

# Real-time identity recognition and authentication method for self-service equipment system of bank

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## Abstract

The invention provides a real-time identity recognition and authentication method for a self-service equipment system of a bank. With face information and historical information, which can be simply and conveniently acquired, identity recognition and authentication are accomplished by using a multi-information fusion method. By using the conventional face recognition technology as main recognition basis and using identity card information and bank credit records as auxiliary information, the accuracy and stability of the identity recognition are guaranteed, and the method can be applied to the identity recognition and authentication of the self-service equipment of the bank, so that the working load of the bank is reduced, working efficiency and the quality of service are improved, and office intelligitization is realized.

## Description

A kind of real-time identity identifying and authenticating method that is used for the bank self-aid apparatus system

### Technical field

The invention belongs to the crossing domain of pattern-recognition and information security; Be particularly related to a kind of real-time personal identification method that is used for the bank self-aid apparatus system; The present invention be a kind of people's of utilization face visual signature identification authentication for master, ID card information and credit record are the personal identification method of assisting, be a kind of method of relevant crime such as prevent to utilize that bank self-aid apparatus is swindled.

### Background technology

At present, the identity identifying and authenticating method that bank generally adopts mainly still relies on password and artificial treatment, and is a lot of professional because it is very high to the identity identifying and authenticating accuracy requirement, can only take artificial treatment, such as the granting of bank card, credit card. Along with present banking constantly enlarges; Especially the demand straight line of bank card rises, and by the end of 2010, the bank card that is issued throughout the country surpassed 2,300,000,000; The workload that this shows bank is increasing; The working pressure of bank clerk also constantly increases, and has caused work efficiency low, and bank the long situation of a lot of client's queuing times occurs through regular meeting. The increase of bank self-aid apparatus has replaced a lot of manual service, has alleviated bank clerk pressure, improves service quality and work efficiency. But there is a comparatively significant disadvantages in bank self-aid apparatus at present; There is big leak in identity identifying and authenticating; Only rely on this mode of password; Cause utilizing the criminal activities such as swindle of bank self-aid apparatus constantly to increase thus, and

the business that much takes time and effort can't utilize Possum to handle [1], like handling of bank card, credit card. Nowadays the more existing method that is used for identity identifying and authenticating; Also there is certain shortcoming; Make that it can't be comparatively stable be applied to bank self-aid apparatus identification in: the method for recognition of face, its identification relatively depends on environment, stability is not enough; And be difficult to resolve and determine, thereby can't be applied to the identification [2] of bank self-aid apparatus separately because the facial characteristics that age growth etc. bring changes the problem of bringing; Iris recognition and fingerprint recognition, because these two kinds of recognition methods need be set up iris feature storehouse and fingerprint base, and [3] are not popularized in the collection of present iris and fingerprint characteristic, its application is extensive not enough; The other biological feature identification, like Gait Recognition, notes identification, auricle identification etc., the stability of these methods and popularization all do not reach requirement, difficult at present being applied in the identity identifying and authenticating of bank.

### Summary of the invention

The problem that exists to prior art is (like preamble [1] [2] [3] Shown in); How to utilize the technological means of comparatively popularizing at present, make up a cover stable, accurately, real-time identity identifying and authenticating method, make in the middle of its identity identifying and authenticating that can be applied to bank self-aid apparatus; Thereby alleviate bank's work load; Increase work efficiency and service quality, realize that office is intelligent, i.e. the present invention provides a kind of real-time identity identifying and authenticating method that is used for the bank self-aid apparatus system. People's face information and historical information that this method utilization can simple and convenient be gathered; Method through many information fusion is accomplished identity identifying and authenticating; With existing face recognition technology is main basis of characterization; ID card information and bank credit are recorded as supplementary, guarantee the accuracy and the stability of identification with this.

For realizing that the technical scheme that the object of the invention adopts is: a kind of real-time identity identifying and authenticating method that is used for the bank self-aid apparatus system, the bank self-aid apparatus system that said method is used comprises: the I.D. POS, ID card information storehouse; The bank information storehouse, digital camera, banking platform; Warning facility; Communication network, bank self-aid apparatus, the step of said method is following:

Step S1: obtain Customer Information, concrete steps are following:

Step S11; The I.D. POS of bank self-aid apparatus reads client's ID card information; Obtain this I.D. for information about through communication network from Ministry of Public Security ID card information storehouse by the banking platform, information spinner will comprise name, identification card number, the mug shot when handling I.D. and previous conviction etc.

Step S12; Obtain this user credit recorded information through ID card information or bank card information (if this service needed bank card); If the business that client handles does not need bank card; Then in the bank information storehouse, seek this client's associated credit record through the ID card information that obtains in the last step, this record comprises that the photographic intelligence that when bank's transacting business, stays before this client and bank are to integrity index that this client estimated etc. If whether the service needed bank card handled of client then needs a Customer

Information to this bank card to conform to client's ID card information, if conform to and then extract credit record, if do not conform to, then stop this service.

Step S13 utilizes this client's of digital camera collection in worksite facial characteristics photo, cooperates through client; Obtain this client's front-face and hat-free photos head photo; If the historical photograph less than is 5 in this customer's credit record of client, then need gather 5 photos and handle, get final product otherwise then gather one. Photo acquisition is intact in 10 seconds, if under the night environment, then need carry out light filling and handle;

Step S2: the identity identifying and authenticating step, concrete steps are following:

Step S21: obtain threshold value and sincere value:

Client's face-image to the ID card information, credit record and the collection that are obtained is handled, and accomplishes the task of identity identifying and authenticating. As the matching value  $x$  that obtains during, could pass through authentication determination, and threshold value  $y$  is determined by sincerity value  $z$  greater than threshold value  $y$ .

Sincere value mainly by to this client's ID card information with the credit record statistical treatment and the sincere acquisition that is worth  $z$  shown in formula (1):

$$z = 100 - 20a - 5b - 15c + 2d \quad (1)$$

In the formula, a: previous conviction quantity; B: the number of times of on time not refunding; C: debt is not gone back number of times; D: the number of times of on time refunding. For example, the  $z$  maximal value is 100, and once previous conviction subtracts 20, and once do not refund subtracts 5 on time, and debt does not also subtract 15, and once refund adds 2 on time.

The occurrence of threshold value need confirm that a kind of feasible pattern of threshold value  $y$  is shown in formula (2) according to the practical application scene::

$$y = \infty; , z < 60 \quad 0.97, 60 < z < 80 \quad 0.95, 80 < z < 90 \quad 0.90 , y < 90 \quad \dots \quad (2)$$

In the formula,  $z < 60$ ,  $y$  levels off to infinity;  $60 < z < 80$ ,  $y$  gets 0.97,  $80 < z < 90$ , and  $y$  gets 0.95;  $90 < z$ ,  $y$  gets 0.9. Sincere value is low more, and threshold value is high more. According to the characteristics of practical application scene, also can adjust the parameter in the formula (2).

Step S22: the acquisition of matching value:

Said matching value is meant the client's mug shot that utilizes the digital camera collection in worksite, this user's in writing down with bank credit the mug shot and the matching degree of identity card picture; After credit record requires each client to handle bank's related service, can preserve certain this client's pictorial information automatically, can solve like this because the facial characteristics that age growth brings changes the inaccurate problem of caused identification authentication; Photo in the bank credit record and identity card picture as training set, are obtained the eigenface of this training set by the PCA algorithm, remove the average face image of client's mug shot of matched field collection. Matching process based on eigenface was made up of training stage and two stages of cognitive phase, in the training stage, every facial image was mapped on the subspace that eigenface opens, and obtained a  $m$  dimensional vector, and obtained distance threshold  $R$  thus.

$$\Omega_k = U^T(R_k - \psi) \quad (3)$$

$$R = \frac{1}{2} \max_{j, k} \{ | \Omega_j - \Omega_k | \} \quad (4)$$

In the formula,  $R_k$  is the facial image,  $\psi$  is the average image of facial image, and  $U$  is the eigenface subspace.

At cognitive phase, at first image mapped to be identified to the eigenface space, obtain a vector, calculate this vector and collection the facial image collection apart from  $E$ , calculate  $E/R$  then and just obtain matching value.

Step S3: classification processing, concrete operations are following:

For client through authentication determination, then can carry out handling of follow-up business, and the standard photographs of the collection when preserving this business handling. Photo and this service log all write this client's credit record; For unsanctioned client, then need carry out manual service and handle, wherein unsanctioned client reminds bank clerk automatically because previous conviction is arranged, and for extreme cases such as fugitive criminals, then reports to the police through warning facility automatically.

Advantage of the present invention and good effect:

- 1, the present invention has been merged multiple information and has been carried out identity identifying and authenticating, has made full use of ID card information, credit record and people's face visual signature, and a kind of comparatively stable, real-time identity identifying and authenticating method is provided;
- 2, the present invention's using and handle that the method that makes can solve because the facial characteristics that age growth etc. brings changes the problem of bringing to people's face historical information;
- 3, the present invention is with respect to traditional method of only utilizing bank card and password as identity identifying and authenticating, more reliable, stable, safety, thus can reduce the criminal activity that utilizes bank self-aid apparatus accordingly;
- 4, the present invention is with respect to the identity identifying and authenticating method that only relies on face recognition technology, and its threshold value is that the actual conditions according to client change, thereby has stronger adaptability.
- 5, the invention provides the identity identifying and authenticating method that is applied to automatic card dispenser, significantly reduced the workload of bank clerk.

Description of drawings

Fig. 1 is an implementation step process flow diagram of the present invention;

Fig. 2 is a system construction drawing of the present invention;

Fig. 3 is an identity identifying and authenticating particular flow sheet among the present invention;

Fig. 4 is the structural drawing of the embodiment of the invention one;

Fig. 5 is the structural drawing of the embodiment of the invention two.

## Embodiment

Below in conjunction with accompanying drawing and embodiment the present invention is further specified:

Embodiment one bank self-help card sender identity identifying and authenticating

Present embodiment is the identity identifying and authenticating method that is applied to the bank self-help card sender, and the system that said method is used comprises: the I.D. POS, digital camera, communication network; The bank information storehouse, ID card information storehouse, banking platform; Warning facility, automatic card dispenser, as shown in Figure 4. The step of said method is:

Obtain the Customer Information step; Obtain client's ID card information through the I.D. card reader; Obtain this I.D. for information about from Ministry of Public Security ID card information storehouse thus; Information spinner will comprise name, identification card number, the mug shot when handling I.D. and previous conviction etc., and obtains the relative recording of this client at bank's transacting business by ID card information, i.e. credit record. After obtaining above information, under client's cooperation, gather this client's front-face and hat-free photos image through digital camera.

If client handles related service in this bank for the first time; Then need the credit record new for client creates according to this client's ID card information; The correlation circumstance of handling bank business after the credit record record client; As apply for card, provide a loan, refund, enchashment etc., and the facial image information during record client transacting business is for the identification authentication. Because client is the transacting business first time; This client's face-image photo not in the banking data base; Thereby need the collection in worksite multiple pictures to handle and preserve; That passing threshold automatically is provided with in the process of identification authentication is higher (for example 0.97), and the suggestion client of transacting business is for the first time preferably handled through manual service.

The identity identifying and authenticating step is handled client's face-image of the ID card information, credit record and the collection that are obtained, accomplishes the task of identity identifying and authenticating.

Client at first selects the bank card kind that need handle, if belong to debit card, and the then initial threshold setting lower (lowest threshold is 0.85) through the identification authentication; If belong to credit card, then initial threshold is provided with higher (lowest threshold is 0.90). Through handling client's ID card information and credit record; Obtain client's sincerity value, the sincere value initial value of client is 100, according to its relative recording the sincerity value is done corresponding change; As: once previous conviction subtracts 20; Once do not refund subtracts 5 on time, and debt does not also subtract 15, and once refund adds 2 on time ... For example, a client credit record comprises 1 debt not also, 3 not refund on time, and 12 refund on time, the sincerity value when then this client's carrying out this time served is 94.

Handle the kind of bank card according to sincerity value and client application and confirm client through discerning the threshold value height of authentication, to same type bank card, sincere value is high more, and then threshold value is provided with relatively low. For common debit card, when sincerity value

during at 90-100, passing threshold is 0.85; When sincerity value during at 80-90, passing threshold is 0.90; When sincerity value during at 70-80, passing threshold is 0.95; When sincerity value during at 60-70, passing threshold is 0.97; When the sincerity value less than 60 the time, it is infinitely great that passing threshold is tending towards. For credit card, when sincerity value during at 90-100, passing threshold is 0.90; When sincerity value during at 80-90, passing threshold is 0.93; When sincerity value during at 70-80, passing threshold is 0.95; When sincerity value during at 60-70, passing threshold is 0.97; When the sincerity value less than 60 the time, it is infinitely great that passing threshold is tending towards. This shows that when client's sincerity value was 94, its passing threshold of handling debit card was 0.85, and the passing threshold when handling credit card is 0.90.

By obtaining of matching value at last, through handling the photo of preserving in identity card picture and the credit record, the client's mug shot that comes matched field to gather obtains matching value. Photo in the bank credit record and identity card picture as training set, are obtained the eigenface of this training set by the PCA algorithm, remove the average face image of client's mug shot of matched field collection. Matching process based on eigenface was made up of training stage and two stages of cognitive phase, in the training stage, every facial image was mapped on the subspace that eigenface opens, and obtained a  $m$  dimensional vector, and obtained distance threshold  $R$  thus. At cognitive phase, at first image mapped to be identified to the eigenface space, obtain a vector, calculate this vector and collection the facial image collection apart from  $E$ , calculate  $E/R$  then and just obtain matching value.

When matching value more than or equal to before during this client's of confirming threshold value, through the identification authentication, otherwise then do not pass through.

The hair fastener step through after the identity identifying and authenticating, through the banking platform, is filled in corresponding electrical form client, improves personal information, is to handle credit card business as crossing, and the income proof that can check through network etc. then need be provided. Client is provided with the password of bank card then, after client confirms, and bank card and associated documents that the bank card card sender provides client to apply for. If client does not pass through identity identifying and authenticating; Then remind client to carry out business handling automatically, if some comparatively extreme cases occur, like situation such as more, the fugitive suspect of client's previous conviction, wholesale debts through manual work; Then report to the police automatically, the notice related work personnel handle.

## Embodiment two

### Bank ATM identity identification authentication

Present embodiment is the identity identifying and authenticating that is applied to the bank ATM machine, and the identification authentication method of core is identical with embodiment one, but on the practical implementation step difference to some extent. This method main target is to reduce the criminal activity that utilizes the bank ATM machine, and the system that said method is used comprises: ATM, the I.D. POS, digital camera; Communication network, bank information storehouse, ID card information storehouse; The banking platform, warning facility, as shown in Figure 5. The step of said method is:

Obtain the Customer Information step; After client provides bank card and login password; On the I.D. POS, brush personal identity card, obtain client's ID card information, obtain this I.D. for information about

from Ministry of Public Security ID card information storehouse thus through the I.D. card reader; Information spinner will comprise name, identification card number, the mug shot when handling I.D. and previous conviction etc., and whether check this I.D. be the I.D. that this bank card provides when opening an account. After obtaining above information, under client's cooperation, gather this client's front-face and hat-free photos image through digital camera.

The I.D. that if the I.D. that client provides is not this bank card when opening an account; Then through bank the phone number of SMS platform notice and this bank card binding; After through the mobile phone authentication, just can continue handling of related service, handle otherwise need carry out manual service.

The identity identifying and authenticating step at first provides the bank card kind to set different passing thresholds according to client, and the initial threshold of debit card is lower, and the threshold value of credit card is higher. Client's face-image to the ID card information, credit record and the collection that are obtained is handled, and accomplishes the task of identity identifying and authenticating. Through handling client's ID card information and credit record, obtain client's sincerity value, the sincere value initial value of client is 100, according to its relative recording the sincerity value is done corresponding change. Algorithm is identical with a last example. Handle the kind of bank card according to sincerity value and client application and confirm client through discerning the threshold value height of authentication, to same type bank card, sincere value is high more, and then threshold value is provided with relatively low. Be obtaining of matching value at last, through handling the photo of preserving in identity card picture and the credit record, the client's mug shot that comes matched field to gather obtains matching value. When matching value more than or equal to before during this client's of confirming threshold value, through the identification authentication, otherwise then do not pass through.

The business handling step, if through the identity identifying and authenticating step, promptly Confirm Bank's card card holder is the client that I.D. is provided when opening an account, provide then that client applies for as withdraw the money, refund, business such as inquiry; If not through authentication, then through the cell-phone number of bank short message platform notice with this bank card binding, this client can only carry out handling of related service through manual service simultaneously.

## **Claims (1)**

1. real-time identity identifying and authenticating method that is used for the bank self-aid apparatus system; The bank self-aid apparatus system that said method is used comprises: the I.D. POS, ID card information storehouse, bank information storehouse; Digital camera; The banking platform, warning facility, communication network and bank self-aid apparatus; The step of said method is following:

Step S1: obtain Customer Information, concrete steps are following:

Step S11; The I.D. POS of bank self-aid apparatus reads client's ID card information; Obtain this I.D. for information about through communication network from Ministry of Public Security ID card information storehouse by the banking platform, information spinner will comprise name, identification card number, the mug shot when handling I.D. and previous conviction;

Step S12; Obtain this user credit recorded information through ID card information or bank card information; If the business that client handles does not need bank card; Then in the bank information

storehouse, seek this client's associated credit record through the ID card information that obtains among the last step S11, this record comprises that the photographic intelligence that when bank's transacting business, stays before this client and bank are to integrity index that this client estimated; If the service needed bank card that client handles then needs a Customer Information to this bank card whether to conform to client's ID card information,,, then stop this service if inconsistent as if conforming to and then extracting credit record;

Step S13 utilizes this client's of digital camera collection in worksite facial characteristics photo, cooperates through client, obtains this client's front-face and hat-free photos head photo, if 5 of historical photograph less thaies in this customer's credit record of client then need be gathered 5 photos and handled; Otherwise then gathering one gets final product; Photo acquisition was accomplished in 10 seconds, if under the night environment, then need carry out light filling and handle;

Step S2: the identity identifying and authenticating step, concrete steps are following:

Step S21: obtain threshold value and sincere value:

Client's face-image to the ID card information, credit record and the collection that are obtained is handled, and accomplishes the task of identity identifying and authenticating; As the matching value  $x$  that obtains during, could pass through authentication determination, and threshold value  $y$  is determined by sincerity value  $z$  greater than threshold value  $y$ ;

Sincere value  $z$  mainly get with the credit record statistical treatment by the ID card information to this client, and sincerity is worth the acquisition of  $z$  shown in formula (1):

$$z = 100 - 20a - 5b - 15c + 2d \quad (1)$$

In the formula,  $a$ : previous conviction quantity;  $B$ : the number of times of on time not refunding;  $C$ : debt is not gone back number of times;  $D$ : the number of times of on time refunding;

The occurrence of threshold value need confirm that definite mode of threshold value  $y$  is shown in formula (2) according to the practical application scene:

$$y = \infty, z < 60 \quad 0.97, 60 < z < 80 \quad 0.95, 80 < z < 90 \quad 0.90, y < 90 \quad \dots \quad (2)$$

In the formula,  $z < 60$ ,  $y$  levels off to infinity;  $60 < z < 80$ ,  $y$  gets 0.97;  $80 < z < 90$ , and  $y$  gets 0.95;  $90 < z$ ,  $y$  gets 0.9; Sincere value is low more, and threshold value is high more; According to the characteristics of practical application scene, also can adjust the parameter in the formula (2);

Step S22: the acquisition of matching value:

Said matching value is meant the client's mug shot that utilizes the digital camera collection in worksite, this user's in writing down with bank credit the mug shot and the matching degree of identity card picture; After credit record requires each client to handle bank's related service, can preserve certain this client's pictorial information automatically, can solve like this because the facial characteristics that age growth brings changes the inaccurate problem of caused identification authentication; Photo in the bank credit record and identity card picture as training set, are obtained the eigenface of this training set by the PCA algorithm, remove the average face image of client's mug shot of matched field collection; Matching process based on eigenface was made up of training stage and two stages of cognitive phase, in the



training stage, every facial image was mapped on the subspace that eigenface opens, and obtained a m dimensional vector  $\Omega$ , and obtained distance threshold R thus:

$$\Omega_k = U^T(R_k - \psi) \quad (3)$$

$$R = \frac{1}{2} \max_{j, k} \{ | \Omega_j - \Omega_k | \} \quad (4)$$

In the formula,  $R_k$  be that k opens facial image,  $\psi$  is the average image of facial image, and U is the eigenface subspace;

At cognitive phase, at first image mapped to be identified to the eigenface space, obtain a vector, calculate this vector and collection the facial image collection apart from E, calculate E/R then and just obtain matching value;

Step S3: classification processing, concrete operations are following:

For client through authentication determination, then can carry out handling of follow-up business, and the standard photographs of the collection when preserving this business handling; Photo and this service log all write this client's credit record; For unsanctioned client, then need carry out manual service and handle, wherein unsanctioned client reminds bank clerk automatically because previous conviction is arranged, and for extreme cases such as fugitive criminals, reports to the police through warning facility automatically.

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