

Description

Title of Invention: AUTHENTICATION METHOD AND SYSTEM FOR PAYMENTS

5 Technical Field

[1] The present disclosure relates to an authentication method and system using a beacon signal and a face recognition technology.

[2] The present disclosure relates to a payment system
10 based on authentication using a face recognition technology.

Background Art

[3] A human body has various types of biometric information, such as fingerprints, voice, face, irises, and veins, and the biometric information is unique information,
15 so authentication technology using the biometric information has been widely used. In particular, in airports, government offices, or offices where access must be strictly limited for safety management, many access authentication technologies using biometric information, such as fingerprints, are
20 already in use.

[4] These authentication technologies using biometric information use information obtained by making body parts, such as fingerprints or irises, touch detection devices at the beginning. However, the obtained biometric information
25 is highly inaccurate and the detection devices are used by

many users, making them hygienically unacceptable. This has led to a growing number of authentication technologies using biometric information, such as face images, obtained in a non-contact manner.

5 [5] In the meantime, there is a conventional method of using wireless signals, such as BLE, Wi-Fi, or UWB, alone, but it is difficult to realize a directional antenna radiation pattern of RF signals. In addition, reception sensitivity is affected by depending on the characteristics
10 of a receiver, so the distinction between boarding and alighting is unclear and there are limitations in processing multiple wireless signals. Therefore, it is difficult to perform real-time user processing.

Disclosure

15 Technical Problem

[6] The present disclosure is directed to providing a non-contact authentication method and system to which a technology that combines unique identification information of a user terminal with a face authentication method is applied,
20 and providing a payment service through user authentication.

[7] The present disclosure is directed to providing a real-time access authentication method and system using a real-time database that is generated in a local face recognition server by using unique identification information of a user
25 terminal and unique information of a gate terminal.

Technical Solution

[8] According to an embodiment of the present disclosure, there is provided a method of providing a payment service through user face recognition, the method including:

5 obtaining, by a gate terminal, identification information of a user terminal; transmitting, by the gate terminal, the identification information of the user terminal and unique information of the gate terminal to a local face recognition server; making, by the local face recognition server, a

10 request to a main face recognition server for user authentication data; extracting, by the main face recognition server, user face image data matching the identification information of the user terminal from a total database in response to the request of the local face recognition server,

15 and transmitting the user face image data to the local face recognition server; generating, by the local face recognition server, a real-time database of a particular region by using the user face image data; controlling user access on the basis of an authentication result obtained by comparing data

20 included in the real-time database with real-time user face image data; generating payment data on the basis of the identification information of the user terminal; and performing payment using a payment system.

[9] In addition, the generating of the payment data on the

25 basis of the identification information of the user terminal

may include: generating usage history data including at least one selected from a group of the identification information of the user terminal, the unique information of the gate terminal, the authentication result, time information, and
5 boarding and alighting information when the authentication result indicates authentication success; transmitting the usage history data to the main face recognition server; and generating, by the main face recognition server, the payment data by using the usage history data.

10 **[10]** In addition, the performing of payment using the payment system may include transmitting, by the main face recognition server, the payment data to the payment system, and performing, by the payment system, payment by inquiring about a payment means registered by a user.

15 **[11]** In addition, the generating of the payment data on the basis of the identification information of the user terminal may include generating the payment data when the boarding and alighting information included in the usage history data indicates 'boarding' or 'entering' and it is determined that
20 the boarding and alighting information of the usage history data generated afterward for the same user terminal indicates 'alighting' or 'leaving'.

[12] In addition, the obtaining of the identification information of the user terminal by the gate terminal may
25 include transmitting, by the user terminal, a BLE signal and

transmitting the identification information of the user terminal to the gate terminal when the user terminal and the gate terminal are within a predetermined distance.

[13] In addition, the obtaining of the identification
5 information of the user terminal by the gate terminal may include transmitting, by the gate terminal, a BLE signal and obtaining the identification information of the user terminal when the user terminal and the gate terminal are within a predetermined distance.

10 **[14]** In addition, the identification information of the user terminal may include UUDI information for identifying a user.

[15] In addition, the unique information of the gate terminal may include position information of the gate terminal and boarding and alighting information.

15 **[16]** In addition, registering a user corresponding to the user terminal may include: making, by the user terminal, a request to the main face recognition server for user registration; inquiring, by the main face recognition server, whether the user is registered and requesting input of user
20 information; generating a UUID corresponding to the user information, in the main face recognition server when the user information is input to the user terminal; and transmitting the generated UUID to the user terminal.

[17] In addition, registering payment information may
25 include: transmitting, by the main face recognition server,

payment means registration information based on user information to the user terminal; and registering the payment means registration information by linking the user terminal with the payment system.

5 [18] In addition, the generating of the real-time database of the particular region by using the user face image data by the local face recognition server may include updating the real-time database of the particular region each time the local face recognition server receives the user face image
10 data matching the identification information of the user terminal extracted from the main face recognition server.

[19] In addition, the generating of the real-time database of the particular region by using the user face image data by the local face recognition server may include deleting, when
15 a preset period of time elapses after the local face recognition server receives the user face image data matching the identification information of the user terminal extracted from the main face recognition server, the received user face image data from the real-time database of the particular
20 region.

Advantageous Effects

[20] According to an embodiment of the present disclosure, payment data is generated through a non-contact authentication method to which an authentication technology
25 that combines identification information of a user terminal

with a face authentication method is applied, thereby providing a user's convenience of use.

[21] In addition, a local face recognition system placed in a particular area is used to form a real-time database for each particular area, thereby improving authentication speed and authentication accuracy during 1:N authentication.

[22] In addition, a non-contact authentication method and system to which an authentication technology that combines identification information of a user terminal with a face authentication method is applied is provided to various places, such as airports and public transportations, requiring user authentication, thereby providing convenient authentication and a payment service.

Description of Drawings

[23] FIG. 1 is a diagram illustrating an authentication system 1 according to an embodiment of the present disclosure.

[24] FIG. 2 is a diagram illustrating a gate terminal according to an embodiment of the present disclosure.

[25] FIG. 3 is a diagram illustrating a face recognition system according to an embodiment of the present disclosure.

[26] FIG. 4 is a flowchart illustrating an authentication method according to an embodiment of the present disclosure.

[27] FIG. 5 is a diagram illustrating an authentication method according to an embodiment of the present disclosure.

[28] FIG. 6 is a diagram illustrating a payment process according to an embodiment of the present disclosure.

Mode for Invention

[29] The accompanying drawings are only for easy
5 understanding of embodiments disclosed in the present specification, and do not limit the technical idea disclosed in the present specification. Embodiments can be construed as including all modifications, equivalents, or substitutes in a technical concept and a technical scope of the present
10 disclosure.

[30] The terms including ordinal numbers, such as "first", "second", etc., may be used to describe various elements, but the elements are not to be construed as being limited to the terms. The terms are only used to differentiate one element
15 from other elements.

[31] FIG. 1 is a diagram illustrating an authentication system 1 according to an embodiment of the present disclosure.

[32] Referring to FIG. 1, the authentication system 1 may
20 include a user terminal 100, a gate terminal 200, a main face recognition server 300, a local face recognition server 400, and a payment system 500.

[33] Each device, server, and system constituting the authentication system 1 may communicate with each other over
25 a network. Specifically, the user terminal 100 corresponds

to a terminal owned by a user who wants to pass an access gate of the gate terminal 200, and may be realized as mobile devices, such as a mobile phone, a smartphone, a laptop computer, a personal digital assistant (PDA), a portable multimedia player (PMP), a tablet PC, and a wearable device.

[34] The user terminal 100 may use a wireless communication technology to transmit and receive data to and from other devices or external devices, such as the gate terminal 200, the server 300, 400, and the payment system 500.

10 **[35]** Herein, the user terminal 100 may use Bluetooth to transmit user unique information to the gate terminal 200 at regular intervals. Herein, the user unique information may mean identification information of a user terminal, and the user unique information may include a beacon signal and
15 Bluetooth Low Energy (BLE) that is a low-power short-range communication technology. The gate terminal 200 may use obtained signal information to control an access gate.

[36] In addition, while the embodiment describes that the user terminal 100 transmits user unique information to the gate terminal 200, the gate terminal 200 may transmit a signal for requesting user unique information to the user terminal 100 and the user terminal 100 may transmit the requested user unique information to the gate terminal 200 according to the implementation method.

25 **[37]** The specific configuration of the gate terminal 200 will

be described with reference to FIG. 2.

[38] FIG. 2 is a diagram illustrating a gate terminal 200 according to an embodiment of the present disclosure.

[39] First, the gate terminal 200 may be installed at a place
5 where a user is expected to pass, such as a gate, an entrance door, a public transportation entrance, or an entrance of a particular building. The form of the gate terminal is not limited to FIG. 2. That is, the gate terminal may be understood as a terminal that a user must pass to reach a
10 particular location, and it will be appreciated that it is not essential to have a separate structure for restricting user access. For example, the gate terminal may mean a subway gate, a door to get on a bus or taxi, or an entrance of a store or a particular building. Hereinafter, among the
15 various forms of gate terminals 200, the gate terminal shown in FIG. 2 will be described as an example.

[40] Referring to FIG. 2, the gate terminal 200 for controlling gate access may include a communication part 250 (not shown) for communicating with the user terminal 100 and
20 the servers 300 and 400, a camera 210 for obtaining user face image data, a gate part 220, a display part 230, and a control part 240 (not shown) for controlling the gate terminal 200.

[41] In the meantime, the gate terminal 200 may be a gate
25 control device provided in a gate system requiring access

authentication. The gate terminal 200 separately equipped with the gate part 220 for passing the gate may be installed to control a plurality of gates. As described above, the form of the gate terminal 200 is not limited to FIG. 2.

5 [42] In addition, the gate terminal 200 may perform user authentication. When necessary, the user terminal 100 or the server 300, 400 may act as an authentication device.

[43] The camera 210 of the gate terminal 200 may correspond to an input part for inputting video signals, and the camera
10 210 may consist of at least one camera. For example, when a user approaches within a predetermined distance of the gate terminal 200 to pass the gate part 220, the control part 240 may control the camera 210 to obtain face image data of the user. The face image data obtained through the camera 210
15 may be stored in a memory (not shown).

[44] The communication part 250 of the gate terminal 200 may transmit and receive data to and from external devices, such as the face recognition server 300, 400 and the user terminal 100. Herein, the communication part 250 may include
20 communication modules that use wireless signals, such as Bluetooth, Wi-Fi, and UWB. For example, a Bluetooth module among the communication modules may receive user identification information or beacon signals transmitted from the user terminal 100 at regular intervals. Herein, in
25 addition to receiving user identification information from

the user terminal, the gate terminal 200 may also transmit a signal for requesting user identification information to the user terminal 100 when the user terminal 100 approaches within an identifiable distance.

5 [45] In addition, the communication modules may obtain user identification information from the user terminal, and then may also transmit the user identification information to other devices at regular intervals.

[46] When user identification information is received from
10 the user terminal, the control part 240 of the gate terminal 200 may perform user authentication based on received data and may control the gate part 220 according to a response or control command based on a result value. Hereinafter, an authentication method will be described in detail with
15 reference to FIG. 4.

[47] FIG. 3 is a diagram illustrating a configuration of a face recognition system according to an embodiment of the present disclosure. A face recognition system according to an embodiment of the present disclosure may include a main
20 face recognition server 300 and a plurality of local face recognition servers 410, 420, 430, and 440.

[48] A main face recognition server 300 and a local face recognition server 400 according to an embodiment of the present disclosure may correspond to authentication servers
25 equipped with databases for user authentication, and may be

collectively named as a face recognition system.

[49] The main face recognition server 300 may manage data in an integrated manner allocated to a plurality of local face recognition servers 400, and may communicate with each of the
5 local face recognition servers 410, 420, 430, and 440 installed at particular regions.

[50] For example, when the gate terminal 200 transmits user identification information of the user terminal 100 recognized and unique information of the gate terminal to the
10 face recognition system, the face recognition system may generate a database corresponding to the user on the basis of the received information. The gate terminal 200 may use the database generated by the face recognition system to obtain a user authentication result and control the gate part 220 of
15 the gate terminal 200. Herein, user authentication may be performed by various devices, such as the gate terminal 200, a server, or the user terminal 100.

[51] Specifically, the main face recognition server 300 may correspond to a server that manages an authentication system
20 according to an embodiment of the present disclosure in an integrated manner, and may generate an integrated database including data for authentication obtained from the user terminal 100, the gate terminal 200, and the one or more local face recognition servers 410, 420, 430, and 440. The
25 main face recognition server 300 may be connected to each of

the one or more local face recognition servers 410, 420, 430, and 440 through a wired or wireless communication technology.

[52] When receiving data related to user authentication from the gate terminal 200, the main face recognition server 300
5 may transmit the data corresponding to the user to a local face recognition server. Alternatively, when receiving data related to user authentication from the gate terminal 200, a local face recognition server may make a request to the main face recognition server for the data corresponding to the
10 user. The main face recognition server may transmit requested data to a local face recognition server.

[53] A local face recognition server 400 according to an embodiment of the present disclosure may be a server positioned in a particular region, and may be a local server
15 for performing real-time authentication within a regional server. For example, when there are access authentication gates at each station, such as a subway station, a local face recognition server 400 may exist separately within a range to cover each subway station.

[54] That is, a first local face recognition server 410 may
20 exist at a first subway station, a second local face recognition server 420 may exist at a second subway station, and a third local face recognition server 430 and a fourth local face recognition server 440 may exist at a third subway
25 station and a fourth subway station, respectively.

[55] Herein, for convenience of description, the case in which a user passes a gate in a particular region among a plurality of local face recognition servers will be described.

5 **[56]** A local face recognition server 400 according to an embodiment of the present disclosure may be connected to at least one gate terminal 200 existing at a particular position, and may create a real-time database for supporting user authentication of the at least one gate terminal 200
10 existing at the position. A user authentication method will be described in detail with reference to FIGS. 4 and 5.

[57] In the meantime, the main face recognition server 300 may generate payment data by using at least one piece of data among user position information, user identity information,
15 user boarding/alighting information, and user access information after user authentication is completed, and may transmit the payment data to the payment system 500. A payment process will be described in detail with reference to FIG. 6.

20 **[58]** FIG. 4 is an operation flowchart illustrating an authentication method according to an embodiment of the present disclosure.

[59] Referring to FIG. 4, a user needs to pass a gate terminal to pass an access gate. The user is carrying a user
25 terminal 100. Herein, examples of the user terminal may

include portable electronic devices, such as a mobile phone, a smartphone, and a tablet PC. Hereinafter, it is assumed that the user terminal 100 has approached within a predetermined distance for short-range communication with the
5 gate terminal 200.

[60] According to an embodiment of the present disclosure, the step S410 of obtaining identification information of a user terminal by a gate terminal may be included. Specifically, the step of obtaining the identification
10 information of the user terminal by the gate terminal may include transmitting a BLE signal and the identification information of the user terminal to the gate terminal by the user terminal when the user terminal and the gate terminal are within a predetermined distance. Alternatively, the step
15 may include transmitting a BLE signal by the gate terminal to obtain the identification information of the user terminal when the user terminal and the gate terminal are within a predetermined distance.

[61] That is, according to an embodiment of the present
20 disclosure, the gate terminal 200 may transmit a BLE beacon signal, and when the user terminal 100 approaches within a predetermined range of the gate terminal 200, the user terminal 100 may be connected to the gate terminal 200, and the gate terminal 200 may obtain the identification
25 information of the user terminal.

[62] The data transmitted by the user terminal 100 may include unique information that is capable of identifying a user, as user identification information. For example, the identification information of the user terminal may include a beacon signal, and a universally unique identifier (UUID) corresponding to an identification ID for identifying a user, and may be generated by the face recognition system in advance when the user terminal is registered. The user terminal 100 may periodically transmit the identification information of the user terminal, and when the user approaches within a predetermined distance of the gate terminal provided in the gate system, the gate terminal installed in the gate system may recognize the identification information of the user terminal transmitted from the user terminal.

[63] In the meantime, according to a scenario of use of the present disclosure, when a plurality of users pass any one among a plurality of gates, such as gates placed at a subway station and airport access gates, authentication for gate access is performed through a gate terminal provided in the gate system, so it may be sufficient for identification information of a user terminal or a beacon signal to be received by at least one of the gate terminals provided in the gate system according to the scenario.

[64] According to an embodiment of the present disclosure,

the step S420 of transmitting, by the gate terminal 200, the identification information of the user terminal and unique information of the gate terminal to a face recognition system may be included.

5 **[65]** Specifically, the unique information of the gate terminal 200 is an identification ID assigned on the basis of a particular area in which a gate is placed, and may include position information of the gate terminal 200 and boarding/alighting information. Herein, the
10 boarding/alighting information may be information for determining whether a user passing the gate terminal 200 is boarding or alighting.

[66] For example, when a user enters or exits a public transportation or a store, the gate terminal 200 installed in
15 the direction of entering the place may determine 'getting on' or 'entering' or the gate terminal 200 installed in the direction of exiting the place may determine 'alighting' or 'leaving'.

[67] In addition, the gate terminal 200 that has received the
20 identification information of the user terminal including the UUID for identifying the user may transmit the received identification information of the user terminal and the unique information of the gate terminal to the local face recognition server 400 of the face recognition system.

25 **[68]** Herein, the local face recognition server 400 may

correspond to a local face recognition server that exists in a particular area in which the gate terminal 200 is placed.

[69] In the meantime, according to another embodiment of the present disclosure, the gate terminal 200 may transmit the
5 identification information of the user terminal and the unique information of the gate terminal directly to the main face recognition server.

[70] According to an embodiment of the present disclosure, the step of making a request to the main face recognition
10 server 300 for user authentication data by the local face recognition server 400 may be included. Herein, the local face recognition server may make a request to the main face recognition server for the user authentication data, so that the local face recognition server may generate a real-time
15 database corresponding to any one among user unique information, beacon information, and UUID information included in the identification information of the user terminal.

[71] Specifically, the step of making the request to the main
20 face recognition server for the user authentication data by the local face recognition server may include transmitting the unique information of the gate terminal and the identification information of the user terminal to the main face recognition server by the local face recognition server,
25 and inquiring about user information corresponding to the

identification information of the user terminal by the main face recognition server.

[72] According to an embodiment of the present disclosure, the step S430 of extracting, by the main face recognition server 300, user face image data matching the identification information of the user terminal from a total database in response to the request of the local face recognition server, and transmitting the user face image data to the local face recognition server 400 may be included.

10 **[73]** In the meantime, the main face recognition server 300 may pre-hold user face image data received from the user terminal 100, the gate terminal 200, and the local face recognition server 400 and registered, and the user face image data may be registered directly by the user or may be
15 registered when an authentication event for the user to pass a gate occurs.

[74] Specifically, an authentication method and system according to an embodiment of the present disclosure may further include registering the user corresponding to the user terminal before the step S410 of obtaining the identification information of the user terminal by the gate terminal.

[75] Herein, the step of registering the user corresponding to the user terminal 100 may include making a request to the
25 main face recognition server 300 for user registration by the

user terminal 100, and inquiring, by the main face recognition server 300, whether the user is registered and requesting input of user information, and generating a UUID corresponding to the user information, in the main face
5 recognition server when the user information is input to the user terminal, and transmitting the generated UUID to the user terminal 100.

[76] Herein, the user information may include various types of personal information, such as user face image data for
10 identifying a user, biometric information, e.g., fingerprints and iris recognition data, name, and sex. The main face recognition server 300 may collect the user face image data to generate a database corresponding to a particular user, and the database corresponding to the particular user may be
15 stored matching user UUID information and user face image data.

[77] In addition, the data may be updated at regular intervals. Afterward, when the user terminal 100 approaches within a predetermined distance of the gate terminal 200, the
20 identification information of the user terminal including the UUID information may be transmitted to the gate terminal 200. In the meantime, while the embodiment describes the case in which user authentication is performed using user face image data, the user face image data means one piece of biometric
25 information that a user holds. The case in which user

authentication is performed using various types of biometric information, such as fingerprints and iris recognition data, may be included.

[78] FIG. 4 will be described again.

5 **[79]** When receiving the identification information of the user terminal and the unique information of the gate terminal from the gate terminal 200, the main face recognition server 300 may inquire about the UUID included in the identification information of the user terminal from a face image database
10 of the main face recognition server 300. The main face recognition server may obtain the face image data matching the UUID information, and may transmit, on the basis of the position information included in the unique information of the gate terminal, the face image data matching the UUID
15 information to the local face recognition server 400.

[80] According to an embodiment of the present disclosure, the step S440 of generating, by the local face recognition server 400, a real-time database using the user face image data received from the main face recognition server 300 may
20 be included.

[81] Specifically, a real-time database may correspond to a set of some pieces of data in the total database of the main face recognition server 300, and may be a database generated by transmitting face image data corresponding to a user UUID
25 to the local face recognition server 400 corresponding to

position information included in unique information of a gate terminal.

[82] As described above, the local face recognition server 400 may be a server covering a particular region, and may correspond to a local server for performing real-time authentication in a regional server. Since the local face recognition server 400 generates a real-time database using face image data sourced and provided from the main face recognition server 300, may perform rapid user authentication with a small amount of data.

[83] According to an embodiment of the present disclosure, after the local face recognition server 400 generates a real-time database, the real-time database generated by the local face recognition server 300 may be used to perform user authentication in step S450.

[84] Herein, user authentication may be performed by the gate terminal 200, or may be performed by the local face recognition server 300. The gate terminal may control the gate part on the basis of a result of user authentication.

[85] Specifically, the step of obtaining, when a user approaches within a face recognition range of a gate terminal 200, real-time user face image data by the gate terminal 200, and controlling user access on the basis of an authentication result obtained by comparing the real-time user face image data with data included in the real-time database of the

local face recognition server 400 may be included.

[86] In order to obtain the real-time user face image data, the gate terminal may use the camera 210 to photograph the user's face and obtain the real-time user face image data.

5 **[87]** Herein, regarding the gate terminal provided in the gate system, the camera of the gate terminal closest to the user terminal may be driven to obtain a face image of the user. The real-time user face image data may be stored in a memory of the gate terminal, and the gate terminal may perform user authentication by comparing the real-time user face image data with the real-time database generated by the local face recognition server. Alternatively, the local face recognition server may receive real-time user image data obtained from the camera of the gate terminal, and may
10 perform user authentication by comparing the real-time user image data with the real-time database.

[88] According to an embodiment of the present disclosure, the step of generating, by the local face recognition server, the real-time database of the particular region using the user face image data may include updating the real-time
20 database by the local face recognition server.

[89] Specifically, each time the local face recognition server receives the user face image data matching the identification information of the user terminal extracted
25 from the main face recognition server, the real-time database

of the particular region may be updated.

[90] Alternatively, when a preset period of time elapses after the local face recognition server receives the user face image data matching the identification information of the user terminal extracted from the main face recognition server, the received user face image data may be deleted from the real-time database of the particular region, thereby updating the real-time database.

[91] For example, the user authentication method may be an embodiment as follows.

[92] The face image data of the user stored in the real-time database of the local face recognition server and the real-time user face image data obtained through the camera of the gate terminal may be used to generate respective templates, and the two templates may be compared to determine the similarity the two templates, thereby performing user authentication. Herein, the templates may mean a type of data that is stored by extracting and analyzing features of biometric information.

[93] According to an embodiment of the present disclosure, the step S460 of controlling user access by the gate terminal on the basis of the authentication result may be included. That is, the gate terminal 200 may control the gate part 220 on the basis of a user authentication result.

[94] For example, as a result of comparing the real-time user

face image data with the real-time database generated by the local face recognition server, when the similarity between the two pieces of data is equal to or greater than a preset value, 'allowed access' may be determined the gate part of the gate terminal may be opened. Alternatively, as a result of comparing the real-time user face image data with the real-time database generated by the local face recognition server, when the similarity between the two pieces of data is less than the preset value, 'not allowed to access' may be determined.

[95] Hereinafter, a detailed scenario will be described with reference to FIG. 5.

[96] FIG. 5 is a diagram illustrating an authentication scenario according to an embodiment of the present disclosure.

[97] Referring to FIG. 5, a user may be carrying a user terminal 100, and the user terminal 100 and a gate terminal 200 may exist at a distance allowing short-range communication with each other.

[98] The user terminal 100 may transmit a BLE signal to transmit the identification information of the user terminal to the gate terminal 200, or the gate terminal 200 may transmit a BLE signal to request and obtain the identification information of the user terminal in step S410. The gate terminal 200 may obtain the identification

information of the user terminal 100 to obtain a user UUID.

[99] Alternatively, when recognizing that the user terminal 100 is within a predetermined distance, the gate terminal 200 may transmit a BLE signal to obtain the identification
5 information of the user terminal 100, and the gate terminal 200 may obtain a user UUID through the identification information of the user terminal 100.

[100] The gate terminal 200 may transmit its unique information and the user UUID information to a face
10 recognition system 300, 400 in step S420. The main face recognition server 300 of the face recognition system may extract user face image data corresponding to the user UUID from a total database 310. The main face recognition server 300 may transmit the extracted user face image data to the
15 local face recognition server 400 in step S430. The local face recognition server 400 may generate a real-time database 410 in step S440. The gate terminal may use the camera of the gate terminal adjacent to the user to obtain real-time user face image data, and may use the real-time database
20 generated by the local face recognition server 400 to perform user authentication in step S450, and may control the gate in step S460. Herein, the controlled gate may be a gate obtained through the user face image data. Alternatively, the gate terminal may receive a result of user authentication
25 performed by the local face recognition server to control the

gate.

[101] According to an embodiment of the present disclosure, the gate terminal may generate usage history data of the user and transmit the same to the main face recognition server in
5 step S470. In addition, the generated user history data may be used to generate payment data, and payment may be performed using a registered payment means in step S480.

[102] Specifically, when the authentication result indicates authentication success, the gate terminal 200 may generate
10 the usage history data including at least one selected from a group of the identification information of the user terminal, the unique information of the gate terminal, the authentication result, and time information, and may transmit the usage history data to the main face recognition server
15 300.

[103] Afterward, the main face recognition server 300 may generate payment data on the basis of the identification information of the user terminal and the user history data, and may use a payment system 500 to perform payment.

20 **[104]** In addition, after the usage history data is generated, the step of transmitting the usage history data to the main face recognition server and the step of using the usage history data to generate the payment data by the main face recognition server may be included.

25 **[105]** More specifically, according to an embodiment in which a

user accesses a particular gate or door, when a predetermined single rate needs to be charged for user access, the main face recognition server 300 may transmit the payment data generated according to the usage history data to the payment
5 system 500 and the payment system 500 may perform payment by inquiring about the payment means registered by the user.

[106] In still another embodiment, when a user accesses a particular gate or door and different rates need to be charged for user access depending on a traveling distance,
10 the main face recognition server 300 may determine that boarding and alighting information included in the usage history data indicates 'boarding' or 'entering'. When the boarding and alighting information included in the usage history data indicates 'boarding' or 'entering', the main
15 face recognition server 300 may not generate the payment data immediately, but may generate the payment data when it is determined that the boarding and alighting information of the usage history data generated afterward for the same user terminal indicates 'alighting' or 'leaving'.

20 **[107]** In the meantime, the payment data may include payment means information pre-registered by the user, the user information, and payment amount information. The main face recognition server 300 may transmit the data to the payment system 500, and the payment system 500 may transmit a result
25 of performing payment based on the transmitted payment data

to the main face recognition server 300. According to an embodiment, the result of performing payment may be transmitted to the user terminal 100.

[108] Hereinafter, an example of a method of generating payment data will be described with reference to FIG. 6.

[109] FIG. 6 is a diagram illustrating a method of providing a payment service according to an embodiment of the present disclosure.

[110] According to an embodiment of the present disclosure, the subject of performing user authentication is a gate terminal 200 or a local face recognition server 400, and a main face recognition server 300 receives an authentication result in step S470. Herein, the main face recognition server 300 may receive a result for authentication from the user terminal as well as identification information of the user terminal, unique information of the gate terminal, an authentication result, and time information.

[111] For example, regarding user history data for a public transportation, such as a subway station, the usage history data may be generated, such as 'UUID : KILSUN HONG' as a beacon signal, 'Seoul station line 1, area 3, boarding 1, terminal' as unique information of a gate terminal, 'authentication success' as an authentication result, '30 October 2021, 12:00' as time information, and 'passing boarding gate' as boarding and alighting information.

[112] As another example, in an embodiment equipped with an access door, such as a store, a convenience store, and a stationery store, usage history data may be generated, such as 'UUID : KILSUN HONG' as a beacon signal, store name
5 information as unique information of a gate terminal, 'authentication success' as an authentication result, '30 October 2021, 12:00' as time information, and 'entering store' as access information.

[113] According to an embodiment of the present disclosure,
10 the main face recognition server 300 may generate payment data on the basis of the user history data, may transmit the payment data to the payment system 500 in step S480. The payment system may perform payment by inquiring about a payment means registered by the user in step S480.

15 [114] Alternatively, when the boarding and alighting information included in the usage history data indicates 'boarding' or 'entering', payment data may be generated when it is determined that the boarding and alighting information of the usage history data generated afterward for the same
20 user terminal indicates 'alighting' or 'leaving', and the generated payment data may be transmitted to the payment system 500. Afterward, the payment system 500 may perform payment by inquiring about the payment means registered by the user.

25 [115] Herein, the payment system may be provided in the main

face recognition server, and a separate server communicating with the main face recognition server may exist.

[116] In the meantime, in order for the payment system 500 to perform payment, the user needs to link payment information
5 to the payment system 500 in advance.

[117] Accordingly, a method of providing a payment service according to an embodiment of the present disclosure may further include registering payment information.

[118] Specifically, the step of registering the payment
10 information may include transmitting, by the main face recognition server, payment means registration information based on the user information to the user terminal, and linking the user terminal with the payment system to register the payment means registration information.

[119] More specifically, the user terminal 100 may make a link
15 with the main face recognition server 300 to register a payment means. The main face recognition server 300 may generate the payment means registration information by matching user information of the user terminal 100, user face
20 image data, and payment means information. The user terminal 100 may transmit and receive the payment means registration information generated by linked with the payment system 500.

[120] The payment system 500 may use the payment means registration information and may perform payment using the
25 payment means registration information when user history data

is received afterward.

[121]Afterward, when a user access event occurs, the payment system may identify user identity and user position by using the identification information of the user terminal and the
5 unique information of the gate terminal, and may inquire whether the payment means registered by the user exists, on the basis of the identification information of the user terminal.

[122]When the payment means registered by the user exists,
10 the payment system may deduct the payment amount through the payment means. In the meantime, the payment system may transmit a payment result to the main face recognition server.

[123]In addition, according to the method of the payment
15 system, when a one-time fixed rate is paid as well as when boarding and alighting stops, such as subway stations, exist separately, the main face recognition server may determine boarding position information of a user through unique information of a gate terminal, and determine alighting
20 position information when the user alights afterward, and may calculate a rate based on the boarding and alighting stations of the user and generate payment data.

[124]In addition, when an access door is provided, such as a store and a stationery store, the main face recognition
25 server may determine position information of a user through

unique information of a gate terminal, may calculate a rate based on the user's access time, and may generate payment data. Alternatively, when a user purchases a particular item, purchased item price information may be received to
5 calculate a rate and payment data may be generated.

[125] While the present disclosure has been described with reference to the embodiments shown in the drawings to help an understanding of an authentication method and device for gate access according to an embodiment of the present disclosure,
10 the embodiments are merely for illustrative purpose, and those skilled in the art will understand that various modifications and equivalent embodiments may be made. Accordingly, the scope of the present disclosure should be defined by the accompanying claims.

15

CLAIMS

1. A method of providing a payment service through user face recognition, the method comprising:

5 obtaining, by a gate terminal, identification information of a user terminal;

transmitting, by the gate terminal, the identification information of the user terminal and unique information of the gate terminal to a local face recognition server;

10 making, by the local face recognition server, a request to a main face recognition server for user authentication data;

extracting, by the main face recognition server, user face image data matching the identification information of the user terminal from a total database in response to the request of the local face recognition server, and transmitting the user face image data to the local face recognition server;

20 generating, by the local face recognition server, a real-time database of a particular region by using the user face image data;

controlling user access on the basis of an authentication result obtained by comparing data included in the real-time database with real-time user face image data;

25 generating payment data on the basis of the

identification information of the user terminal; and
performing payment using a payment system.

2. The method of claim 1, wherein the generating of the
5 payment data on the basis of the identification information
of the user terminal comprises:

generating usage history data including at least one
selected from a group of the identification information of
the user terminal, the unique information of the gate
10 terminal, the authentication result, time information, and
boarding and alighting information when the authentication
result indicates authentication success;

transmitting the usage history data to the main face
recognition server; and

15 generating, by the main face recognition server, the
payment data by using the usage history data.

3. The method of claim 2, wherein the performing of
payment using the payment system comprises transmitting, by
20 the main face recognition server, the payment data to the
payment system, and performing, by the payment system,
payment by inquiring about a payment means registered by a
user.

25 4. The method of claim 2, wherein the generating of the

payment data on the basis of the identification information of the user terminal comprises generating the payment data when the boarding and alighting information included in the usage history data indicates 'boarding' or 'entering' and it
5 is determined that the boarding and alighting information of the usage history data generated afterward for the same user terminal indicates 'alighting' or 'leaving'.

10 5. The method of claim 1, wherein the obtaining of the identification information of the user terminal by the gate terminal comprises transmitting, by the user terminal, a BLE signal and transmitting the identification information of the user terminal to the gate terminal when the user terminal and the gate terminal are within a predetermined distance.

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6. The method of claim 1, wherein the obtaining of the identification information of the user terminal by the gate terminal comprises transmitting, by the gate terminal, a BLE signal and obtaining the identification information of the
20 user terminal when the user terminal and the gate terminal are within a predetermined distance.

7. The method of claim 1, wherein the identification information of the user terminal includes UUDI information
25 for identifying a user.

8. The method of claim 1, wherein the unique information of the gate terminal includes position information of the gate terminal and boarding and alighting information.

5

9. The method of claim 1, wherein registering a user corresponding to the user terminal comprises:

making, by the user terminal, a request to the main face recognition server for user registration;

10 inquiring, by the main face recognition server, whether the user is registered and requesting input of user information;

generating a UUID corresponding to the user information, in the main face recognition server when the user information
15 is input to the user terminal; and

transmitting the generated UUID to the user terminal.

10. The method of claim 1, further comprising registering payment information,

20 wherein the registering of the payment information comprises:

transmitting, by the main face recognition server, payment means registration information based on user information to the user terminal; and

25 registering the payment means registration

information by linking the user terminal with the payment system.

11. The method of claim 1, wherein the generating of the
5 real-time database of the particular region by using the user
face image data by the local face recognition server
comprises updating the real-time database of the particular
region each time the local face recognition server receives
the user face image data matching the identification
10 information of the user terminal extracted from the main face
recognition server.

12. The method of claim 1, wherein the generating of the
real-time database of the particular region by using the user
15 face image data by the local face recognition server
comprises deleting, when a preset period of time elapses
after the local face recognition server receives the user
face image data matching the identification information of
the user terminal extracted from the main face recognition
20 server, the received user face image data from the real-time
database of the particular region.