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(54) **Cash management for automated teller machines**

(57)   A monitoring system (1) stores geographical locations (212, 222, 2n2) of automated teller machines (21, 22, 2n) and address information for transmitting electronic messages via a telecommunications network (4) to registered service assistants. The monitoring system (1) receives from the automated teller machines (21, 22, 2n) fill levels of bank note containers (211, 221, 2n1) and determines an automated teller machine that requires servicing. Using the current geographical location (312, 322, 3m2) of the registered service assistants, the monitoring system (1) determines suitable service assistants located within a defined proximity to the automated teller machine (21, 22, 2n) that requires servicing and, using the address information, transmits to these suitable service assistants service requests for reloading or removing bank notes at the automated teller machine (21, 22, 2n) that requires servicing.
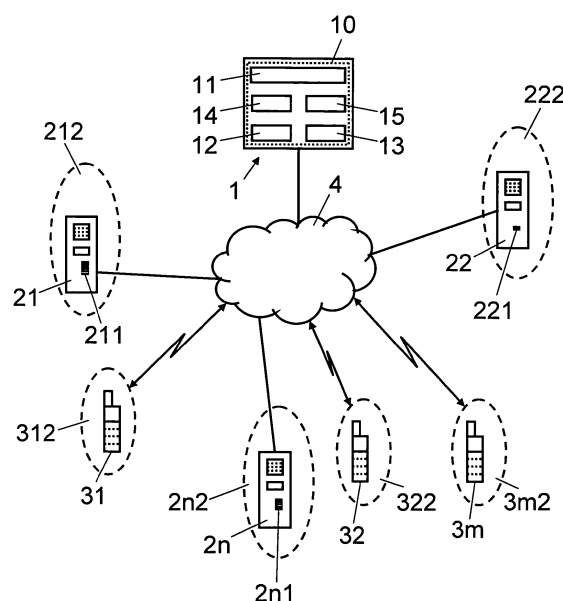
Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to a monitoring system and a method for monitoring automated teller machines (ATMs).

Background of the Invention

[0002] According to the concept of mobile money, which has proliferated particularly in areas with few banking institutions, a user is able to store his cash in electronic form in an electronic wallet, e.g. a so called eWallet (electronic wallet) or mWallet (mobile wallet). A mobile money user is typically a mobile (or "cell") phone subscriber of a mobile operator, whereby the mobile communication device (e.g. a mobile phone) is configured to store the electronic wallet. The user is able to deposit and withdraw cash to and from his electronic wallet and to perform financial transactions, such as paying bills, transferring money to someone, topping-up a telephone account, etc.

[0003] In this context, agents perform important tasks such as cash-in and cash-out transactions. In a cash-in transaction, an agent takes real cash from a user and deposits an equivalent amount to the user's electronic wallet. Thus, by performing a cash-in transaction, the user is able to convert real cash into an equivalent amount of electronic money. In a cash-out transaction, the user requests cash from an agent in exchange for electronic money stored in the user's electronic wallet. The agent initiates the cash-out transaction and the user may have to confirm the transaction on his cell phone that manages the electronic wallet, typically by entering a PIN (Personal Identification Number). In exchange for the electronic money, the agent hands out to the user real cash. Typically, the transaction is charged with a fee.

[0004] For efficiency reasons, agents may install self-service channels such as Automatic Teller Machines (ATMs) designed for mobile money transactions. Service assistants are notified, in case the ATMs need to be reloaded with bank notes or bank notes need to be removed. The service assistant usually receives an incentive, such as a flat fee reward or a commission that depends on the amount of reloaded or removed money. In a variant, the ATM includes a cash recycler which is configured to perform cash recycling by dispensing cash to a user that was previously deposited by another user.

[0005] Often, cash liquidity problems occur because the amount deposited through cash-in transactions does not balance with the amount withdrawn through cash-out transactions. Typically, there are more cash-in transactions in urban areas and more cash-out transactions in rural areas. Rebalancing can be expensive for the agent in terms of travel cost, time, and lost business. If the agent has an ATM installed, the ATM needs to be visited more frequently in order to reload or remove cash. If a user visits an agent or an agent's ATM with liquidity problems, the user will be frustrated as he has to return later or visit another agent.

[0006] US 2007/0229253 relates to the handling of cassettes for bank notes ATMs and/or deposit devices. The filling level of a cassette is determined and compared to a threshold lower than the maximum capacity of the cassette. If the threshold is exceeded, the replacement of the respective cassette is initiated by transmitting a respective signal to a bank or service centre via an interface such as a modem, network connection, Internet connection, telephone connection, etc. The service centre sends an employed service assistant to replace the full cassette with an empty cassette. An optimal threshold value can be calculated based on an average number of banknotes deposited in a time period and based on the time it takes to replace the cassette, wherein the time of day and/or day of the week is taken into account. In a variant, a request to replace cassettes is transmitted from the ATM via the network to an employed service assistant directly.

[0007] GB 2 356 728 relates to replenishing arrangements for ATMs. When the number of currency notes in a particular cassette of an ATM reaches a low level, an indication is provided. ATMs installed in bars and shops are often loaded with currency notes by the bar proprietor or shopkeeper. A marker bill is inserted in the stack of notes indicating a low level. The marker bill may be in the form of a voucher to prompt the user to present it to the person responsible for loading the machine. In a variant, the marker bill is detected automatically for alerting a service person.

[0008] GB 2 325 327 relates to an apparatus for receiving and monitoring the value of currency. The apparatus is configured to issue an alarm when the running total in a storage unit exceeds a predetermined value. Running totals are tracked separately for different storage units.

[0009] EP 0 164 717 relates to an automatic bank note depositing and dispensing machine. Banknotes are loaded or collected manually into or from a container. The machine is designed to automatically transfer bank notes to an external delivery unit or a self-propelled vehicle when a defined maximum number of bank notes is stored in the container. Moreover, the machine is designed to automatically supply the container with bank notes from the external delivery unit or the self-propelled vehicle when only a defined lower number of bank notes is stored in the container. In a variant, a controller issues signals indicating required numbers and denominations of required bank notes to an external accounting unit and the self-propelled vehicle.

Summary of the Invention

[0010] It is an object of this invention to provide a monitoring system and a method for monitoring ATMs, which do not have at least some of the disadvantages of the

prior art. In particular, it is an object of the present invention to provide a monitoring system and a method for monitoring ATMs to improve the efficiency of servicing ATMs that require reloading or removing of bank notes.

[0011] According to the present invention, these objects are achieved through the features of the independent claims. In addition, further advantageous embodiments follow from the dependent claims and the description.

[0012] According to the present invention, the above-mentioned objects are particularly achieved in that a computerized monitoring system for monitoring ATMs comprises: a data store configured to store geographical locations of the ATMs; a service assistant registration module configured to store address information for transmitting via a telecommunications network electronic messages to registered service assistants; and a servicing module configured to determine an ATM that requires servicing, based on status data indicating fill levels of bank note containers, received from the ATMs, to determine suitable registered service assistants, based on current geographical locations of the service assistants and the geographical location of the ATM that requires servicing, and to transmit service requests for reloading or removing bank notes at the ATM that requires servicing to the suitable registered service assistants via the telecommunications network, using the address information. Preferably, the address information relates to mobile communication devices of the registered service assistants, e.g. the telephone number of a mobile (cellular) telephone, and the geographical location of a registered service assistant is defined by the current position of his mobile communication device. In a variant, the fill levels are transmitted to the monitoring system on a periodic basis. As soon as the monitoring system detects that a particular ATM requires servicing, suitable service assistants are determined based on their current geographical locations.

[0013] Depending on the embodiment, the servicing module is configured to determine each of the suitable registered service assistants based the distance between the current geographical location of the service assistant and the geographical location of the ATM that requires servicing, the estimated travel time of the service assistant from his current geographical location to the geographical location of the ATM that requires servicing, past service history of the service assistant, cash level of the registered service assistant, and/or an indicated preference of the registered service assistant for either reloading or removing bank notes at the ATMs.

[0014] Accordingly, depending on the embodiment, the suitability of a service assistant for servicing the ATM that requires servicing is determined not only by proximity defined by geographic distance but also by the length of the route or path used to reach the ATM from the current location of the service assistant, e.g. by car, public transport or on foot, depending on current profile settings of the service assistant. In an embodiment, the proximity is

determined by taking into account further factors, such as the time of day, traffic information, weather conditions, etc. By transmitting service requests to registered service assistants in close proximity to the respective ATM, the efficiency of servicing is improved as the average response time for servicing the ATMs is reduced. The more people from the public, e.g. subscribers to mobile radio networks, that register and participate in servicing the ATMs, the greater is the improvement that can be expected.

[0015] In an embodiment, the location determination module is configured to determine the current geographical location of the registered service assistants by interacting with a positioning system arranged externally to the monitoring system, e.g. a GPS system (Global Positioning System) or a localization system of a cellular mobile radio network such as a GSM (Global System for Mobile Communication) or UMTS (Universal Mobile Telephone System) network. Thus, the geographic location of service assistants can be determined accurately using various widely available systems.

[0016] In an embodiment, the service assistant registration module is configured to store availability information of registered service assistant, and the servicing module is configured to determine suitable registered service assistant using the availability information, e.g. with respect to the current time. Thus, the suitable service assistants include only service assistants that are presently available and willing to service the ATM. Accordingly, the service requests are not transmitted to service assistants who have indicated to the monitoring system that they are presently not available.

[0017] In an embodiment, the servicing module is further configured to receive via the telecommunications network a transaction confirmation from an ATM that required servicing, the transaction confirmation indicates the number of bank notes reloaded or removed at the ATM, respectively. For example, the transaction confirmation indicates the number and denominations of the bank notes that were removed or reloaded, respectively. Thus, with any servicing of the ATM by one or more of the service assistants, the monitoring system is updated with current status data (fill level) of the respective ATM.

[0018] In an embodiment, the servicing module is configured to transmit the service requests using a messaging service of the telecommunications network. Likewise, the transaction confirmations are transmitted by the ATMs using the messaging service. The messaging service includes, for example, SMS (Short Message Services) or USSD (Unstructured Supplementary Service Data) messages. Thus, the service requests and transaction confirmations can be transmitted using various widely available messaging services of reliable communication systems.

[0019] In an embodiment, the status monitoring module is configured to receive the status data from the ATMs on a periodic basis and/or depending on fill level threshold values. Depending on the embodiment, the fill levels

are received by the monitoring system polling the status data from the ATMs and/or by the ATMs pushing the status data to the monitoring system.

[0020] In a variant, the servicing module is configured to calculate an incentive for reloading or removing bank notes at the ATM that requires servicing, and to include in the service requests an indication of the incentive and a temporal validity of the incentive.

[0021] In addition to a monitoring system for monitoring the ATMs, the present invention further relates to a computer-implemented method of monitoring the ATMs. The method comprises: storing in a computer geographical locations of the ATMs; storing in the computer address information for transmitting via a telecommunications network electronic messages to registered service assistants; determining in the computer an ATM that requires servicing, based on status data indicating fill levels of bank note containers, received from the ATMs; determining in the computer suitable registered service assistants, based on current geographical locations of the service assistants and the geographical location of the ATM that requires servicing; and transmitting from the computer service requests for reloading or removing bank notes at the ATM that requires servicing to the suitable registered service assistants via the telecommunications network, using the address information.

[0022] Moreover, the present invention further relates to a computer program product comprising a computer-readable medium having stored thereon computer program code for controlling one or more processors of a monitoring system, such that the monitoring system stores geographical locations of ATMs; stores address information for transmitting via a telecommunications network electronic messages to registered service assistants; determines an ATM that requires servicing, based on status data indicating fill levels of bank note containers, received from the ATMs; determines suitable registered service assistants, based on current geographical locations of the service assistants and the geographical location of the ATM that requires servicing; and transmits service requests for reloading or removing bank notes at the ATM that requires servicing to the suitable registered service assistants via the telecommunications network, using the address information.

Brief Description of the Drawings

[0023] The present invention will be explained in more detail, by way of example, with reference to the drawings in which:

Figure 1: shows a block diagram illustrating schematically a monitoring system for monitoring ATMs; and

Figure 2: shows a flow diagram illustrating an exemplary sequence of steps for monitoring ATMs.

Detailed Description of the Preferred Embodiments

[0024] In Figure 1, reference numeral 1 refers to a computerized monitoring system 1 for monitoring ATMs 21, 22, ..., 2n.

[0025] As illustrated schematically in Figure 1, each of the ATMs 21, 22, ..., 2n is arranged in and associated with a respective geographical location 212, 222, ..., 2n2. Each of the ATMs 21, 22, ..., 2n comprises one or more containers 211, 221, ..., 2n1 configured to store bank notes. Depending on the embodiment, the containers 211, 221, ..., 2n 1 comprise a housing that fully or partly encloses bank notes or a carrier that merely holds the bank notes. For example, the containers 211, 221, ..., 2n1 are exchangeable, wherein during a service operation, the containers are removed from the ATMs 21, 22, ..., 2n, either empty or together with the stored bank notes, and replaced by other containers 211, 221, ..., 2n1 with bank notes or empty, respectively. Alternatively, the containers are installed in the ATMs 21, 22, ..., 2n in a fixed fashion and the stored bank notes are removed directly from the containers 211, 221, ..., 2n1 or stored directly in the containers 211, 221, ..., 2n1. One skilled in the art will understand that the ATMs 21, 22, ..., 2n may include exchangeable containers 211, 221, ..., 2n1 as well as, or in addition to, fixed containers 211, 221, ..., 2n1.

[0026] In an embodiment, at least some of the ATMs 21, 22, ..., 2n are configured to exchange electronic money and bank notes by performing cash-in transactions and cash-out transactions. In a cash-in transaction, a user deposits bank notes into the ATM 21, 22, ..., 2n and receives electronic money, for example through interaction between a mobile communication device 31, 32, ..., 3m of an associated user and the ATM 21, 22, ..., 2n. The electronic money is stored with the help of a device of the user, for example using an electronic wallet of the mobile communication device 31, 32, ..., 3m. In a cash-out transaction, the user transmits electronic money to the ATM 21, 22, ..., 2n, for example through interaction between the mobile communication device 31, 32, ..., 3m containing the electronic wallet and the ATM 21, 22, ..., 2n, and then withdraws in exchange bank notes from the ATM 21, 22, ..., 2n. For example, the interaction between the ATM and the user's mobile communication device 31, 32, ..., 3m is performed via a telecommunications network, a wireless local area network, near field communication, etc.

[0027] As illustrated in Figure 1, the ATMs 21, 22, ..., 2n and the monitoring system 1 are connected via a telecommunications network 4. The telecommunications network 4 includes wired communication links as well as wireless communication links. The telecommunications network 4 is operated by one or more network operators. For example, the telecommunications network 4 may be an IP based communications network (IP: Internet Protocol), e.g. the Internet. Via the telecommunications network 4, communication channels are established be-

tween the ATMs 21, 22, ..., 2n and the monitoring system 1.

[0028] The monitoring system 1 includes one or more operational computers 10, for example personal computers or servers, comprising one or more processors. For example, the monitoring system 1 comprises a data entry system and a display terminal. Furthermore, the monitoring system 1 comprises various functional modules including a servicing module 11, a data store 12, a service assistant registration module 13, a status monitoring module 14, and a location determination module 15. In accordance with various embodiments of the invention, the functional modules 11 through 15 may be implemented as programmed software modules. The data store 12 comprises data storage modules for storing data, as outlined below. The computer program code of the software modules is included in a computer program product, e.g. stored on a computer readable medium, either in memory integrated in a computer 10 of the monitoring system 1 or on a tangible data carrier which can be inserted into or connected to a computer 10 of the monitoring system 1. The computer program code of the software modules controls the computer(s) 10 of the monitoring system 1 so that the monitoring system 1 executes various functions described in the following paragraphs. One skilled in the art will understand, however, that in alternative embodiments, the functional modules can be implemented fully or partly by way of hardware components.

[0029] As illustrated in Figure 1, the monitoring system 1 comprises a data store 12 configured to store geographical locations 212, 222, ..., 2n2 of the ATMs 21, 22, ..., 2n. The geographical locations 212, 222, ..., 2n2 include a relative location and/or an absolute location. A relative location is defined as a displacement from another site, for example by defining an angle and a distance. An absolute location is defined, for example, by coordinates including latitude and longitude. Or, for example, the geographic locations 212, 222, ..., 2n2 may include a postal or street address.

[0030] The service assistant registration module 13 is configured to receive and store registrations of authenticated users who are willing to participate as service assistants and who may service ATMs when needed. Registrations of service assistants are received, for example, via an Internet-based web site and/or through a programmed software application (app) installed on a mobile communication device 31, 32, ..., 3m. Thus, the service assistant registration module 13 is configured to store identification, contact and authentication information of service assistants as well as address information for transmitting via the telecommunication network 4 electronic messages to the registered service assistants, i.e. to their communication terminals, e.g. mobile communication devices 31, 32, ..., 3m such as mobile telephones, personal digital assistants, notebooks or tablet computers, etc. For example, the electronic messages include SMS messages, USSD messages, etc. In an embodiment, the service assistant is notified by way of an alarm

sound, generated by the mobile communication device 31, 32, ..., 3m upon receipt of the electronic message, and the electronic message is displayed on a display of the mobile communication device 31, 32, ..., 3m.

[0031] The service assistant registration module 13 is further configured to receive and store availability information of registered service assistants. In a variant, the availability information includes preferred times, possible times, blocked times, available cash, preferences for deposit or withdrawal, etc. of a service assistant for servicing ATMs. For example, a service assistant may specify that 8am-12pm and 1pm-6pm are preferred times, 6am-8am and 6pm-10pm are possible times, and 10pm-6am are blocked (not possible) times for servicing ATMs. For example, the availability information may further include weekdays, holidays, etc. The availability information is received at the monitoring system 1 from registered service assistants via an Internet-based web site and/or through a programmed software application (app) installed on a mobile communication device 31, 32, ..., 3m, for example.

[0032] The status monitoring module 14 is configured to monitor and receive from the ATMs 21, 22, ..., 2n status data indicating fill levels of their respective bank note containers 211, 221, ..., 2n1. Depending on the embodiment, the status monitoring module 14 is configured to poll status data from the ATMs 21, 22, ..., 2n periodically at regular time intervals and/or upon receipt of a polling request, etc. In further embodiments, the ATMs 21, 22, ..., 2n are configured to transmit status data to the status monitoring module 14 periodically at regular time intervals and/or after comparison of the fill level of one or more containers 211, 221, ..., 2n1 with a threshold. For example, the transmission of status data is triggered if the fill level exceeds an upper threshold, i.e. when the respective container 211, 221, ..., 2n1 is nearly full, for example, if the number of bank notes is above a level of 80% of the capacity of a container 211, 221, ..., 2n1; or if the fill level is below a lower threshold, i.e. when the respective container 211, 221, ..., 2n1 is nearly empty, for example, if the number of bank notes is below a level of 20% of the capacity of a container 211, 221, ..., 2n1.

[0033] The location determination module 15 is configured to determine a current geographical location of at least some of the registered service assistants. Particularly, the location of a service assistant is defined by the current location or position of his respective mobile communication device 31, 32, ..., 3m. For example, the location determination module 15 is configured to determine the current geographical location of a registered service assistant by interacting with a positioning system arranged externally to the monitoring system 1, e.g. a GPS system (Global Positioning System) or a localization system of a mobile radio network included in the telecommunications network 4, e.g. a cellular telephone network such as a GSM or an UMTS network, etc. In an embodiment, the location determination module 15 is configured to send a location request to the mobile com-

munication device 31, 32, ..., 3m of the respective service assistant and the mobile communication device 31, 32, ..., 3m reports its current location to the location determination module 15 upon receipt of the location request. Depending on the embodiment, the location determination module 1 5 is configured to send a location request periodically at regular time intervals and/or upon receipt of a location request from another functional module of the monitoring system 1, e.g. from the status monitoring module 14 or the servicing module 11. In an embodiment, the mobile communication devices 31, 32, ..., 3m are configured to send their current location to the location determination module 15 periodically at regular time intervals.

[0034] The servicing module 11 is configured to determine an ATM 21, 22, ..., 2n that requires servicing. Specifically, the servicing module 11 is configured to determine and identify, depending on the fill levels included in the current or available status data, an ATM 21, 22, ..., 2n that needs its container(s) 211, 221, ..., 2n1 to be reloaded with bank notes or bank notes removed from its containers 211, 221, ..., 2n1. For example, if the status data indicates that the fill level is below a defined (lower) threshold, e.g. 20% of the maximal capacity of a container 211, 221, ..., 2n1, the respective ATM 21, 22, ..., 2n is determined to require servicing, namely that bank notes need to be reloaded. If the status data indicates that the fill level is above a defined (upper) threshold, e.g. 80% of the maximal capacity of a container 211, 221, ..., 2n1, the respective ATM 21, 22, ..., 2n is determined to require servicing, namely that bank notes need to be removed.

[0035] The servicing module 11 is further configured to transmit via the telecommunications network 4 service requests for reloading or removing bank notes at the identified ATM 21, 22, ..., 2n to suitable registered service assistants. For that purpose, the servicing module 11 uses the address information of the mobile communication devices 31, 32, ..., 3m of the respective service assistants.

[0036] The servicing module 11 is further configured to determine the suitable registered service assistants based on their current location, i.e. the current location of their mobile communication devices 31, 32, ..., 3m. Suitable registered service assistants are determined by the servicing module 11 evaluating whether their current geographical location is within a defined proximity to the geographical location of the ATM 21, 22, ..., 2n that requires servicing, e.g. within a certain distance or temporal reachability (by car, public transport, walking, etc.). Specifically, for determining suitable service assistants, the servicing module 11 compares the geographical location of the ATM 21, 22, ..., 2n requiring servicing to the current geographical location of at least some of the registered service assistants. For example, the servicing module 11 determines the proximity of a service assistant with regards to an ATM 21, 22, ..., 2n by calculating the distance between the two geographical locations, e.g. from their coordinates (latitude, longitude), and comparing the dis-

tance to a defined proximity threshold, e.g. 500m or 1 km, to determine whether the respective service assistant meets the desired proximity criteria for a suitable service assistant, e.g. a location closer than 500m or 1 km to the ATM 21, 22, ..., 2n that requires servicing, respectively. Depending on the embodiment, various other factors are taken into account when determining whether a service assistant is within a defined proximity to the ATM that needs servicing, for example, the type of street between the geographic locations, traffic information related to the streets interconnecting the geographic locations, etc. Accordingly, the proximity criteria may be defined by a maximum duration of time that a service assistant is expected to need for reaching the ATM that needs servicing, based on the service assistant's current means of transportation, current traffic information, etc. Furthermore, the servicing module 11 is configured to determine the suitable service assistants based on the availability information stored for the service assistant, considering the current time. If there are no suitable service assistants, the process is repeated for less stringent proximity and/or availability criteria. Other criteria may also include past service history indicating e.g. a service assistant's response probability to a service request, or some form of round-robin algorithm among available service assistants to ensure that the service requests are not always sent to the same registered users. Further criteria may include, the cash level of the registered service assistants and/or an indicated preference of the service assistants for either reloading or removing bank notes at the ATMs 21, 22, 2n.

[0037] In an embodiment, the servicing module 11 is further configured to receive a transaction confirmation which is transmitted by the ATM 21, 22, ..., 2n after having been services by a service assistant. The transaction confirmation is transmitted via the telecommunications network 4 to the monitoring system 1 and includes data indicating the number of bank notes reloaded or removed at the ATM 21, 22, 2n, e.g. the number and denomination of the bank notes removed or reloaded bank notes. Depending on the embodiment, the transaction confirmation is generated by the ATM 21, 22, 2n, after it has been serviced, and/or by the respective service assistant using his mobile communication device 31, 32, ..., 3m. The transaction confirmations enable bookkeeping and financial balancing and controlling, e.g. for verifying that the number of bank notes actually removed or reloaded, as reported by the ATM 21, 22, 2n, corresponds to the number of bank notes that the respective service assistant(s) reported to have picked up or deposited at the ATM 21, 22, 2n. In an embodiment, the servicing module 11 notifies the service assistants concerned that a particular ATM 21, 22, 2n has been successfully serviced and that the respective service request has been cancelled. For example, the transaction confirmation and/or cancellation message is transmitted using messaging services of the telecommunications network 4, such as SMS, USSD, e-mail, etc.

[0038]   In a variant, the servicing module 11 is configured to calculate an incentive for reloading or removing bank notes at the ATM 21, 22, 2n that requires servicing and to include the incentive in the service request. In particular, the incentive includes a commission and a period of validity. For example, the service request includes the following content: "refill ATM ID 222 with bank notes of €10 and €20 within the next 2 hours, and you will receive a 1% commission. Offer valid for 2 hours or until cancellation". For example, the geographical position of the ATM 21, 22, 2n to be serviced and/or the distance from the service assistant's current location is indicated graphically on a map shown on the display of his mobile communication device 31, 32, ..., 3m.

[0039]   As the ATMs 21, 22, ..., 2n are replenished with bank notes when required, there will be significantly less downtime caused by lack of bank notes at the ATMs 21, 22, ..., 2n, compared to traditional replenishing and/or emptying of ATM cassettes. Accordingly, the users will have increased trust into the system and are encouraged to perform cash-in and cash-out transactions. Since the replenish procedure, namely the removing or the reloading of bank notes, is automated and costs of the replenishment can be controlled directly, multiple benefits arise: cash or bank notes are only replenished when needed; providing an incentive for replenishment is typically much smaller than the costs of cash management; owners of the ATMs 21, 22, ..., 2n can focus on their core business and will not need to frequently leave for example their shops to rebalance cash. Since there is more cash flow at the ATMs, opportunities for advertising, for selling other services such as data packages, airtime, etc. are increased. As the cash management is automated, mobile money operators are enabled to observe and control the balance of electronic money and cash in any particular ATM 21, 22, ..., 2n at any time. Through the increased transparency, proactive measures in managing the ATMs 21, 22, ..., 2n and in rectifying customer experience concerns can be taken quickly and efficiently. Moreover, areas with high or low traffic may be identified and decisions about the need for additional services in a particular geographical area can be taken.

[0040]   In the following paragraphs, described with reference to Figure 2 are possible sequences of steps performed by the functional modules of the monitoring system 1 for monitoring the ATMs 21, 22, ..., 2n.

[0041]   In preparatory step S1, geographical locations of the ATMs 21, 22, ..., 2n are stored in data store 12 of the monitoring system 1. The geographical locations are entered manually by an administrator and/or received electronically from the ATMs 21, 22, ..., 2n. In some instances, the ATMs 21, 22, ... 2n may determine their location fully automatically.

[0042]   In preparatory step S2, the service assistant registration module 13 receives and stores registrations of service assistants. The received and stored registrations include contact information for transmitting via a telecommunications network electronic messages to the registered service assistants, i.e. to his one or more mobile or fixed communication devices, for example addressing information such as a telephone (MSISDN) number or an e-mail address.

[0043]   In step S3, the status monitoring module 14 monitors and/or receives status data from the ATMs 21, 22, ..., 2n. The status data indicates fill levels of the bank note containers 211, 221,..., 2n1.

[0044]   In step S4, the location determination module 15 determines and stores the current geographical location of at least some of the registered service assistants, e.g. of those that are presently available.

[0045]   In step S5, depending on the fill levels of the ATMs, the servicing module 11 identifies an ATM 21, 22, ..., 2n that requires servicing. Subsequently, the servicing module 11 determines suitable registered service assistants that meet defined proximity criteria with regards to the ATM that requires servicing 21, 22, ..., 2n. Thereafter, using the stored address information, the servicing module 11 generates and transmits via the telecommunications network 4 a service request to the mobile communications devices 31, 32, ..., 3m of the suitable service assistants, requesting the respective service assistants to reload or remove bank notes at the ATM 21, 22, ..., 2n that requires servicing.

[0046]   It should be noted that, in the description, the computer program code has been associated with specific functional modules and the sequence of the steps has been presented in a specific order, one skilled in the art will understand, however, that the computer program code may be structured differently and that the order of at least some of the steps could be altered, without deviating from the scope of the invention.

Claims

1. A monitoring system (1) for monitoring automated teller machines (21, 22, 2n), the system comprising:

    a data store (12) configured to store geographical locations (212, 222, 2n2) of the automated teller machines (21, 22, 2n);
    a service assistant registration module (13) configured to store address information for transmitting via a telecommunications network (4) electronic messages to registered service assistants; and
    a servicing module (11) configured to determine an automated teller machine that requires servicing, based on status data indicating fill levels of bank note containers (211, 221, 2n1), received from the automated teller machines (21, 22, 2n), to determine suitable registered service assistants, based on current geographical locations (312, 322, 3m2) of the service assistants and the geographical location of the automated teller machine (21, 22, 2n) that requires servic-

ing, and to transmit service requests for reloading or removing bank notes at the automated teller machine (21, 22, 2n) that requires servicing to the suitable registered service assistants via the telecommunications network (4), using the address information.

2. The monitoring system (1) of claim 1, wherein the servicing module (11) is configured to determine each of the suitable registered service assistants based on at least one of: distance between the current geographical location (312, 322, 3m2) of the service assistant and the geographical location of the automated teller machine (21, 22, 2n) that requires servicing, estimated travel time of the service assistant from his current geographical location (312, 322, 3m2) to the geographical location of the automated teller machine (21, 22, 2n) that requires servicing, past service history of the service assistant, cash level of the registered service assistant, and an indicated preference of the registered service assistant for either reloading or removing bank notes at the automated teller machines (21, 22, 2n).

3. The monitoring system (1) of claim 1 or 2, wherein the service assistant registration module (13) is configured to store availability information of registered service assistants, and the servicing module (11) is configured to determine suitable registered service assistants using the availability information.

4. The monitoring system (1) of one of claims 1 to 3, wherein the servicing module (11) is further configured to receive via the telecommunications network (4) a transaction confirmation from an automated teller machine (21, 22, 2n) that required servicing, the transaction confirmation indicating a number of bank notes reloaded or removed at the automated teller machine (21, 22, 2n), respectively.

5. The monitoring system (1) of one of claims 1 to 4, wherein the servicing module (11) is configured to transmit the service requests using a messaging service of the telecommunications network (4).

6. The monitoring system (1) of one of claims 1 to 5, wherein the status monitoring module (14) is configured to receive the status data from the automated teller machines (21, 22, 2n) on a periodic basis and/or depending on fill level threshold values.

7. The monitoring system (1) of one of claims 1 to 6, wherein the servicing module (11) is configured to calculate an incentive for reloading and removing bank notes at the automated teller machine (21, 22, 2n) that requires servicing, and to include in the service requests an indication of the incentive and a temporal validity.

8. A method of monitoring automated teller machines (21, 22, 2n), the method comprising:

    storing in a computer (10) geographical locations (212, 222, 2n2) of the automated teller machines (21, 22, 2n);
    storing in the computer (10) address information for transmitting via a telecommunications network (4) electronic messages to registered service assistants;
    determining in the computer (10) an automated teller machine (21, 22, 2n) that requires servicing, based on status data indicating fill levels of bank note containers (211, 221, 2n1), received from the automated teller machines (21, 22, 2n);
    determining in the computer (10) suitable registered service assistants, based on current geographical locations (312, 322, 3m2) of the service assistants and the geographical location of the automated teller machine (21, 22, 2n) that requires servicing; and
    transmitting from the computer (10) service requests for reloading or removing bank notes at the automated teller machine (21, 22, 2n) that requires servicing to the suitable registered service assistants via the telecommunications network (4), using the address information.

9. The method of claim 8, wherein each of the registered service assistants is determined based on at least one of: distance between the current geographical location (312, 322, 3m2) of the service assistant and the geographical location of the automated teller machine (21, 22, 2n) that requires servicing, estimated travel time of the service assistant from his current geographical location (312, 322, 3m2) to the geographical location of the automated teller machine (21, 22, 2n) that requires servicing, past service history of the service assistant, cash level of the registered service assistant, and an indicated preference of the registered service assistant for either reloading or removing bank notes at the automated teller machines (21, 22, 2n).

10. The method of claim 8 or 9, further comprising storing in the computer (10) availability information of registered service assistants, and determining the suitable registered service assistants using the availability information.

11. The method of one of claims 8 to 10, further comprising receiving in the computer (10) via the telecommunications network (4) a transaction confirmation from an automated teller machine (21, 22, 2n) that required servicing, the transaction confirmation indicating a number of bank notes reloaded or removed at the automated teller machine (21, 22, 2n), respectively
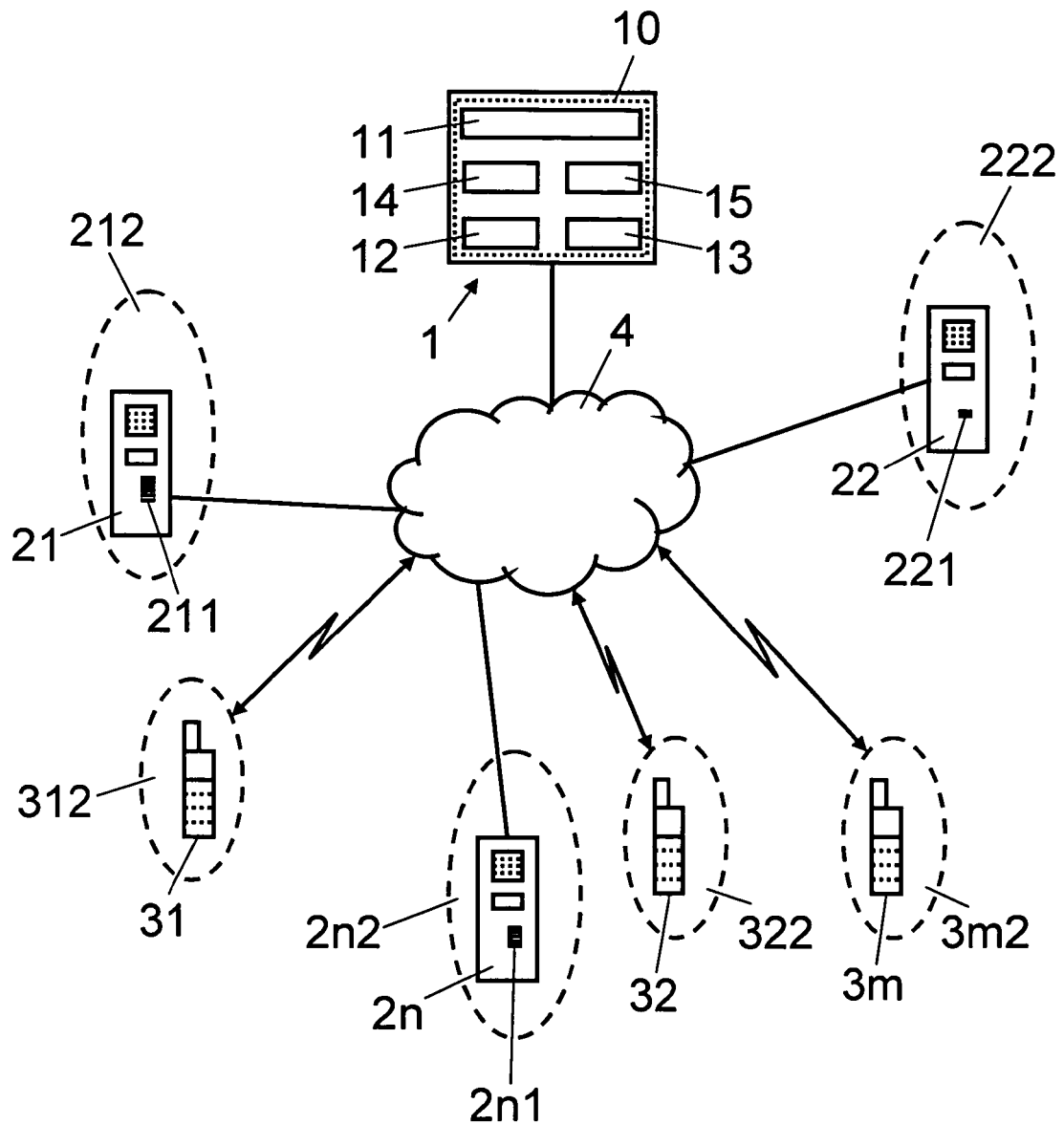
12. The method of one of claims 8 to 11, wherein the service requests are transmitted using a messaging service of the telecommunications network (4).

13. The method of one of claims 8 to 12, wherein the status data is received from the automated teller machines (21, 22, 2n) on a periodic basis and/or depending on fill level threshold values.

14. The method of one of claims 8 to 13, further comprising calculating in the computer (10) an incentive for reloading and removing bank notes at the automated teller machine (21, 22, 2n) that requires servicing, and including in the service requests an indication of the incentive and a temporal validity.

15. A computer program product comprising a computer-readable medium having stored thereon computer program code for controlling one or more processors of a monitoring system (1), such that the monitoring system (1)
stores geographical locations (212, 222, 2n2) of automated teller machines (21, 22, 2n);
stores address information for transmitting via a telecommunications network (4) electronic messages to registered service assistants;
determines an automated teller machine (21, 22, 2n) that requires servicing, based on status data indicating fill levels of bank note containers (211, 221, 2n1), received from the automated teller machines (21, 22, 2n);
determines suitable registered service assistants, based on current geographical locations (312, 322, 3m2) of the service assistants and the geographical location of the automated teller machine (21, 22, 2n) that requires servicing; and
transmits service requests for reloading or removing bank notes at the automated teller machine (21, 22, 2n) that requires servicing to the suitable registered service assistants via the telecommunications network (4), using the address information.
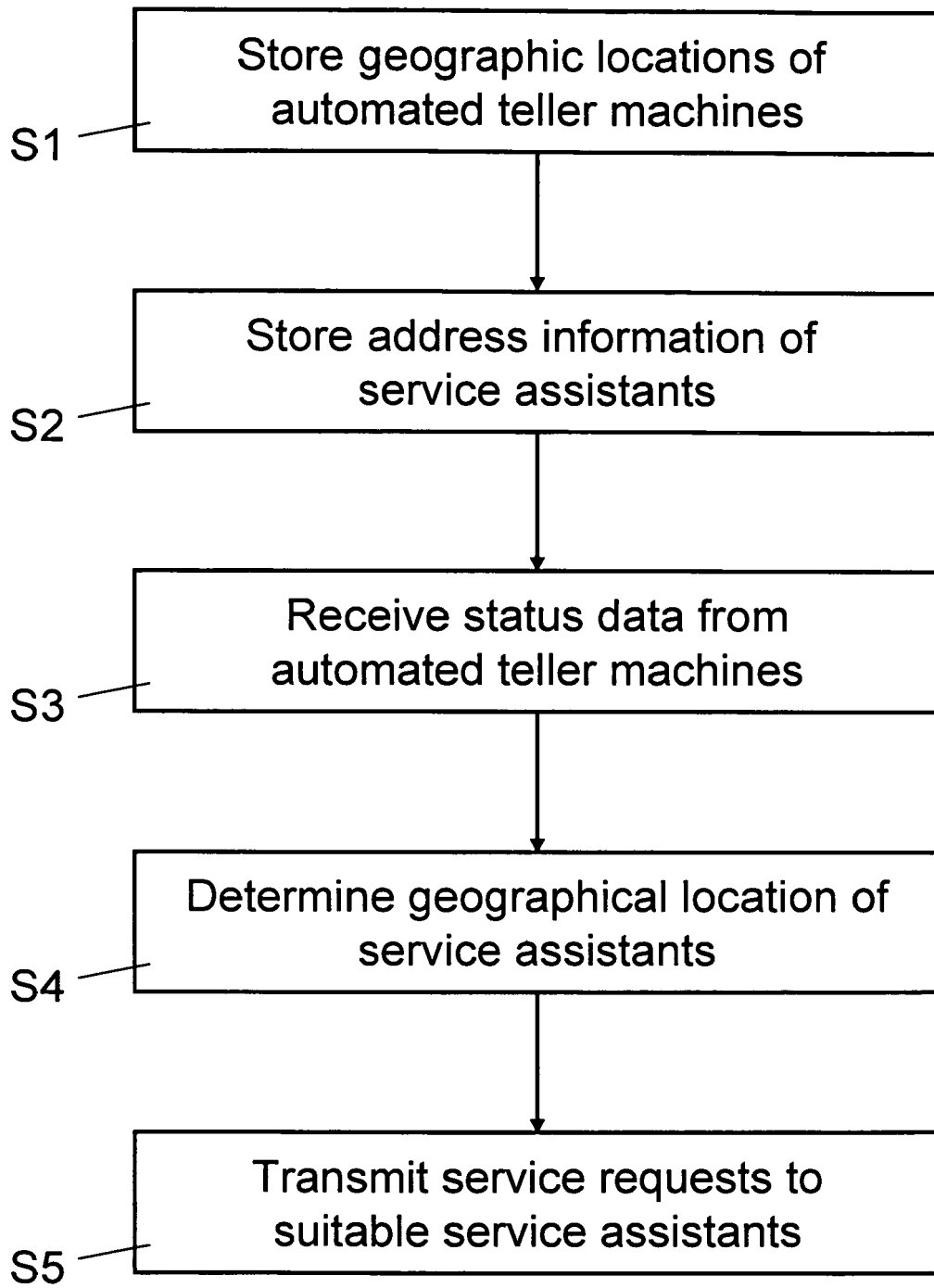
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Fig. 1

Store geographic locations of
automated teller machines

S1

Store address information of
service assistants

S2

Receive status data from
automated teller machines

S3

Determine geographical location of
service assistants

S4

Transmit service requests to
suitable service assistants

S5

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number

EP 12 00 7640

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G07D

The present search report has been drawn up for all claims

1

Place of search	Date of completion of the search	Examiner
The Hague	2 May 2013	Van Dop, Erik

EPO FORM 1503 03.82 (P04C01)

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