

【DESCRIPTION】

【Invention Title】

METHOD AND SYSTEM FOR AUTHENTICATING IDENTITY USING VARIABLE KEYPAD

5 【Technical Field】

[0001] The present invention relates to a method and system for identity authentication, and more particularly, to a method and system for identity authentication in which a password and signature information are received through a variable keypad of a mobile terminal, the received password and signal information
10 are transmitted to a server, and identity authentication is performed in the server.

【Background Art】

[0002] Recently, with activation of financial transactions, including electronic payment using mobile terminals, such as smart phones and tablet personal computers (tablet PCs), security issues, including passwords, are garnering a large
15 amount of interest.

[0003] This is because, in the case of smart phones, different from the existing mobile phones, applications are able to be developed by anyone and the structure is known to everyone, thus having a vulnerability to hacking, similar to PCs that are widely used.

20 [0004] In particular, when a password or resident registration number is input using a fixed keypad, the password or resident registration number may be easily obtained only by finding out a position being touched for the input, and thus users should be cautious in inputting passwords.

[0005] A method for compensating for the limitation in using a fixed keypad includes an authentication method using a variable keypad. The variable keypad method operates in such a way that the arrangement of input buttons of the keypad is changed whenever a user uses the variable keypad, so that even when a third party
5 finds out the positions of a password and the like that are input by the user to the keypad, it is not easy for the third party to find out the password using the positions.

[0006] However, even in the use of the variable keypad, when the scene of inputting the password is observed, or the password and the like are hacked in the middle of transmission from a mobile terminal to a server at a time of an
10 authentication request, the password itself is subject to discovery, thus there is a limitation in the security against personal information leaks.

[0007] In addition, it is also difficult to prevent a third party from performing identity authentication by using the password obtained as described above and
deceiving identity.

15 **【Disclosure】**

【Technical Problem】

[0008] The present invention is directed to providing a system and method for preventing a third party from using a password without authorization by transmitting position information of a variable keypad and identity signature
20 information when a password is transmitted from a mobile terminal to an identity authentication server.

[0009] The technical objectives of the present invention are not limited to those disclosed above, and other objectives may become apparent to those of ordinary skill in the art on the basis of the following description.

【Technical Solution】

[0010] One aspect of the present invention provides a password and signature information-combined identity authentication server including: a variable keypad generating unit configured to generate a variable keypad including encryption keys
5 and a signature input part that receives an input of a signature of a user, wherein a position of each of the encryption keys is changed whenever the variable keypad is generated; an authentication information storing unit configured to store authentication information of a user of a mobile phone; and an authentication executing unit configured to provide a mobile terminal at a remote area with
10 information about the generated variable keypad, receive position information of the encryption keys according to an order in which the user inputs the encryption keys and signature information input to the signature input part by the user, and perform identity authentication by using the received position information of the encryption keys and the received signature information.

15 [0011] Another aspect of the present invention provides an identity authentication mobile terminal including: a display unit including encryption keys and a signature input part and configured to display a variable keypad that is generated such that a position of each of the encryption keys is changed whenever the variable keypad is generated; and a control unit configured to receive information
20 about the variable keypad from an identity authentication server, and transfer position information of the encryption keys, an input order of the encryption keys, and signature information that are obtained through the variable keypad to the identity authentication sever.

[0012] Still another aspect of the present invention provides a password and
25 signature information-combined identity authentication method including: generating

a variable keypad including encryption keys and a signature input part, wherein a position of each of the encryption keys is changed whenever the variable keypad is generated; providing the generated variable keypad to a mobile terminal; receiving position information of the encryption keys according to an order in which a user
5 inputs the encryption keys and signature information input to the signature input part by the user; and performing identity authentication on the basis of the received position information of the encryption keys and the received signature information.

【Advantageous Effects】

[0013] According to the present invention, position information of a keypad
10 instead of a password itself is transmitted and thus the password cannot be detected through hacking, and signature information is transmitted together with the position information and thus even when the password is disclosed, additional identity authentication is performed using the signature information and thus security can be improved.

15 **【Description of Drawings】**

[0014] FIG. 1 is a block diagram illustrating an authentication system including a mobile terminal and an authentication server according to an embodiment of the present invention.

[0015] FIG. 2 is a sequence diagram showing an identity authentication
20 method according to an embodiment of the present invention.

[0016] FIG. 3A and FIG. 3B are diagrams illustrating a variable keypad that is changed whenever being generated according to an embodiment of the present invention.

[0017] FIG. 4A and FIG. 4B are diagrams illustrating a variable keypad using coordinates on an X-Y plane according to an embodiment of the present invention.

[0018] FIG. 5 is a flowchart showing a procedure of performing authentication by extracting a password from encryption keys according to an
5 embodiment of the present invention.

[0019] FIG. 6A and FIG. 6B are diagrams illustrating a display unit of a mobile terminal on which a variable keypad and a signature input part are displayed according to an embodiment of the present invention.

[0020] FIG. 7A and FIG. 7B are diagrams illustrating a variable keypad with
10 a facial recognition part added thereto according to another embodiment of the present invention.

[0021] FIG. 8A and FIG. 8B are diagrams illustrating an example in which authentication is performed using an index of a variable pad according to still another embodiment of the present invention.

15 **【Modes of the Invention】**

[0022] Hereinafter, advantages, features, and ways to achieve them will become readily apparent with reference to descriptions of the following detailed embodiments when considered in conjunction with the accompanying drawings. However, the scope of the present invention is not limited to such embodiments, and
20 the present invention may be realized in various forms. The embodiments to be described below are only embodiments provided to complete the disclosure of the present invention and assist those skilled in the art to completely understand the scope of the present invention. The present invention is defined only by the scope of the appended claims. Meanwhile, terms used herein are used to aid in the
25 explanation and understanding of the present invention and are not intended to limit

the scope and spirit of the present invention. It should be understood that the singular forms “a,” “an,” and “the” also include the plural forms unless the context clearly dictates otherwise. The terms “comprises,” “comprising,” “includes,” and/or “including,” when used herein, specify the presence of stated features, integers, steps, operations, elements, components and/or groups thereof, and do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

[0023] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0024] FIG. 1 is a block diagram illustrating a password and signature information-combined identity authentication system according to an embodiment of the present invention.

[0025] Referring to FIG. 1, the password and signature information-combined identity authentication system includes a mobile terminal 100 and an identity authentication server 200.

[0026] The identity authentication server 200 includes a variable keypad generating unit 210, an authentication executing unit 220, and an authentication information storing unit 230.

[0027] The variable keypad generating unit 210 generates a variable keypad including encryption keys and a signature input part such that a position of each of a number key and a text key constituting the encryption keys is changed whenever the variable keypad is generated. Alternatively, the variable keypad generating unit 210 may allow the position of the signature input part to be changed whenever the variable keypad is generated.

[0028] When the authentication executing unit 220 transmits arrangement information of the respective encryption keys, that is, information about the generated variable keypad, to the mobile terminal 100 at a remote site, the mobile terminal 100 receives authentication information, such as a password, signature
5 information, and the like, from a user using the information about the generated variable keypad.

[0029] Instead of the method of generating the variable keypad whenever necessary, the authentication executing unit 220 may use a method in which a plurality of variable keypads are generated in advance, indexes are assigned to the
10 respective variable keypads, and whenever authentication is performed, only the index of the variable keypad is transferred to the mobile terminal 100 while sharing the indexes with the mobile terminal 100.

[0030] The authentication executing unit 220 may receive position information of encryption keys according to the order in which a user inputs the
15 encryption keys and signature information from the mobile terminal 100, and perform identity authentication on the basis of the position information and the signature information. When the position of the signature input part is also changed, the authentication executing unit 220 receives position information of the signature input part as well in order to use for the identity authentication.

20 [0031] For example, the authentication executing unit 220 performs identity authentication by receiving position information of encryption keys according to the order in which a user inputs the encryption keys and signature information from the mobile terminal 100, such as a smart phone. That is, referring to FIG. 4A, when a user consecutively inputs 4, 3, 1, and 2 to a keypad, the authentication executing unit
25 220 receives position coordinates (0.5,2.5), (3.5,3.5), (1.5,3.5), and (2.5,3.5) of the

encryption keys corresponding to the inputs and signature information, and performs identity authentication on the basis of the received information.

[0032] The authentication executing unit 220 stores position information and an input order of encryption keys corresponding to a password as well as position information of the signature input part whenever a variable keypad is generated, and upon receiving position information of encryption keys according to an order in which a user inputs the encryption keys, position information of the signature input part, and signature information from the mobile terminal 100, performs authentication by comparing the received position information of encryption keys according to the order in which the user inputs the encryption keys, the position information of the signature input part, and the signature information with the position information of the encryption keys, the position information of the signature input part, and the signature information that are previously stored.

[0033] Assuming that a password is composed of 4, 3, 1, and 2 as described in the above example, position information of encryption keys corresponding to the password is provided as (0.5,2.5), (3.5,3.5), (1.5,3.5), and (2.5,3.5) according to FIG. 4A, and the input order is the same as that described above. In addition, when the position of the signature input part is changed whenever the variable keypad is generated, the position information of the signature input part is provided as (1.5, 2.5).

[0034] The authentication executing unit 220 receives the position information of the encryption keys corresponding to the password according to the order in which the user inputs the encryption keys, the input order of the encryption keys, the position information of the signature input part, and the signature information from the mobile terminal 100, and performs authentication by comparing

the received position information of the encryption keys, input order of the encryption keys, position information of the signature input part, and signature information with authentication information including position information of the encryption keys, input order of the encryption keys, position information of the signature input part, and signature information that are previously stored in the authentication information storing unit 230.

[0035] The present invention may adopt a method of recognizing user's handwriting instead of signature information and using the handwriting for the identity authentication.

[0036] Since a signature has a fixed pattern, the signature may be imitated by practicing transcription of the signature. However, when a user uses characters that change every time instead of a signature, for example, a given sentence "I love you", "I confirm" "On a wonderful day in October", and the like, it is almost impossible for the characters to be imitated every time, so that security is enhanced.

[0037] In order to check the handwriting of a user, previously stored handwriting of the user is compared with handwriting of an input sentence, for example, a decomposition identification method of decomposing characters and comparing common copies in which a composition of strokes, a shape of a stroke, a stroke order, an arrangement of letters, a pen pressure, a stroke of a pen, misspelling, or a misuse is identified is also used.

[0038] According to a comprehensive determination of the identification tests, it is distinguished whether a sentence input by a user is written by an identical person or by a different person.

[0039] The authentication executing unit 220 generates an example sentence whenever the variable keypad is generated and transmits the example sentence to the

mobile terminal 100, and a user inputs a password together with the example sentence, instead of the signature, to the signature input part of the mobile terminal 100.

[0040] The mobile terminal 100 transmits the position information of encryption keys corresponding to the password according to the order in which the user inputs the encryption keys, the input order of the encryption keys, and the sentence input by the user to the authentication executing unit 220.

[0041] The authentication executing unit 220 performs identity authentication by comparing the sentence input by the user, which is received together with the position information and input order of the password, with handwriting of the user that is previously stored in the authentication information storing unit 230.

[0041] The authentication information storing unit 230 stores passwords, signature information, and handwriting information of mobile terminal users.

[0042] In addition, the authentication information storing unit 230 stores authentication information including encryption keys of variable keypads generated by the variable keypad generating unit 210, position information of the encryption keys, position information of a signature input part of the variable keypad, and signature information.

[0043] The mobile terminal 100 may include a display unit 120 including the variable keypad 110 and a control unit 130, and may further include a camera unit 140.

[0044] The mobile terminal 100 includes not only a mobile phone but also a smart phone, a cell phone, a tablet PC, a notebook computer, a mobile credit card payment terminal, a bank automatic teller machine (ATM), a kiosk installed in a pharmacy and a government office,

[0045] Whenever the variable keypad 110 is generated, the position of each of the encryption keys and the position of the signature input part are changed. The variable keypad 110 is generated by the variable keypad generating unit 210 of the identity authentication server 200, and the variable keypad 110 on the mobile terminal 100 is the variable keypad received from the identity authentication server 200 and displayed.

[0046] The display unit 120 displays the variable keypad 110 while changing the position of the encryption key included in the variable keypad whenever the variable keypad 110 is generated with the position of the signature input part fixed, or with the position of the signature input also changed whenever the variable keypad 110 is generated.

[0047] FIG. 6 is a diagram illustrating the display unit 120 on which the variable keypad 110 and the signature input part are displayed. FIG. 6A illustrates the display unit before a user inputs a password and a signature, and FIG. 6B illustrates the display unit after a user inputs a password and a signature. The input password is asterisked for security purposes.

[0048] The control unit 130 receives information about the variable keypad from the identity authentication server 200, and transmits position information of encryption keys input by a user, an input order of the encryption keys, and position information of the signature input part, and signature information to the identity authentication server 200.

[0049] When the above-described handwriting identification method is used for the identity authentication, the control unit 130 transmits, to the identity authentication server 200, a sentence input by a user instead of the signature information.

[0050] The mobile terminal 100 may additionally include the camera unit 140. The camera unit 140 captures an image in a direction toward the user. Accordingly, the face of the user who inputs authentication information is used as additional authentication information in addition to the input through the variable keypad 110.

5 [0051] The camera unit 140 captures a facial image of the user by receiving a command of the control unit 130 while the variable keypad 110 is receiving an input from the user. The user may capture a facial image conforming to a guide line of a facial outline displayed on the display unit 120 by adjusting the position of the mobile terminal 100 in accordance with the guide line of the facial outline.

10 [0052] FIG. 7 is a diagram illustrating a process of recognizing the face of a user for a facial recognition together with the variable keypad 110 and the signature input part. When a facial outline is presented and a user conforms his/her face to the facial outline as shown in FIG. 7A, a facial image for facial recognition is captured as shown in FIG. 7B.

15 [0053] The control unit 130 transmits the facial image captured as such to the identity authentication server 200, and the identity authentication server 200 may perform additional authentication using the facial image together with other pieces of authentication information.

[0054] FIG. 2 is a sequence diagram showing a password and signature
20 information-combined identity authentication method according to an embodiment of the present invention.

[0055] First, a variable keypad including encryption keys and a signature input is generated such that the position of each of the encryption keys and the signature input part may be changed whenever the variable keypad is generated
25 (S110).

[0056] The variable keypad generated as above is transmitted to the mobile terminal 100 together with generation information (S120), and a user inputs a password and a signature to the variable keypad displayed on the mobile terminal 100.

5 [0057] The identity authentication server 200 receives position information of encryption keys according to an order in which the user inputs the encryption keys, position information of the signature input part, and signature information from the mobile terminal 100 (S130), and performs identity authentication on the basis of the position information of the encryption keys, the position information of the signature
10 input part, and the signature information that are received (S140).

[0058] According to another embodiment of the present invention, identity authentication may be performed by only using position information of some of the encryption keys in performing the identity authentication.

[0059] For example, when a password is 4 3 1 2, a user does not input all of
15 the four digits of the password but inputs some of the password, for example, leading two digits 4 and 3, trailing two digits 1 and 2, first and third digits 4 and 1 of the password, and the like.

[0060] When the leading two digits 4 and 3 are input, the positions of the password are (0.5, 2.5) and (3.5, 3.5) as shown in FIG. 4A, and identity
20 authentication is performed on the basis of the positions and the input order of the password, the signature information or handwriting information, and the like in performing the identity authentication.

[0061] It should be understood that when the mobile terminal 100 includes a camera, facial recognition information of the user may be additionally used for the
25 authentication as described above.

[0062] When the identity authentication is performed on the basis of the position information of some of the encryption keys, the amount of data used to perform the authentication is smaller than that required when the position information of all encryption keys is used, so that computation speed is improved, and the number of encryption keys to be input is smaller than that required when the position information of all encryption keys is used, so that user convenience is improved.

[0063] FIG. 3 is a diagram illustrating a variable keypad including encryption keys and a signature input part according to an embodiment of the present invention, in which the position of each of the encryption keys and the signature input part is changed whenever the variable keypad is generated. FIG. 3A illustrates the variable key pad that is initially generated, and FIG. 3B illustrates that the position of the encryption keys and the signature input part is changed when the variable keypad is generated later.

[0064] FIG. 5 is a flowchart showing a procedure of performing identity authentication by extracting a password from the positions of encryption keys according to an embodiment of the present invention.

[0065] A password is previously stored in the identity authentication server, and when position information of a password is received from the mobile terminal, the password is extracted from the received position information and input order of the password, and the extracted password is compared with the password stored in the authentication storing unit, thereby performing identity authentication.

[0066] First, the authentication executing unit receives positions of encryption keys according to an order in which a member inputs the encryption keys from the mobile terminal, and extracts a password input by the member (S510).

[0067] Then, the authentication executing unit compares the extracted password and received signature with the password and signature stored in the authentication information storing unit, thereby performing authentication (S520).

[0068] FIG. 7 is a diagram illustrating a process of capturing a facial image of a user and transmitting the captured facial image to the identity authentication server 200 according to another embodiment of the present invention.

[0069] The control unit 130 of the mobile terminal 100 controls the camera unit 140 to capture the face of the user in front of the mobile terminal 100, and the camera unit 140 captures a facial image of the user according to a command of the control unit 130.

[0070] When the user conforms his/her face to a guide line of the facial outline displayed on the screen as shown in FIG. 7A, the face is recognized together with the password of the variable keypad as shown in FIG. 7B, and are transmitted to the identity authentication server 200, so that identity authentication is performed.

[0071] When an illumination is adjusted using a flashlight of the mobile terminal 100 before the camera unit 140 captures the facial image, human eyes are caused to have dilated or constricted pupils in response to the adjusted illumination. Accordingly, as the pupils according to the adjustment of illumination are checked, authentication information is prevented from being fabricated using a facial picture of a user that is previously captured, so that security is enhanced.

[0072] FIG. 8 is a diagram illustrating an example in which primary authentication is performed using an index corresponding to a variable pad according to an embodiment of the present invention. FIG. 8A illustrates indexes assigned to variable keypads stored in the authentication server, respectively, and FIG. 8B

illustrates indexes assigned to variable keypads stored in the mobile terminal, respectively.

[0073] Referring to FIG. 8, the authentication executing unit generates a plurality of variable keypads and generates indexes corresponding to the plurality of variable keypads. That is, when the identity authentication server generates the variable keypads, indexes 1, 2, and 3 corresponding to variable keypads 1, 2, and 3 are generated, and the generated variable keypads and indexes are transmitted to the mobile terminal.

[0074] The authentication server selects one of the stored indexes in response to receiving an authentication request and provides the selected index to the mobile terminal, and the mobile terminal, after receiving the selected index, may select a variable keypad corresponding to the received index and displays the selected variable keypad on the screen.

[0075] The authentication server performs secondary authentication by comparing the position information of encryption keys, the input order and the signature information received from the mobile terminal with the position information of encryption keys, the input order, and the signature information that are previously stored.

[0076] According to the embodiment, a variable keypad arrangement is not transmitted from the authentication server to the mobile terminal, so the variable keypad arrangement is not identified through hacking of a transmission packet, and thus security is improved.

[0077] Through the above described user authentication method and apparatus using the variable keypad, signature information, and facial recognition, a user can perform a financial transaction in an environment with improved security,

and thus can perform a financial transaction using a mobile terminal and a mobile communication network without concern.

[0078] Although exemplary embodiments of the present invention have been described for illustrative purposes, those skilled in the art will appreciate that various
5 modifications, additions and substitutions are possible, without departing from the scope and spirit of the present invention. Accordingly, the scope of the present invention is not to be limited by the above embodiments and is defined by the claims and the equivalents thereof.

【Reference Numerals】

- 10 100: mobile terminal
- 110: variable keypad 120: display unit
- 130: control unit 140: camera unit
- 200: authentication server
- 210: variable keypad generating unit 220: authentication executing unit
- 15 230: authentication information storing unit

【CLAIMS】

【Claim 1】

A password and signature information-combined identity authentication server comprising:

5 a variable keypad generating unit configured to generate a variable keypad including encryption keys and a signature input part that receives an input of a signature of a user, wherein a position of each of the encryption keys is changed whenever the variable keypad is generated;

 an authentication information storing unit configured to store authentication
10 information of a user of a mobile phone; and

 an authentication executing unit configured to provide a mobile terminal at a remote site with information about the generated variable keypad, receive position information of the encryption keys according to an order in which the user inputs the encryption keys and signature information input to the signature input part by the
15 user, and perform identity authentication by using the received position information of the encryption keys and the received signature information.

【Claim 2】

 The server of claim 1, wherein the variable keypad generating unit generates the variable keypad such that a position of the signature input part is changed
20 whenever the variable keypad is generated.

【Claim 3】

 The server of claim 1, wherein the authentication executing unit performs authentication by extracting a password input by the user from the received position information of the encryption keys and comparing the extracted password and the

received signature information with the authentication information that are previously stored in the authentication information storing unit.

【Claim 4】

5 The server of claim 1, wherein the authentication executing unit is configured to:

store position information and an input order of encryption keys corresponding to the password whenever the variable keypad is generated; and

upon receiving position information of the encryption keys according to the order in which the user inputs the encryption keys and the signature information from
10 the mobile terminal, perform authentication by comparing the position information and the input order of the encryption keys and the signature information with position information and an input order of encryption keys and signature information that are previously stored in the authentication information storing unit.

【Claim 5】

15 The server of claim 1, wherein the authentication executing unit is configured to:

store an index corresponding to the variable keypad that is generated whenever the variable keypad is generated, and provide the index to the mobile terminal;

20 upon receiving an index from the mobile terminal, perform primary authentication by comparing the received index with a previously stored index; and

when a result of the primary authentication is successful, perform authentication by comparing the position information and the input order of the encryption keys and the signature information received from the mobile terminal

with position information and input order of encryption keys and signature information that are previously stored in the authentication information storing unit.

【Claim 6】

An identity authentication mobile terminal comprising:

- 5 a display unit including encryption keys and a signature input part and configured to display a variable keypad that is generated such that a position of each of the encryption keys is changed whenever the variable keypad is generated; and
- a control unit configured to receive information about the variable keypad from an identity authentication server, and transfer position information of the
- 10 encryption keys, an input order of the encryption keys, and signature information that are obtained through the variable keypad to the identity authentication sever.

【Claim 7】

The mobile terminal of claim 6, further comprising a camera configured to capture a facial image of a user,

- 15 wherein the control unit controls the camera unit to capture a facial image of a user in front of the camera unit and transfer the captured facial image to the identity authentication server.

【Claim 8】

- A password and signature information-combined identity authentication
- 20 method comprising:

 generating a variable keypad including encryption keys and a signature input part, wherein a position of each of the encryption keys is changed whenever the variable keypad is generated;

 providing the generated variable keypad to a mobile terminal;

receiving position information of the encryption keys according to an order in which the user inputs the encryption keys and signature information input on the signature input part by the user; and

performing identity authentication on the basis of the received position
5 information of the encryption keys and the received signature information.

【Claim 9】

The method of claim 8, wherein the generating of a variable keypad includes generating the variable keypad such that a position of the signature input part is changed whenever the variable keypad is generated.

10 **【Claim 10】**

The method of claim 8, wherein the performing of identity authentication includes performing authentication on the basis of position information of some of the encryption keys.

【Claim 11】

15 The method of claim 8, wherein the performing of identity authentication includes performing authentication by extracting a password input by the user from the position information of the encryption keys according to the order in which the user inputs the encryption keys and comparing the extracted password and the received signature information with a password and signature information that are
20 previously stored in an authentication information storing unit.