

APPARATUS FOR PROCESSING PAPER OR OTHER LEAVES AND PROGRAM FOR UPDATING IDENTIFICATION ALGORITHM

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for processing paper or other leaves by judging whether paper or other leaves such as paper notes, bank checks, and corporation securities are genuine or counterfeit depending on amounts of feature of optical and magnetic
5 patterns on the paper or other leaves and also on serial numbers represented on the paper or other leaves. The invention also relates to a program for updating an identification algorithm used to identify whether they are genuine or counterfeit by amounts of feature on the paper or other leaves.

In the past, apparatus for processing paper or other leaves such as paper notes,
10 bank checks, and corporation securities have been available. An apparatus for processing paper or other leaves identifies whether each leaf to be treated is genuine or counterfeit. For example, an automated teller machine (hereinafter abbreviated an ATM) installed in a financial institution shop such as a bank detects an optical pattern or magnetic pattern on each treated paper notes as a feature amount. The apparatus identifies whether the leaf or the like is genuine or counterfeit
15 depending on the detected amount of feature.

If a paper note (counterfeit note) cannot be identified as counterfeit using an amount of feature associated with an optical or magnetic pattern detected from the paper note, the ATM identifies the note relying on its serial number in order that the note is identified as counterfeit. In particular, the ATM stores a blacklist of counterfeit notes in which the serial
20 numbers represented on counterfeit notes are registered. The serial number represented on a paper note to be checked is collated with serial numbers registered in the blacklist of counterfeit notes to identify whether the note is genuine or counterfeit.

The authorities concerned such as the police give a notice of the serial numbers of discovered counterfeit notes to financial institutions. If a paper note having a serial number of
25 which notice has been given cannot be identified as counterfeit at that time by a financial institution depending on the amount of feature associated with an optical or magnetic pattern detected from the note, then the financial institution registers the serial number in the blacklist of counterfeit notes.

Furthermore, an apparatus for judging whether or not each paper note is a stolen
30 note based on the serial number represented on the note is available (see JP-A-5-250546). An apparatus that reads two serial numbers represented on a paper note and judges the coincidence

in character string and number between the two serial numbers is also available (see JP-A-2010-117803). A further apparatus checks whether paper or other leaves bearing the same serial number exist in plural devices at the same time and can identify any counterfeit note having a serial number not registered in the blacklist of counterfeit notes (see JP-A-2003-303367).

5 However, financial institutions are developing an identification algorithm which additionally registers the serial number of such a counterfeit note in the blacklist of counterfeit notes that cannot be identified as counterfeit depending on an amount of feature associated with an optical or magnetic pattern detected from the paper note when it is detected as described above, the identification algorithm being further operable to correctly identify the note as
10 counterfeit using an amount of feature associated with an optical or magnetic pattern detected from the counterfeit note. The identification algorithm installed in the ATM is updated to a developed identification algorithm. Accordingly, in the ATM, with respect to any serial number registered in the blacklist of counterfeit notes, if the identification algorithm is updated to an identification algorithm capable of correctly identifying the note as counterfeit using an amount
15 of feature associated with an optical or magnetic pattern on the note, then that serial number is dispensed with.

 It is unlikely that the serial numbers of registered counterfeit notes which have been rendered unnecessary are deleted from the blacklist of counterfeit notes. Rather, serial numbers increase accumulatively. That is, unnecessary serial numbers are also registered in the
20 blacklist of counterfeit notes and so there is the problem that its size is increased uselessly.

 Furthermore, the ATM identifies whether each paper note is genuine or counterfeit by its serial number by collating the serial number read from the note with all serial numbers registered in a list of counterfeit notes. Therefore, as serial numbers registered in the blacklist of counterfeit notes increase in number, it takes longer to identify whether each note is
25 genuine or counterfeit. That is, the ATM has the problem that if serial numbers which have been rendered unnecessary are registered in a blacklist of counterfeit notes, it will take longer to identify whether each note is genuine or counterfeit by its serial number, thus deteriorating the processing efficiency.

SUMMARY OF THE INVENTION

30 It is an object of the present invention to provide an apparatus for processing paper or other leaves and program for updating an identification algorithm which secures high accuracy at which each paper leave or the like is identified as genuine or counterfeit and which can suppress increases in the size of a list of counterfeit notes and deterioration of the efficiency

at which each note is identified as genuine or counterfeit by serial number.

An apparatus for processing paper or other leaves in accordance with the present invention is configured as follows to solve the foregoing problem and achieve the object.

5 A feature amount-detecting portion detects feature amounts on a paper or other leaf. The feature amount-detecting portion detects an optical pattern (such as a pattern of reflected light or transmitted light) and a magnetic pattern on a paper or other leaf as feature amounts. An identification portion identifies the paper or other leaf as genuine or counterfeit by an installed identification algorithm using the feature amounts detected by the feature amount-detecting portion. The identification portion calculates, for example, the degrees of
10 similarity between feature amounts detected from a paper or other leaf and feature amounts on genuine notes previously stored or the degrees of similarity between feature amounts detected from a paper or other leaf and previously stored feature amounts on counterfeit notes, and identifies each paper or other leaf as genuine or counterfeit based on the calculated degrees of similarity.

15 A serial number recognition portion recognizes the serial number represented on a paper or other leaf. A decision portion makes a decision as to whether a serial number recognized by the serial number recognition portion is registered in the list of counterfeit notes in which the serial numbers of counterfeit notes stored in a storage portion are registered.

Accordingly, when a paper or other leaf cannot be identified as counterfeit from
20 its feature amounts by the installed identification algorithm, if the serial number is registered in the list of counterfeit notes, the note can be identified as counterfeit.

When an identification algorithm-updating portion has updated the identification algorithm, serial numbers of paper or other leaves which are registered in the list of counterfeit notes and which can be identified as counterfeit by the identification portion by means of the
25 updated identification algorithm are deleted. Specifically, when the identification algorithm for identifying paper or other leaves as genuine or counterfeit using amounts of feature associated with optical and magnetic patterns detected from the paper or other leaves is updated, the serial numbers of counterfeit notes capable of being identified as counterfeit by the updated identification algorithm are deleted from the list of counterfeit notes. Accordingly, serial
30 numbers which are rendered unnecessary are prevented from uselessly being kept registered in the list of counterfeit notes. Increases in the size of the list of counterfeit notes can be suppressed. Also, the processing efficiency associated with an operation for identifying each note as genuine or counterfeit by its serial number is prevented from deteriorating.

The identification algorithm-updating portion may, for example, acquire a delete

list of serial numbers deleted from a list of counterfeit notes together with the updated identification algorithm, and delete the unnecessary serial numbers registered in the list of counterfeit notes using the delete list.

According to the present invention, it is possible to prevent serial numbers which are no longer needed from being still registered uselessly in a list of counterfeit notes. Increases in size of the list of counterfeit notes can be suppressed. Furthermore, the efficiency of processing associated with the operation for identifying whether a paper or other leaf is genuine or counterfeit by its serial number can be prevented from deteriorating.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of an automatic cash dispenser system in a financial institution such as a bank.

FIG. 2 is a block diagram showing the configuration of main portions of an ATM.

FIG. 3 is a schematic view showing the internal configuration of a paper note-processing portion.

FIG. 4 is a block diagram showing the configuration of main portions of a paper note identification unit.

FIG. 5 is a table showing a blacklist of serial numbers.

FIG. 6 is a flowchart illustrating additional processing performed on the blacklist of serial numbers regarding counterfeit notes.

FIG. 7 is a flowchart illustrating a processing routine for identification of paper notes.

FIG. 8 is a table showing a delete list.

FIG. 9 is a flowchart illustrating operations performed when an identification algorithm is updated.

FIG. 10 is a table showing another example of delete list associated with an ATM.

FIG. 11 is a flowchart illustrating operations performed when an identification algorithm associated an ATM and for use with the delete list shown in FIG. 10 is updated.

DETAILED DESCRIPTION OF THE INVENTION

The preferred embodiments of the present invention are hereinafter described.

FIG. 1 is a schematic view showing an automatic cash dispenser system in a financial institution such as a bank. In this system, plural automatic teller machines (ATMs) 1 are connected with a host machine 5 via a network 6. The ATMs 1 are installed in financial

institution shops, convenience stores, or the like. One ATM 1 is a processor for processing paper or other leaves, referred to herein. The host machine 5 is installed in a financial institutions center. The ATMs 1 can communicate with the host machine 5 via the network 6.

Each ATM 1 performs various kinds of processing such as cash deposit and cash withdrawal in response to a user's entry operation. The host machine 5 manages account information about each account established in the financial institution. The account information includes information about the residence, name, contact telephone number, passcode, bank balance, and transaction history of the account holder. The host machine 5 gives a notice of the serial numbers of counterfeit notes to the ATMs 1 which are connected via the network 6.

FIG. 2 is a block diagram showing the configuration of the main portions of one ATM. The ATM 1 has a main controller 10, a displaying-and-manipulating portion 11, a paper note-processing portion 12, a coin-processing portion 13, a card/specification-processing unit 14, a passbook-processing portion 15, a biological information-reading portion 16, a communication portion 17, a CD drive 18, and a storage portion 19. The main controller 10 controls the operation of each portion of the body of the ATM 1.

The displaying-and-manipulating portion 11 has a display unit mounted in the front of the body and a touch panel stuck on the display screen of the display unit. The displaying-and-manipulating portion 11 displays navigational information for the user on the display unit. Furthermore, the displaying-and-manipulating portion 11 detects user's entry operations associated with the password or contents of transactions (such as types of transactions and sum of deposited or withdrawn money) by detecting the position on the touch panel that has been depressed. In addition, the displaying-and-manipulating portion 11 has a display device and an input device manipulated by a serviceman when the system is maintained or serviced.

The paper note-processing portion 12 processes paper notes deposited or withdrawn, and has a paper note insertion/withdrawal port 12a in the front of the body to accommodate deposited or withdrawn paper notes. A shutter is mounted across the paper note insertion/withdrawal port 12a. Partition plates are mounted in the insertion/withdrawal port 12a to partition spaces for inserted paper money, withdrawn paper money, and returned paper money from each other. The paper note-processing portion 12 limits insertion and withdrawal of paper notes into and from the paper note insertion/withdrawal port 12a by opening and closing the shutter. Details of the configuration of the paper note-processing portion 12 will be described later.

The coin-processing portion 13 conveys coins along a coin transport path formed

between a coin-paper note insertion and withdrawal port formed in the front of the body and a coin cartridge received inside of the body. The coin-processing portion 13 has a coin identification portion for identifying the denomination of each coin conveyed along the coin transport path and whether it is genuine or counterfeit.

5 The card/specification-processing portion 14 accepts a cash card (hereinafter may be simply referred to as the card) inserted in a card insertion port formed in the front of the body and reads card information (financial institution code number, shop code number, account number, and so on) recorded on the magnetic stripes of the card or rewrites the card information. Where the inserted card is an IC card, data recorded in the IC chip of the card is read or rewritten
10 as necessary. Biological information (registration information) about the user (owner of the card) is recorded in the IC chip. Furthermore, the card/specification-processing portion 14 has a printing portion for printing the contents of each transaction onto a specification. The processing portion 14 delivers the specification on which the transaction contents are printed into a specification delivery port formed in the front of the body.

15 The passbook-processing portion 15 has a printing portion that accepts a passbook inserted in a passbook insertion port formed in the front of the body and prints the transaction history on the passbook. Furthermore, the passbook-processing portion 15 has a page-flipping mechanism for flipping the page of the accepted passbook, a barcode reader for reading a barcode which is printed on the passbook and which indicates a page number, and a magnetic
20 head for reading passbook information (financial institution code number, shop code number, account number, and so on) recorded on the magnetic stripes attached to the passbook.

 The biological information-reading portion 16 has a biological information-reading sensor mounted in the front of the body. The reading sensor reads a vein pattern of a finger of the user. In this example, the biological information-reading sensor reads a vein
25 pattern of a finger. A sensor that reads other kind of biological information such as a palm vein, iris, or retina may also be adopted. The biological information-reading portion 16 collates biological information read from the user using the biological information-reading sensor with biological information (registration information) recorded in the IC chip of the card and identifies whether the user is the same as the owner of the card from the degree of similarity.

30 The communication portion 17 controls communications with the host machine 5 of the financial institution via the network 6. The CD drive 18 reads a program or a file associated with data from the set CD. Furthermore, the CD drive writes a file, which is associated with a program or data stored in the body, to the set CD.

 The storage portion 19 has a mass storage medium such as a hard disk and stores

various programs necessary to control the operation of the body of the ATM 1 and a blacklist of serial numbers (described later), the blacklist being also herein referred to as a list of counterfeit notes. Each of the various portions of the body of the ATM 1 has a control portion including a CPU and a nonvolatile memory. A program necessary during operation is installed in the control portion. The main controller 10 installs programs into the various portions of the body of the ATM 1. An installer is stored in the storage portion 19.

The configuration of the paper note-processing portion 12 is next described. FIG. 3 is a schematic view showing the internal configuration of the paper note-processing portion. Denomination-specific cartridges 21-24 and a recovery cartridge 25 are received inside the paper note-processing portion 12. The denomination-specific cartridges 21-24 and recovery cartridge 25 are detachable from the body. The denomination-specific cartridges 21 and 22 receive 10,000-yen paper notes. The denomination-specific cartridge 23 receives 1,000-yen paper notes. The denomination-specific cartridge 24 receives 2,000-yen and 5,000-yen paper notes. The recovery cartridge 25 receives paper notes which have been judged to be nonuseable for transactions. Paper notes (2,000-yen notes and 5,000-yen notes) received in the denomination-specific cartridge 24 and paper notes received in the recovery cartridge 25 are not used for payment transactions. Therefore, the denomination-specific cartridge 24 and the recovery cartridge 25 may not have a mechanism for delivering paper money.

The paper note-processing portion 12 has a temporal note storage 26 for temporarily receiving and storing entered paper money. Furthermore, the paper note-processing portion 12 has a paper note transport path 27 that connects the paper note insertion/withdrawal port 12a, domination-specific cartridges 21-24, recovery cartridge 25, and temporal note storage 26. In addition, the paper note-processing portion 12 has a paper money transport portion (not shown) for transporting paper notes along the paper note transport path 27. The paper money transport portion controls a flapper mounted at a branching point of the paper note transport path 27, and provides control of the destination of the paper notes being transported. Additionally, the paper note-processing portion 12 has a paper note identification unit 30 for identifying the denomination of each paper note being transported along the paper note transport path 27 and identifying whether the note is genuine or counterfeit. The paper note identification unit 30 identifies each paper note being transported along the paper note transport path 27 as genuine or counterfeit using the feature amounts of optical and magnetic patterns read from the note. The paper note identification unit 30 also recognizes the serial number represented on the note. This paper note identification unit 30 incorporates various portions which are herein referred to as a feature amount detection portion, an identification portion, and a serial number recognition

portion.

FIG. 4 is a block diagram showing the configuration of the main portion of the paper note identification unit. The paper note identification unit 30 has a control portion 31, an optical sensor 32, a magnetic sensor 33, a serial number recognition portion 34, an identification
5 portion 35, a storage portion 36, and an input-output portion 37.

The optical sensor 32 detects either light that is reflected by a paper note after being emitted toward the note or light transmitted through the note, obtains an optical pattern on the paper note, and derives an image of the note. The image may contain a region of the paper note in which a serial number is represented, not necessarily the whole note. The paper note
10 identification unit 30 may be so configured that the optical sensor 32 operates to obtain both the optical pattern and the image. Alternatively, the optical sensor 32 for obtaining the optical pattern may be separate from another optical sensor 32 that obtains the image.

The magnetic sensor 33 acquires a magnetic pattern on the paper note, the pattern being created by a magnetic ink used for paper notes.

15 The serial number recognition portion 34 processes an image of a serial number-containing field in the paper note obtained by the optical sensor 32, and recognizes the serial number represented on the note.

The identification portion 35 identifies each paper note as genuine or counterfeit by the installed identification algorithm, using an optical pattern on the note obtained by the
20 optical sensor 32 and a magnetic pattern on the note obtained by the magnetic sensor 33.

The storage portion 36 stores parameters used to identify each paper note as genuine or counterfeit. The parameters used for the identification include amounts of feature of the optical and magnetic patterns on genuine notes and amounts of feature of the optical and magnetic patterns on counterfeit notes.

25 The input-output portion 37 gives a notice of the results of identification performed by the identification portion 35 to the paper note-processing portion 12.

The paper note identification unit 30 identifies the denomination of each paper note and identifies the note as genuine or counterfeit from the optical and magnetic patterns read from the note. However, an identification as to whether the note is genuine or counterfeit based
30 on the serial number is made by the main controller 10.

FIG. 5 is a table showing a blacklist of serial numbers. The blacklist is stored in the storage portion 19. As shown in FIG. 5, in the blacklist of serial numbers, the serial number and denomination represented on each counterfeit note are correlated with each other and registered. Each denomination is indicated by a combination of a pass code (in the case of

Japanese yen, JPY) defined in ISO 4217 and a sum of money.

The operation of each ATM 1 of this embodiment is next described.

FIG. 6 is a flowchart illustrating additional processing routine performed on each counterfeit note regarding the blacklist of serial numbers. The authorities concerned such as the police give a notice of the serial numbers and denominations of discovered counterfeit notes to financial institutions. The financial institution concerned sends an additional registration request including the serial numbers and denominations of counterfeit notes to all the ATMs 1 at the same time via the network 6 from the host machine 5 such that all the ATMs 1 connected with the host machine 5 can identify the discovered counterfeit notes.

When one ATM 1 receives the additional registration request by its communication portion 17 from the host machine 5 (s1), the ATM reads the serial number and denomination of one counterfeit note contained in the currently received additional registration request (s2) and makes a decision as to whether this counterfeit note is not registered in the blacklist of serial numbers (s3). If the note is a counterfeit not registered, the ATM 1 registers the serial number and denomination of the counterfeit note read at s2 into the blacklist of serial numbers (s4). If the note is a counterfeit registered in the blacklist, the ATM 1 does not register the serial number and denomination of the counterfeit note read at s2 (any processing associated with s4 is not performed) into the blacklist of serial numbers. The ATM 1 makes a decision as to whether the processing including the aforementioned step s2 and subsequent steps has been executed for the serial numbers and denominations of all the counterfeit notes contained in the currently received additional registration request (s5). If the ATM 1 determines at s5 that there is any counterfeit note whose serial number and denomination are not processed, control returns to s2, where the above-described processing is repeated. If the ATM 1 determines at s5 that there is neither serial number nor denomination of a counterfeit note that is unprocessed, then the present processing routine is ended.

Note that this additional registration request regarding counterfeit notes whose serial numbers and denominations have been sent to the ATMs 1 does not need to be sent. That is, serial numbers and denominations of only counterfeit notes which have not been sent to the ATMs 1 at this instant of time and a notice of which was recently given from the authorities concerned such as the police should be sent.

Various transactions through the ATMs 1 such as money deposit transactions and payment transactions are well known in the art and so their detailed description is omitted herein. Only a processing routine for identification of paper notes is described briefly here.

FIG. 7 is a flowchart illustrating the processing routine for identification. The

paper note identification unit 30 of the paper note-processing portion 12 reads the optical and magnetic patterns on each paper note transported along the paper note transport path 27 (s11). The identification unit 30 reads the optical pattern on the note by its optical sensor 32 and reads the magnetic pattern on the note by its magnetic sensor 33.

5 The paper note identification unit 30 identifies the denomination of each paper note and identifies it as genuine or counterfeit based on the installed identification algorithm (s12). At s12, the optical and magnetic patterns on the paper read at s11 are collated with the optical and magnetic patterns on genuine notes previously stored, and calculates their degrees of similarity. If the degree of similarity of the optical pattern of a paper note is in excess of a
10 predetermined optical threshold value, and if the degree of similarity of the magnetic pattern is in excess of a predetermined magnetic threshold value, the paper note is identified as genuine. Alternatively, at s12, collations with the optical and magnetic patterns of counterfeit notes previously registered may be done. The note may be identified as genuine provided that the note can be identified as noncounterfeit from its degree of similarity.

15 If the paper note identification unit 30 identifies the note as genuine from the feature amounts of the note at s12, the serial number recognition portion 34 of the identification unit 30 recognizes the serial number represented on the paper note from the image of the note read by the optical sensor 32 (s13 and s14). The paper note identification unit 30 gives a notice of the serial number recognized at s14 to the main controller 10. The main controller 10 makes
20 a decision as to whether the serial number of which notice has been given from the paper note identification unit 30 is registered in the blacklist of serial numbers (s15). If not registered, the note is identified as genuine (s16). Conversely, if registered, the note is identified as counterfeit (s17).

 If the note is identified as nongenuine from its amounts of feature at s12, the note
25 is identified as counterfeit (s17).

 In this way, even when the installed identification algorithm cannot accurately identify a counterfeit note as genuine or counterfeit by the optical and magnetic patterns on the paper note, if the serial number of the note is registered in the blacklist of serial numbers, the note can be identified as counterfeit by the serial number represented on the note.

30 With respect to each paper note that has been identified as counterfeit owing to the collation of the optical and magnetic patterns, the represented serial number is not recognized. This can reduce the processing load on the serial number recognition portion 34.

 An operation performed when the identification algorithm is updated is now described. In the following description, an example in which the updated identification

algorithm is recorded on a CD is taken as an example. It is assumed that a delete list as shown in FIG. 8 is recorded on the CD, as well as the updated identification algorithm. In this delete list, denominations and serial numbers of counterfeit notes which can be identified as genuine or counterfeit by this identification algorithm are correlated with each other.

5 FIG. 9 is a flowchart illustrating the operation performed when the identification algorithm is updated. A program for updating the algorithm is stored in the storage portion 19. The main controller 10 reads the identification algorithm from the CD that is set in the CD drive 18 (s21) and installs the identification algorithm (s22). If the installation of the algorithm is complete, the main controller 10 checks whether there is a delete list recorded on the CD set in
10 the CD drive 18 (s23). If no delete list is recorded, the present processing routine is ended.

 If a delete list is recorded on the CD that is set in the CD drive 18, the main controller 10 reads the delete list from the CD (s24). The main controller 10 reads the serial number and denomination of one note registered in the delete list read out (s25), and makes a decision as to whether a paper note having hit serial number and denomination is registered in
15 the blacklist of serial numbers (s26). If such a hit note is registered in the blacklist of serial numbers, the main controller 10 deletes the serial number from the blacklist of serial numbers (s27). Then, the main controller 10 makes a decision as to whether the processing starting with s25 has been executed regarding all the serial numbers registered in the delete list (s28). If the main controller 10 determines at s28 that there remains any unprocessed serial number, control
20 returns to s2, where the above-described processing is repeated. If the main controller 10 determines at s28 that there is no unprocessed serial number, the present processing routine is ended.

 Accordingly, with respect to a counterfeit note that can be judged as genuine or counterfeit by the updated identification algorithm, its serial number is deleted from the blacklist
25 of serial numbers. Therefore, it can be prevented that the serial numbers of counterfeit notes are wastefully stored in the blacklist of serial numbers. That is, increases in size of the blacklist of serial numbers can be prevented. Furthermore, the time taken to identify whether each paper note is genuine or counterfeit by its serial number can be suppressed from being prolonged wastefully. The processing efficiency can be suppressed from decreasing.

30 The delete list in the above example may take the form of FIG. 10. In this delete list, the versions of the identification algorithm are made to correspond to other items, in addition to the denominations and serial numbers of counterfeit notes. The versions of the identification algorithm permit identification of respective counterfeit notes.

 FIG. 11 is a flowchart illustrating the operation performed when the identification

algorithm associated with this example is updated. Prior to the update of the algorithm, the main controller 10 judges the version of the installed identification algorithm (s31). Then, the main controller 10 reads the identification algorithm from the CD that is set in the CD drive 18 (s32), and installs the algorithm (s33). If the installation of the algorithm is complete, the main
5 controller 10 checks whether there is a delete list recorded on the CD that is set in the CD drive 18 (s34). If no delete list is recorded, the present processing routine is ended.

If a delete list is recorded on the CD set in the CD drive 18, the main controller 10 reads the delete list from the CD (s35). The main controller 10 extracts all serial numbers incapable of being identified as being born by counterfeit notes in the unupdated version of the
10 identification algorithm but capable of being identified as being born by counterfeit notes in the updated version of the identification algorithm as well as denominations correlated with these serial numbers from the serial numbers registered in the delete list read at s35 (s36).

At s36, all of serial numbers and denominations which satisfy the following condition under the correlated versions X are extracted:

15 unupdated version number < X ≤ updated version number

For example, if the version number of the unupdated identification algorithm is "3" and the version number of the updated identification algorithm is "4", then all of serial numbers and denominations with which version number "4" is correlated are extracted. If the version number of the unupdated identification algorithm is "2" and the version number of the
20 updated identification algorithm is "4", then all of serial numbers and denominations with which version number "3" or "4" is correlated are extracted. It is here assumed that version numbers of the identification algorithm are indicated by integral numbers.

The main controller 10 reads the serial number and denomination of one paper note out of the serial numbers and denominations extracted at s36 (s37), and makes a decision as
25 to whether a hit serial number and a hit denomination are registered in the blacklist of serial numbers (s38). If registered, the main controller 10 deletes the serial number from the blacklist of serial numbers (s39). The main controller 10 makes a decision as to whether the processing starting with s37 has been executed for all the serial numbers extracted at s36 (s40). If the main controller 10 determines at s40 that there is any unprocessed serial number, then control goes
30 back to s37, where the above-described processing is repeated. If the main controller 10 determines at s40 that there is no unprocessed serial number, the present processing routine is ended.

This configuration produces advantageous effects similar to those produced by the above-described example. Furthermore, the time taken to delete unnecessary serial numbers of

counterfeit notes from the blacklist of serial numbers can be shortened.

Furthermore, in the above example, the ATM 1 is prompted to read by recording an updated identification algorithm and a delete list onto a CD and setting the CD into the CD drive 18. The host machine 5 may be configured to distribute the updated algorithm and delete
5 list to each ATM 1.

The present invention can be applied to a processor that processes other kinds of paper or other leaves such as checks and corporation securities, as well as to paper notes.

CLAIMS:

1. A processor (1) for processing paper or other leaves, comprising:
 - a feature amount-detecting portion (30) which detects feature amounts on a paper or other leaf;
 - an identification portion (35) which identifies the paper or other leaf as a counterfeit note by an installed identification algorithm, using the feature amounts detected by the feature amount-detecting portion;
 - a serial number recognition portion (34) which recognizes a serial number represented on the paper or other leaf;
 - a storage portion (36) which stores a counterfeit note list in which serial numbers of counterfeit notes are registered;
 - a decision portion (10) which makes a decision as to whether the paper or other leaf is genuine or counterfeit, depending on whether the serial number recognized by the serial number recognition portion is registered in the counterfeit note list stored in the storage portion;
 - and
 - an identification algorithm-updating portion (10) which updates the identification algorithm;
 - wherein the identification algorithm-updating portion (10) updates the identification algorithm and deletes the serial numbers of counterfeit notes that can be identified as counterfeit by the identification portion (35) using the updated identification algorithm from the counterfeit note list.
2. The processor (1) for processing paper or other leaves of claim 1, wherein said identification algorithm-updating portion (10) obtains a delete list in which the serial numbers of counterfeit notes to be deleted from said counterfeit note list are registered, together with the updated identification algorithm.
3. The processor (1) for processing paper or other leaves of claim 2, wherein in said delete list, serial numbers of counterfeit notes are correlated with versions of said identification algorithm in which the counterfeit notes can be correctly identified as counterfeit, and wherein said identification algorithm-updating portion (10) extracts serial numbers of counterfeit notes incapable of being identified as counterfeit in an unupdated version of the identification algorithm but capable of being identified as counterfeit in the updated version of the identification algorithm from said delete list and deletes the extracted serial numbers of the counterfeit notes from said counterfeit note list.
4. The processor (1) for processing paper or other leaves of any one of claims 1-3,

wherein said serial number recognition portion (34) does not recognize serial numbers represented on paper or other leaves identified as counterfeit by said identification portion (35).

5. A storage medium on which a program for updating an identification algorithm is stored, said program being executed on a computer including a processor (1) which processes paper or other leaves, said processor having a feature amount-detecting portion (30) which detects feature amounts on a paper or other leaf, an identification portion (35) which identifies the paper or other leaf as a counterfeit note by an installed identification algorithm, using the feature amounts detected by the feature amount-detecting portion, a serial number recognition portion (34) which recognizes a serial number represented on the paper or other leaf, a storage portion (36) which stores a counterfeit note list in which serial numbers of counterfeit notes are registered, and a decision portion (10) which makes a decision as to whether the paper or other leaf is a counterfeit note, depending on whether the serial number recognized by the serial number recognition portion is registered in the counterfeit note list stored in the storage portion, said program causing the computer to perform the steps of:

updating the identification algorithm; and

deleting serial numbers of counterfeit notes capable of being identified as counterfeit by the identification algorithm updated by said identification portion from the counterfeit note list simultaneously with the update of the identification algorithm performed at the updating step.