【DESCRIPTION】

【Invention Title】

SYSTEM AND METHOD FOR MANAGING EXPENSE PROCESSING DATA BASED ON BLOCKCHAIN AND COMPUTER PROGRAM FOR THE SAME

【Technical Field】

Embodiments relate to a system and method for managing expense processing data based on blockchain and a computer program for the same, and more particularly, to technology that divides key information in expense processing data into data segments and stores the same on a blockchain network in a distributed manner, and allows a user to download the expense processing data from the blockchain network when the user requests the expense processing data, thereby reducing loads and costs taken to ensure security when providing the expense processing data to the user.

【Background Art】

Companies require employees to submit expense statements to expense managers of the companies together with documentary evidence for expenses paid using corporate cards, personal cards or cashes, and reimburse the expenses after approval. In general, this expense processing is manually performed by gluing a paper receipt to a printed paper document, and after approval of the expense statement is completed, the approved expense statement is filed and kept in a warehouse, or is scanned to create an image and stored in a server. However, the real receipt is inconvenient to store, and the scanned image is not acknowledged as documentary evidence.

As a conventional method to solve this problem, Korean Patent No. 10-1854393 discloses a technology where expense processing is performed by receiving payment details of a personal card from a company's management server and approving the expenses. However, the conventional method disclosed by the Korean Patent No. 10-1854393 is

inconvenient because large amounts of frequently generated card transaction information and expense processing information should be stored and kept in the intra-office system.

Particularly, the card transaction information and the expense processing information include a personal identification number and financial information, for example, a card number and a validity period, and to share this information between systems, data specialized transmission through an agent system or Application Programming Interface (API) is used. In this instance, to prevent the personal information and the financial information from leaking, network security technology, for example, Secure Socket Layer (SSL), Virtual Private Network (VPN) and a leased line is used and multi-security technology, for example, encoding a specific field of data is applied, which increases the costs for data transmission and acts as a factor that reduces the transmission speed.

【Disclosure】

【Technical Problem】

According to an aspect of the present disclosure, there is provided a system and method for managing expense processing data based on blockchain that divides key information in expense processing data into data segments and stores the same on a blockchain network in a distributed manner, and allows a user to download at least part of the data from the blockchain network when the user needs the data, thereby reducing hardware for ensuring security when transmitting the expense processing information and consequential service loads, preventing the counterfeit and falsification of the expense processing information, and separating and transmitting information efficiently and safely at a low cost, and a computer program for the same.

【Technical Solution】

According to an aspect of the present invention, a system for managing expense processing data based on blockchain comprises: a transmitting/receiving unit configured to

receive expense processing information including card transaction information and expense evidence information from a user device of an expense user or an external server; a hash extraction unit configured to generate a hash value corresponding to the expense processing information; a data processing unit configured to divide the card transaction information into financial information, personal identification information and general transaction information, and divide the financial information and the personal identification information into a plurality of segment data; a transmission unit configured to upload the plurality of segment data and the hash value onto a blockchain network; and a storage unit configured to store the general transaction information and the expense evidence information.

In an embodiment, the data processing unit is further configured to provide the user device with identification information of the plurality of segment data on the blockchain network, and the general transaction information and the expense evidence information corresponding to the plurality of segment data, stored in the storage unit, when it is necessary to reconstruct the pre-stored expense processing information.

In an embodiment, the system for managing expense processing data based on blockchain further comprises: a verification unit configured to verify the financial information and the personal identification information of the reconstructed expense processing information by comparing the hash value corresponding to the reconstructed expense processing information with the hash value shared on the blockchain network.

In an embodiment, the data processing unit is further configured to divide the financial information into a plurality of first segment data, and the transmission unit is further configured to store each of the plurality of first segment data in different blocks on the blockchain network.

In an embodiment, the data processing unit is further configured to divide the personal identification information into a plurality of second segment data, and the

transmission unit is further configured to store each of the plurality of second segment data in different blocks on the blockchain network.

In an embodiment, the data processing unit is further configured to examine if the financial information and the personal identification information are pre-stored in the storage unit or the blockchain network, before dividing the financial information and the personal identification information into a plurality of segment data.

In an embodiment, the data processing unit is further configured to match the general transaction information and the expense evidence information with the pre-stored financial information and personal identification information and store them in the storage unit, when the financial information and the personal identification information is pre-stored.

In an embodiment, the data processing unit is further configured to encode the plurality of segment data, and the transmission unit is further configured to upload the plurality of encoded segment data and the hash value onto the blockchain network.

According to another aspect of the present invention, a method for managing expense processing data based on blockchain comprises: receiving, by a system for managing expense processing data, expense processing information including card transaction information and expense evidence information from a user device of an expense user or an external server; dividing, by the system for managing expense processing data, the card transaction information into financial information, personal identification information and general transaction information; generating, by the system for managing expense processing data, a hash value corresponding to the expense processing information; dividing, by the system for managing expense processing data, the financial information and the personal identification information into a plurality of segment data; uploading, by the system for managing expense processing data, the plurality of segment data and the hash value onto a blockchain network; and storing, by the system for managing expense processing data, the general transaction

information and the expense evidence information in the system for managing expense processing data.

In an embodiment, the method for managing expense processing data based on blockchain further comprises: providing, by the system for managing expense processing data, the user device with identification information of the plurality of segment data on the blockchain network, and the general transaction information and the expense evidence information corresponding to the plurality of segment data, stored in the system for managing expense processing data, when it is necessary to reconstruct the pre-stored expense processing information.

In an embodiment, the method for managing expense processing data based on blockchain further comprises: verifying, by the system for managing expense processing data, the financial information and the personal identification information of the reconstructed expense processing information by comparing the hash value corresponding to the reconstructed expense processing information with the hash value shared on the blockchain network.

In an embodiment, the dividing into the plurality of segment data comprises dividing, by the system for managing expense processing data, the financial information into a plurality of first segment data, and the uploading onto the blockchain network comprises storing each of the plurality of first segment data in different blocks on the blockchain network.

In an embodiment, the dividing into the plurality of segment data comprises dividing, by the system for managing expense processing data, the personal identification information into a plurality of second segment data, and the uploading onto the blockchain network comprises storing each of the plurality of second segment data in different blocks on the blockchain network.

In an embodiment, the method for managing expense processing data based on

blockchain further comprises: before the dividing into the plurality of segment data, examining, by the system for managing expense processing data, if the financial information and the personal identification information are pre-stored in the system for managing expense processing data or the blockchain network.

In an embodiment, the method for managing expense processing data based on blockchain further comprises: matching, by the system for managing expense processing data, the general transaction information and the expense evidence information with the pre-stored financial information and personal identification information and storing them in the system for managing expense processing data, when the financial information and the personal identification information are pre-stored.

In an embodiment, the method for managing expense processing data based on blockchain further comprises: encoding, by the system for managing expense processing data, the plurality of segment data, wherein the uploading onto the blockchain network comprises uploading, by the system for managing expense processing data, the plurality of encoded segment data and the hash value onto the blockchain network.

According to another aspect of the present invention, a computer program is stored in a computer-readable medium to perform the method for managing expense processing data based on blockchain according to the aforementioned embodiments, in combination with hardware.

【Advantageous Effects】

According to the system and method for managing expense processing data based on blockchain according to an aspect of the present disclosure, key information of expense processing data may be divided into data segments, and the data segments may be stored on the blockchain network in a distributed manner. Additionally, when a user requests the expense processing data, the user may be allowed to download the information stored on the

blockchain network in a distributed manner from the blockchain network.

Conventionally, when transmitting expense processing data including susceptible personal information to a user, hardware such multi-encoding and decoding, Virtual Private Network (VPN) and a leased line, and consequential service loads have been involved. However, using the system and method for managing expense processing data based on blockchain according to an aspect of the present disclosure, the user is allowed to download some of expense processing data from the blockchain network, thereby preventing the counterfeit and falsification of key information of the expense processing data and separating and transmitting information efficiently and safety at a low cost.

【Description of Drawings】

FIG. 1 is a schematic block diagram of a system for managing expense processing data based on blockchain according to an embodiment.

FIG. 2 is a flowchart of a method for managing expense processing data based on blockchain according to an embodiment.

FIGS. 3a to 3f are conceptual diagrams showing a data processing process by a method for managing expense processing data based on blockchain according to an embodiment.

FIG. 4 is a flowchart of a method for managing expense processing data based on blockchain according to another embodiment.

【Mode for Invention】

Hereinafter, the embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

FIG. 1 is a schematic block diagram of a system for managing expense processing data based on blockchain according to an embodiment.

Referring to FIG. 1, the system 3 for managing expense processing data according to

this embodiment is configured to operate in communication with a first user device 1 of an expense user and a second user device 2 of an expense processing clerk of a company. Additionally, the system 3 for managing expense processing data operates in communication with a blockchain network 4 that works using a plurality of nodes 41-46. Further, the system 3 for managing expense processing data may operate in communication with at least one external server 6, for example, a financial institute server.

This communication process is performed via a wired and/or wireless network. The communication method via the wired and/or wireless network may include all communication methods that enable networking between objects, and for example, includes, but is not limited to, wired communication, wireless communication, 3G, 4G, or other methods. For example, the wired and/or wireless network may include, but is not limited to, a communication network by at least one communication method selected from the group consisting of Local Area Network (LAN), Metropolitan Area Network (MAN), Global System for Mobile Network (GSM), Enhanced Data GSM Environment (EDGE), High Speed Downlink Packet Access (HSDPA), Wideband Code Division Multiple Access (W-CDMA), Code Division Multiple Access (CDMA), Time Division Multiple Access (TDMA), Bluetooth, Zigbee, Wi-Fi, Voice over Internet Protocol (VoIP), LTE Advanced, IEEE802.16m, WirelessMAN-Advanced, HSPA+, 3GPP Long Term Evolution (LTE), Mobile WiMAX (IEEE 802.16e), UMB (formerly EV-DO Rev. C), Flash-OFDM, iBurst and MBWA (IEEE 802.20) systems, HIPERMAN, Beam-Division Multiple Access (BDMA), World Interoperability for Microwave Access (Wi-MAX) and communication using ultrasonic waves.

The system, the user device and the server according to embodiments may have aspects of entirely hardware, or partly hardware and partly software. For example, the user devices 1, 2, the system 3 for managing expense processing data and the external server 6 and each unit included in them may refer collectively to hardware for processing data of a specific

format and content and/or transmitting and receiving the data via electronic communication and its related software. The term "unit", "module", "device", "terminal", "server" or "system" as used herein is intended to indicate a combination of hardware and software that runs by the corresponding hardware. For example, the hardware may be a data processing device including a CPU or other processor. Additionally, the software that runs by the hardware may refer to a process being executed, an object, an executable, a thread of execution and a program.

Each element of the system 3 for managing expense processing data according to this embodiment is not necessarily intended to indicate physically separable respective devices. That is, a transmitting/receiving unit 31, a hash extraction unit 32, a data processing unit 33, a transmission unit 34, a storage unit 35 and a verification unit 36 of FIG. 1 are just functionally distinguished according to the operation performed by hardware that constitutes the system 3 for managing expense processing data, and each unit is not necessarily provided independently from one another. Of course, according to embodiments, at least one of the transmitting/receiving unit 31, the hash extraction unit 32, the data processing unit 33, the transmission unit 34, the storage unit 35 and the verification unit 36 may be implemented as a separate device that can be physically distinguished from one another.

The first user device 1 is a device used by an expense user. The expense user as used herein refers to an employee of a company, who uses a corporate joint card, a corporate individual card, a personal card, a welfare card, an overseas card or cash to pay business expenses and needs to submit a receipt as evidence. In this instance, the receipt as used herein refers to a real paper receipt, for example, a credit card receipt, a debit card receipt, a cash receipt and a simplified tax receipt, and may be any type of receipt defined as evidence for expenses in the law, and is not limited to a particular type.

Further, the second user device 2 is a device used by an expense manager. The

expense manager as used herein is an employee who is primarily responsible for expense processing in the company, and refers to an employee in charge who has responsibility for expense processing by approving or rejecting reimbursement requests with attached receipts submitted by other employees.

The expense user may submit a receipt image for expense processing and conduct a proof result search by communication with the system 3 for managing expense processing data using the first user device 1. Additionally, the expense manager may check expense processing information stored on the blockchain network 4 and in the system 3 for managing expense processing data by communication with the system 3 for managing expense processing data using the second user device 2, and approve or reject an imbursement request from an employee.

In an embodiment, the system 3 for managing expense processing data acts, at least in part, as an application server that enables an application (or app) running on the user device 1, 2 to perform the function by communication with the application. And/or, the system 3 for managing expense processing data may act, at least in part, as a web server that provides a predetermined web page accessible via a web browser running on the user device 1, 2.

In FIG. 1, each of the first and second user devices 1, 2 is shown in the form of a notebook computer. However, this is provided for illustration only, and does not limit the type of the first and second user devices 1, 2, and the first and second user devices 1, 2 may be implemented in the form of any computing device, for example, a mobile communication terminal such as a smartphone, a personal computer, a personal digital assistant (PDA), a tablet and a set-top box for Internet Protocol Television (IPTV).

For example, the first and second user devices 1, 2 may refer to an Enterprise Resource Planning (ERP) system of the company to which the expense user and the expense manager belong.

The external server 6 refers to a financial institute server that communicates with the system 3 for managing expense processing data. For example, the financial institute as described herein may include, but is not limited to, a card company, a bank, a national tax organization and an electronic receipt company. Additionally, although the external server 6 is shown as one device in the drawing for convenience of description, the external server 6 may refer collectively to a plurality of different institutes.

The blockchain network 4 includes the plurality of nodes 41-46 participating in it. The blockchain refers to a chain of blocks containing information, in which information is stored in each node 41-46, not a central management server, in a Peer-to-Peer (P2P) network distributed environment and is cooperatively managed to ensure security. The basic structure of information shared on the blockchain is in the form of a collection of blocks chained in succession, and after checking and approving transaction details by exchange between more than half of participants for a predetermined period of time, only financial transactions agreed by electronic signature are generated into one block. Then, the newly generated block is connected to the previous blockchain, and its copy is stored in each node 41-46 in a distributed manner.

In embodiments of the present disclosure, the blockchain network 4 may be implemented with the nodes 41-46 as participants, and each of the plurality of nodes 41-46 may store a hash value of a file for the expense processing information and a file corresponding to segment data of key information of the expense processing information. In this instance, the file corresponding to the segment data may be a document file requiring security, but is not limited thereto, and may be implemented in various forms, for example, an image file, a video file, etc. The hash value stored in each of the plurality of nodes 41-46 may be always maintained at a latest version and shared on the blockchain network 4, and each block of blockchain type information may be stored in at least one of the plurality of

nodes 41-46.

Although FIG. 1 shows each of the plurality of nodes 41-46 in the form of a server, each of the plurality of nodes 41-46 may include all types of computing devices that can be connected to the external server via a wireless communication network such as a mobile communication terminal including a smartphone, PDA, a tablet PC, a desktop PC and a set-top box for IPTV. Additionally, although FIG. 1 shows the blockchain network 4 including six nodes 41-46, it will be easily understood that the number of nodes participating in the blockchain network 4 may be larger or smaller.

In an embodiment, the system 3 for managing expense processing data includes the transmitting/receiving unit 31, the hash extraction unit 32, the data processing unit 33, the transmission unit 34 and the storage unit 35.

The transmitting/receiving unit 31 receives expense processing information including card transaction information and expense evidence information from the first user device 1 of the expense user or the external server such as the card company server 6, and enables other parts of the system 3 for managing expense processing data to process the expense processing information. In an embodiment, the transmitting/receiving unit 31 stores authentication information (for example, card information, a digital certificate, a password, etc.) corresponding to the expense user to receive the expense processing information from the card company server 6. However, in another embodiment, the first user device 1 may perform an authentication process for receiving the expense processing information, and the transmitting/receiving unit 31 may receive only the expense processing information from the first user device 1 without storing separate authentication information.

Additionally, the transmitting/receiving unit 31 may receive a request for checking pre-stored expense processing information from the second user device 2 of the expense manager. In another embodiment, the transmitting/receiving unit 31 may receive a request

for checking pre-stored expense processing information from the first user device 1 of the expense user. For example, the first and second user devices 1, 2 that want to check the expense processing information may be an ERP system of the corresponding company, but are not limited thereto.

The hash extraction unit 32 is configured to generate a hash value corresponding to the expense processing information received by the transmitting/receiving unit 31. The hash value is generated corresponding to original expense processing information, and with even a slight change in the original information, the hash value changes, but it is impossible to track the original information from the hash value, and in embodiments, matching the expense processing information and checking if the expense processing information is true may be performed using the hash value.

The data processing unit 33 is configured to divide the card transaction information into financial information, personal identification information and general transaction information. Additionally, the data processing unit 33 is configured to divide the financial information and the personal identification information into a plurality of segment data. For example, the data processing unit 33 may divide the financial information into a plurality of first segment data and the personal identification information into a plurality of second segment data.

The transmission unit 34 is configured to upload the plurality of segment data generated from the financial information and the personal identification information and the hash value onto the blockchain network 4. In this instance, the transmission unit 34 may store each of the plurality of first segment data of the financial information in different blocks of the blockchain. Additionally, the transmission unit 34 may store each of the plurality of second segment data of the personal identification information in different blocks of the blockchain.

The storage unit 35 is configured to store the expense processing information. For example, the storage unit 35 acts as a cloud storage that accesses the first user device 1 of the expense user and/or the second user device 2 of the expense manager and downloads necessary data. In this instance, the storage unit 35 may provide the first user device 1 and/or the second user device 2 with only general transaction information and expense evidence information except information that the user can obtain from the blockchain network 4 among information stored in the storage unit 35.

The time point at which the financial information and the personal identification information is uploaded onto the blockchain network 4 by the hash extraction unit 32, the data processing unit 33 and the transmission unit 34 may be different according to embodiments. For example, data may be divided and uploaded onto the blockchain network 4 as soon as the expense processing information is received by the system 3 for managing expense processing data, or all information may be stored in the storage unit 35 at the time point when the expense processing information is received by the system 3 for managing expense processing data, and afterward, the financial information and the personal identification information may be uploaded onto the blockchain network 4 when a request for the expense processing information is received from the first user device 1 and/or the second user device 2.

In an embodiment, when there is a request for checking pre-stored expense processing information, the data processing unit 33 may reconstruct the expense processing information using data extracted from the blockchain network 4 and data extracted from the storage unit 35. In an embodiment, the information uploaded onto the blockchain network 4 may be encoded before uploading, and the data processing unit 33 may decode the encoded information when reconstructing the expense processing information. However, in another embodiment, reconstruction of the expense processing information and/or decoding of the encoded information as described above may be performed by the first user device 1 and/or

the second user device 2.

In an embodiment, the system 3 for managing expense processing data further includes the verification unit 36. The verification unit 36 is configured to verify if the reconstructed expense processing information is true by comparing the hash value corresponding to the reconstructed expense processing information with the hash value shared on the blockchain network 4. In another embodiment, the above-described verification process of expense processing information may be performed by the first user device 1 and/or the second user device 2.

Additionally, in an embodiment, the verification unit 36 may verify the expense processing information by examining if transaction information of the expense processing information submitted by the expense user is found identical from a card company through communication with the financial institute server 6, for example, the card company, before storing the transaction information of the expense processing information in the storage unit 35. The above-described verification process may be used when the expense user claims imbursement for expenses paid with a corporate card, and to perform the above-described verification, the verification unit 36 may store authentication information for obtaining the payment details of the corporate card from the financial institute server 6.

Additionally, in an embodiment, the data processing unit 33 may examine if the financial information and the personal identification information are already uploaded onto the blockchain network, before dividing the financial information and the personal identification information of the expense processing information into a plurality of segment data. If the expense processing information is submitted by the same employee, even though there is a change in payment or transaction details of the card, the personal identification information and the financial information may be the same, and thus, instead of redundantly storing the same information in the blockchain network 4, the data processing

unit 33 may match the general transaction information and the expense evidence information extracted from the corresponding expense processing information with the financial information and the personal identification information already uploaded onto the blockchain network 4 and store them.

FIG. 2 is a flowchart of a method for managing expense processing data based on blockchain according to an embodiment. Further, FIGS. 3a to 3f are conceptual diagrams showing a data processing process by the method for managing expense processing data based on blockchain according to an embodiment. For convenience of description, the method for managing expense processing data based on blockchain according to this embodiment will be described with reference to FIGS. 1 to 3f.

First, the transmitting/receiving unit 31 of the system 3 for managing expense processing data may receive expense processing information 300 including card transaction information and expense evidence information from the first user device 1 as shown in FIG. 3a (S11). The card transaction information refers to card transaction details corresponding to expenses for which the expense user or an employee claims imbursement. Additionally, the expense evidence information is a detailed proof of payment inputted by the expense user to claim imbursement for the corresponding expenses, and may include the reason for the expenses, an account code, and a scanned file of an expense receipt.

Subsequently, the data processing unit 33 may divide the card transaction information 301 of the expense processing information 300 into financial information 311, personal identification information 312 and general transaction information 313 as shown in FIG. 3b (S12). In the divided information, the financial information may include a card number and a validity period, and the personal identification information may information for identifying the expense user, for example, a name, an ID, a residential registration number, a mobile phone number and an e-mail address. Further, the general transaction information may

include a transaction date, a transaction amount, a merchant code, and general information related to a merchant (a merchant name, a taxation type, etc.) in connection with card payment for which the expense user claims imbursement.

Subsequently, the data processing unit 33 may check if the financial information and the personal identification information divided from the expense processing information is pre-stored (S13). For example, the data processing unit 33 may check if the financial information and the personal identification information are pre-stored by searching information stored in the storage unit 35. Alternatively, the data processing unit 33 may check if the financial information and the personal identification information are pre-stored by checking a distributed ledger on the blockchain network 4.

As a result of checking, when the financial information and the personal identification information are pre-stored, the data processing unit 33 may match the general transaction information and the expense evidence information in the expense processing information with the pre-stored financial information and personal identification information and store them in the storage unit 35 of the system 3 for managing expense processing data (S19).

On the contrary, as a result of checking, when the financial information and the personal identification information are not pre-stored, this means that new expense processing information is received, and the data processing unit 33 stores new information in the storage unit 35 and publishes the financial information and the personal identification information of the expense processing information on the blockchain network 4.

The time point of publishing the financial information and the personal identification information on the blockchain network 4 may differ depending on the operator of the system 3 for managing expense processing data or the policy of the corresponding company. For example, the company may desire to receive a receipt at the same time as electronic payment, and in this case, the system 3 for managing expense processing data may divide and publish

data on the blockchain network 4 immediately when the expense processing information is found as new data. However, in another embodiment, the system 3 for managing expense processing data may divide and publish data on the blockchain network 4 at a later time point set according to a preset schedule or a request of the company.

Describing the publishing process in detail, first, the hash extraction unit 32 may generate a hash value corresponding to the received expense processing information 300 (S14). The hash value may be generated using the entire expense processing information 300, or may be generated using data of a predefined specific field in the expense processing information 300. As a result, the expense processing information may be reconstructed as information including the financial information 311, the personal identification information 312, the general transaction information 313, the expense evidence information 302 and the hash value 303 as shown in FIG. 3c.

Subsequently, the data processing unit 33 may divide each of the financial information 311 and the personal identification information 312 divided from the expense processing information 300 into a plurality of segment data (S15). For example, as shown in FIG. 3d, the financial information 311 may be divided into three first segment data FI, and the personal identification information 312 may be divided into three second segment data PI. In this instance, #1 first segment data FI#1 may include the first and fourth four-digit numbers of the card number composed of four four-digit numbers, #2 first segment data FI#2 may include the second and third four-digit numbers, and #3 first segment data FI#3 may include the validity period. Additionally, #1 second segment data PI#1 may include the residential registration number of the expense user, #2 second segment data PI#2 may include the mobile phone number of the expense user, and #3 second segment data PI#3 may include the e-mail address of the expense user.

However, the type of the first segment data and the second segment data described

above is for illustration only, and the number of segment data of the financial information 311 and the personal identification information 312 or the type of data included in each segment data may be different from those shown herein.

Further, as shown in FIG. 3e, the data processing unit 33 may combine each of the plurality of first segment data FI with the hash value 303 to generate a plurality of first data blocks 401-403, and combine each of the plurality of second segment data PI with the hash value 303 to generate a plurality of second data blocks 501-503. In an embodiment, the data processing unit 33 may encode each segment data FI, PI before generating into the data blocks 401-403, 501-503, and/or may encode each generated data block 401-403, 501-503 (S16). In encoding, the personal identification information of the expense user or identification information of an institute that will perform expense processing may be used as a key.

Subsequently, the transmission unit 34 may upload each generated data block 401-403, 501-503 onto the blockchain network 4 (S17). The blocks shared on the blockchain network 4 are all linked in a chain, and each newly generated block includes hash values of all blocks generated immediately before and linked in a chain and data of blocks to be newly generated. The nodes 41-46 propagate a newly generated block from a certain node to neighboring nodes, and the neighboring nodes verify if the propagated block is agreed by the consensus algorithm of blockchain, and in this way, they participate in chain generation and share a new block.

Using the above-described feature of the blockchain, the transmission unit 34 transmits each data block 401-403, 501-503 generated from the expense processing information to any one of the nodes 41-46 that form the blockchain network 4, so the data blocks 401-403, 501-503 are included in a newly generated block of the blockchain and stored in at least one node 41-46 on the blockchain network 4. In this instance, the

transmission unit generates the first data blocks 401-403 shown in FIG. 3E into each block and publishes the same over the blockchain network 4. Additionally, the transmission unit 34 generates the second data blocks 501-503 into each block and publishes the same over the blockchain network 4.

The data blocks 401-403, 501-503 included in the block are shared and stored on the blockchain network 4 in a distributed manner such that they are stored in at least one node 41-46 of the blockchain network 4, thereby ensuring data integrity and reducing the burden of completely storing large amounts of frequently generated expense processing information in the intra-office system.

Subsequently, as shown in FIG. 3f, the general transaction information 313 and the expense evidence information 302 except the information uploaded onto the blockchain network 4 in the expense processing information 300 may be stored in the storage unit 35 of the system 3 for managing expense processing data together with the hash value 303 of the expense processing information (S18). Additionally, in the above-described step, the financial information 311 and the personal identification information 312 may be stored together in the storage unit 35. Although FIG. 2 shows the data uploading process (S14 to S17) on the blockchain network 4 is performed earlier than the storage process (S18) in the storage unit 35, this is provided for illustration only, and in another embodiment, the expense processing information may be stored in the storage unit 35 first, and then data publishing on the blockchain network 4 may be performed.

FIG. 4 is a flowchart of a method for managing expense processing data based on blockchain according to another embodiment. FIG. 4 shows a process in which the expense user or the expense manager of the company checks expense processing information by reconstructing information stored in a distributed manner when the expense processing information is pre-stored in the blockchain network and the system for managing expense

processing data.

Referring to FIGS. 1 and 4, the transmitting/receiving unit 31 of the system 3 for managing expense processing data may receive a request for checking pre-stored expense processing information from the first user device 1 of the expense user or the second user device 2 of the expense manager (S21). Although FIG. 4 shows that the request for checking is received from the second user device 2, this is for illustration only, and the request for checking expense processing information may be received from the first user device 1. Further, in another embodiment, the system 3 for managing expense processing data may provide the first user device 1 and/or the second user device 2 with information necessary to reconstruct expense processing information without a separate request from the corresponding company, and in this case, the step S21 may be omitted.

Subsequently, the data processing unit 33 may provide the first user device 1 and/or the second user device 2 with identification information for downloading financial information and personal identification information of the expense user corresponding to the expense processing information requested for checking from the blockchain network 4 (S22). For example, the identification information for downloading financial information and personal identification information from the blockchain network 4 may be information of a data block in which the corresponding information is recorded or a hash value included in the corresponding data block.

Additionally, the data processing unit 33 may extract general transaction information and expense evidence information corresponding to financial information and personal identification information to reconstruct from the storage unit 35 of the system 3 for managing expense processing data, and provide the extracted information to the first user device 1 and/or the second user device 2 (S23). That is, the general transaction information and the expense evidence information having a lower need for security in the expense

processing information is directly transmitted from the storage unit 35 of the system 3 for managing expense processing data to the first user device 1 and/or the second user device 2.

The first user device 1 or the second user device 2 may reconstruct the expense processing information based on the information received from the data processing unit 33. That is, the first user device 1 or the second user device 2 may obtain financial information and personal identification information from data blocks extracted from the blockchain network 4 (S24), and combine the same with the general transaction information and the expense evidence information received by the data processing unit 33 to reconstruct the expense processing information (S26). Because the data blocks extracted from the blockchain network 4 are verified by the consensus algorithm on the blockchain network 4, the first user device 1 or the second user device 2 may receive the verified data blocks, identify data blocks corresponding to the same expense processing information using the hash value, and combine them into one expense processing information.

In an embodiment, when the data extracted from the blockchain network 4 is encoded, the first user device 1 or the second user device 2 may decode the encoded data (S25). In an embodiment, a process of decoding the encoded data by the first user device 1 or the second user device 2 involves communication between the first user device 1 or the second user device 2 and the data processing unit 33 at least in part, and the first user device 1 or the second user device 2 may decode the encoded data using a key value received from the data processing unit 33.

Additionally, in an embodiment, the verification unit 36 may verify if the reconstructed expense processing information is true (S27). For example, the verification unit 36 may check if the financial information and the personal identification information received in the form of segment data is true, by receiving segment data from any one of the plurality of nodes 41-46 defining the blockchain network 4, extracting a hash value therefrom,

and comparing it with the hash value shared on the blockchain network 4. Additionally, the verification unit 36 may check if the financial information and the personal identification information are true, by extracting a hash value from the expense processing information reconstructed by the data processing unit 33 again, and checking if the re-extracted hash value is identical to the hash value shared on the blockchain network 4.

According to the system and method for managing expense processing data based on blockchain according to embodiments of the present disclosure as described above, in transmitting expense processing data including susceptible personal information to the user, data is separated and transmitted through the blockchain network 4. Accordingly, it is possible to eliminate the need for hardware such as multi-encoding and decoding, Virtual Private Network (VPN) and a leased line to protect information from counterfeit and falsification or interception, and avoid consequential service loads, thereby separating and transmitting information efficiently and safely at a low cost.

The operation by the method for managing expense processing data based on blockchain according to embodiments as described above may be implemented, at least in part, as a computer program and recorded in a computer-readable recording medium. The computer-readable recording medium having recorded thereon the program for performing the operation by the method for managing expense processing data based on blockchain according to embodiments includes all types of recording devices in which computer-readable data is stored. Examples of the computer-readable recording medium include ROM, RAM, CD-ROM, magnetic tape, floppy disk, and an optical data storage device. Additionally, the computer-readable recording medium is distributed over computer systems connected via a network, and may store and execute the computer-readable codes in a distributed manner. Additionally, functional programs, codes and code segments for realizing this embodiment will be easily understood by persons having ordinary skill in the technical field to which this

embodiment belongs.

While the present disclosure has been hereinabove described with reference to the embodiments shown in the drawings, this is provided for illustration purposes only and it will be appreciated by those having ordinary skill in the art that various modifications and variations may be made thereto. However, it should be noted that such modifications fall within the technical protection scope of the present disclosure. Therefore, the true technical protection scope of the present disclosure should be defined by the technical spirit of the appended claims.

【CLAIMS】

【Claim 1】

A system for managing expense processing data based on blockchain, comprising:

a transmitting/receiving unit configured to receive expense processing information including card transaction information and expense evidence information from a user device of an expense user or an external server;

a hash extraction unit configured to generate a hash value corresponding to the expense processing information;

a data processing unit configured to divide the card transaction information into financial information, personal identification information and general transaction information, and divide the financial information and the personal identification information into a plurality of segment data;

a transmission unit configured to upload the plurality of segment data and the hash value onto a blockchain network; and

a storage unit configured to store the general transaction information and the expense evidence information.

【Claim 2】

The system for managing expense processing data based on blockchain according to claim 1, wherein the data processing unit is further configured to provide the user device with identification information of the plurality of segment data on the blockchain network, and the general transaction information and the expense evidence information corresponding to the plurality of segment data, stored in the storage unit, when it is necessary to reconstruct the pre-stored expense processing information.

【Claim 3】

The system for managing expense processing data based on blockchain according to claim 2, further comprising:

a verification unit configured to verify the financial information and the personal identification information of the reconstructed expense processing information by comparing the hash value corresponding to the reconstructed expense processing information with the hash value shared on the blockchain network.

【Claim 4】

The system for managing expense processing data based on blockchain according to claim 1, wherein the data processing unit is further configured to divide the financial information into a plurality of first segment data, and

the transmission unit is further configured to store each of the plurality of first segment data in different blocks on the blockchain network.

【Claim 5】

The system for managing expense processing data based on blockchain according to claim 1, wherein the data processing unit is further configured to divide the personal identification information into a plurality of second segment data, and

the transmission unit is further configured to store each of the plurality of second segment data in different blocks on the blockchain network.

【Claim 6】

The system for managing expense processing data based on blockchain according to claim 1, wherein the data processing unit is further configured to examine if the financial

information and the personal identification information are pre-stored in the storage unit or the blockchain network, before dividing the financial information and the personal identification information into a plurality of segment data.

【Claim 7】

The system for managing expense processing data based on blockchain according to claim 6, wherein the data processing unit is further configured to match the general transaction information and the expense evidence information with the pre-stored financial information and personal identification information and store them in the storage unit, when the financial information and the personal identification information is pre-stored.

【Claim 8】

The system for managing expense processing data based on blockchain according to claim 1, wherein the data processing unit is further configured to encode the plurality of segment data, and

the transmission unit is further configured to upload the plurality of encoded segment data and the hash value onto the blockchain network.

【Claim 9】

A method for managing expense processing data based on blockchain, comprising:

receiving, by a system for managing expense processing data, expense processing information including card transaction information and expense evidence information from a user device of an expense user or an external server;

dividing, by the system for managing expense processing data, the card transaction information into financial information, personal identification information and general

transaction information;

generating, by the system for managing expense processing data, a hash value corresponding to the expense processing information;

dividing, by the system for managing expense processing data, the financial information and the personal identification information into a plurality of segment data;

uploading, by the system for managing expense processing data, the plurality of segment data and the hash value onto a blockchain network; and

storing, by the system for managing expense processing data, the general transaction information and the expense evidence information in the system for managing expense processing data.

【Claim 10】

The method for managing expense processing data based on blockchain according to claim 9, further comprising:

providing, by the system for managing expense processing data, the user device with identification information of the plurality of segment data on the blockchain network, and the general transaction information and the expense evidence information corresponding to the plurality of segment data, stored in the system for managing expense processing data, when it is necessary to reconstruct the pre-stored expense processing information.

【Claim 11】

The method for managing expense processing data based on blockchain according to claim 10, further comprising:

verifying, by the system for managing expense processing data, the financial information and the personal identification information of the reconstructed expense

processing information by comparing the hash value corresponding to the reconstructed expense processing information with the hash value shared on the blockchain network.

【Claim 12】

The method for managing expense processing data based on blockchain according to claim 9, wherein the dividing into the plurality of segment data comprises dividing, by the system for managing expense processing data, the financial information into a plurality of first segment data, and

the uploading onto the blockchain network comprises storing each of the plurality of first segment data in different blocks on the blockchain network.

【Claim 13】

The method for managing expense processing data based on blockchain according to claim 9, wherein the dividing into the plurality of segment data comprises dividing, by the system for managing expense processing data, the personal identification information into a plurality of second segment data, and

the uploading onto the blockchain network comprises storing each of the plurality of second segment data in different blocks on the blockchain network.

【Claim 14】

The method for managing expense processing data based on blockchain according to claim 9, further comprising:

before the dividing into the plurality of segment data, examining, by the system for managing expense processing data, if the financial information and the personal identification information are pre-stored in the system for managing expense processing data or the

blockchain network.

【Claim 15】

The method for managing expense processing data based on blockchain according to claim 14, further comprising:

matching, by the system for managing expense processing data, the general transaction information and the expense evidence information with the pre-stored financial information and personal identification information and storing them in the system for managing expense processing data, when the financial information and the personal identification information are pre-stored.

【Claim 16】

The method for managing expense processing data based on blockchain according to claim 9, further comprising:

encoding, by the system for managing expense processing data, the plurality of segment data,

wherein the uploading onto the blockchain network comprises uploading, by the system for managing expense processing data, the plurality of encoded segment data and the hash value onto the blockchain network.

【Claim 17】

A computer program stored in a computer-readable medium to perform the method for managing expense processing data based on blockchain according to any one of claims 9 to 16, in combination with hardware.