining, based on the voiceprint, whether the user matches a fare deduction account.

15 8. The computer-implemented method according to claim 1, further comprising:
providing an instruction to rotate a multi-degree-of-freedom clip module securing a camera
of a terminal device that collects the face image of the user to optimize image collection.

20 9. A system for in-vehicle payment, the system comprising a plurality of modules
configured to perform the computer-implemented method of any one of claims 1 to 8.