

DESCRIPTION

Title of Invention: INFORMATION PROCESSING DEVICE, MANUAL EVALUATION SYSTEM, AND MANUAL EVALUATION METHOD

Technical Field

[0001]

The present invention relates to a technique for determining appropriateness of a description referred to by a user. In particular, the invention relates to a system that supports an improvement task of a manual mainly referred to by a general user, such as a furniture assembly manual, by executing analysis processing based on history data of the user referring to the manual from a terminal.

Background Art

[0002]

As a technique for evaluating appropriateness of a description related to a model work for a worker based on information collected from work behavior performed by the worker, techniques described in PTL 1 and PTL 2 are found.

[0003]

PTL 1 describes a technique of determining whether a work manual contains tacit knowledge by comparing work times taken by an expert and a novice with data obtained by taking

an image of a work process and detecting a work step in which a work delay occurs or operations are different.

[0004]

PTL 2 describes a technique in which an assembly scenario captured in advance is displayed according to a skill level of a worker, time measurement and video imaging are performed in each process, a captured work video is stored as a scenario to be displayed from the next time when work efficiency is the highest, and a worker with poor work efficiency is notified of improvement in work.

Citation List

Patent Literature

[0005]

PTL 1: JP2020-004274A

PTL 2: JP2011-134224A

Summary of Invention

Technical Problem

[0006]

However, what can be evaluated by the systems described in PTL 1 and PTL 2 is limited to a manual referred to by workers who can obtain at least a minimum required manipulation and whose proficiency levels can be classified according to the number of experiences, year of employment,

or the like at a production site where work data can be acquired in detail.

[0007]

That is, the techniques described in PTL 1 and PTL 2 can be applied to improvement of a manual for a person who performs a work as a task, the person being capable of capturing a video of the work and inputting work data every time a detailed process is completed, and it is difficult to directly apply the techniques to a general user whose skills and experience vary for each manipulation and for whom work data collection cannot be mandated.

[0008]

Therefore, an object of the invention is to provide a technique for improving efficiency of an improvement task for a manual referred to by a general user.

Solution to Problem

[0009]

An aspect of the present invention is an information processing device including a control unit, a storage unit, an input unit, and an output unit, the control unit including an analysis function, in which the control unit has a function of providing a manual for instructing a user to perform a predetermined work from the output unit to a terminal operated by the user, the storage unit stores a

process metadata table in which a content of the manual is associated with work blocks, work elements associated with the work blocks, and manipulations to be performed by the user in the work elements, and the work blocks, the work elements, and the manipulations are stored in association with each other, the input unit acquires, for each said work block, a processing history detected by the terminal when the user uses the manual, and records the processing history as a work history table in the storage unit, and the analysis function refers to the process metadata table and the work history table, and analyzes which work element among the work elements, in the work block for which work efficiency for the user is low, is a cause of decrease in work efficiency.

[0010]

Another aspect of the invention is a manual evaluation system including the above-described information processing device and a terminal operated by the user, in which the terminal displays, in units of the work blocks, data of the manual on one screen of a display at the same time or by performing screen scrolling, and a processing history detected by the terminal is information on screen switching timing of the display.

[0011]

Another aspect of the invention is a manual evaluation

system including the above-described information processing device and a terminal operated by the user, in which a processing history detected by the terminal is at least one of information on the number of operations on an icon or an image displayed on a display of the terminal and history information of a chat function.

[0012]

Another aspect of the invention is a manual evaluation method executed by an information processing device including a control unit, a storage unit, an input unit, and an output unit, the control unit including an analysis function, the manual evaluation method including: the storage unit storing a process metadata table in which a content of a manual for instructing a user to perform a predetermined work is associated with work blocks, work elements associated with the work blocks, and manipulations to be performed by the user in the work elements, and the work blocks, the work elements, and the manipulations are stored in association with each other; a first step of providing the manual from the output unit to a terminal operated by the user by the control unit; a second step of acquiring, for each said work block, a processing history detected by the terminal when the user uses the manual by the input unit; a third step of recording a work history table in which, for each of a plurality of users, a numerical

value reflecting the processing history in correspondence with a combination of the user ID and the work block by the storage unit; a fourth step of referring to the work history table, calculating an average value of the numerical values for each said work block, and comparing the average value with a reference value to extract one or a plurality of focus work blocks from the work blocks, by the analysis function; a fifth step of referring to the process metadata table, and specifying, among a plurality of types of manipulations included in the manual, manipulations unevenly included in the focus work blocks as one or a plurality of focus manipulations, by the analysis function; a sixth step of referring to the process metadata table, and specifying, in the focus work blocks, the work element to which at least one of the focus manipulations is associated, by the analysis function; and a seventh step of outputting information indicating the specified work element by the output unit.

Advantageous Effects of Invention

[0013]

It is possible to provide a technique for improving efficiency of an improvement task for a manual referred to by a general user.

Brief Description of Drawings

[0014]

[FIG. 1] FIG. 1 is a block diagram illustrating an overall configuration of a manual evaluation system.

[FIG. 2] FIG. 2 is a data table illustrating an example of a BEM table according to an embodiment.

[FIG. 3] FIG. 3 is a data table illustrating an example of a work history table according to the embodiment.

[FIG. 4] FIG. 4 is a data table illustrating an example of a user table according to the embodiment.

[FIG. 5] FIG. 5 is a flowchart illustrating processing of a user system.

[FIG. 6] FIG. 6 is an image diagram illustrating an example of a manual displayed on a terminal.

[FIG. 7] FIG. 7 is a flowchart of a matching function.

[FIG. 8] FIG. 8 is a flowchart of an analysis function.

[FIG. 9] FIG. 9 is an image diagram illustrating an example of a manual evaluation screen displayed on a PC.

[FIG. 10] FIG. 10 is a flowchart illustrating an example of statistical processing of a work history performed by the analysis function according to the embodiment.

[FIG. 11] FIG. 11 is an example of a data table in which a matrix T according to the embodiment is recorded.

[FIG. 12] FIG. 12 is a flowchart illustrating an

example of determination processing for an inefficient work block performed by the analysis function according to the embodiment.

[FIG. 13] FIG. 13 is an example of a data table in which a matrix B according to the embodiment is recorded.

[FIG. 14] FIG. 14 is a flowchart illustrating an example of determination processing for an inefficient manipulation performed by the analysis function according to the embodiment.

[FIG. 15] FIG. 15 is an example of a data table in which a matrix M according to the embodiment is recorded.

[FIG. 16] FIG. 16 is a flowchart illustrating an example of determination processing for an inefficient work element performed by the analysis function according to the embodiment.

[FIG. 17] FIG. 17 is an example of a data table in which a matrix E according to the embodiment is recorded.

[FIG. 18] FIG. 18 is a flowchart illustrating an example of issuance processing for a notice performed by the analysis function according to the embodiment.

Description of Embodiments

[0015]

An embodiment will be described in detail with reference to the drawings. The invention is not to be

construed as being limited to the description of the embodiments to be described below. It will be easily understood by a person skilled in the art that the specific configuration can be changed within a range not departing from the idea or spirit of the invention.

[0016]

In a configuration of the embodiment to be described below, the same parts or parts having the same function may be denoted by the same reference signs in different drawings, and a redundant description thereof may be omitted.

[0017]

When there are a plurality of components having the same or similar functions, the description may be made by assigning the same reference signs thereof with different subscripts. However, when it is not necessary to distinguish the plurality of components, the description may be made by omitting the subscripts.

[0018]

The notations "first", "second", "third", or the like in the present description are assigned to identify the components and do not necessarily limit the number, the order, or the content thereof. In addition, a number for identifying a component is used for each context, and the number used in one context does not necessarily indicate the same configuration in another context. In addition,

this does not prevent a component identified by a certain number from also having a function of a component identified by another number.

[0019]

In order to facilitate understanding of the invention, the position, size, shape, range, or the like of each configuration illustrated in the drawings or the like may not represent the actual position, size, shape, range, or the like. Therefore, the invention is not necessarily limited to the position, size, shape, range, or the like disclosed in the drawings.

[0020]

Publications, patents, and patent applications cited in the present description constitute a part of the description of the present description.

[0021]

In the present description, it is assumed that a component represented in a single form also includes a plurality of components unless otherwise clearly described in the context.

[0022]

Systems described in PTL 1 and PTL 2 do not solve the following problems that occur when evaluating whether a manual for a general user, such as a furniture assembly manual, is useful in work support for the general user, that

is, when evaluating appropriateness of the work support provided by the manual for the general user.

[0023]

First, it is difficult to determine a work that is not appropriately performed in detail based on work data that can be collected from the general user. Since the general user is not an expert who performs a manipulation (such as "tightening" a screw or the like or "fixing" a member or the like), it is assumed that manipulations cannot be appropriately performed. Therefore, there is a method of causing the general user to check which manipulation cannot be appropriately performed during a work process such as furniture assembly. However, if a report is requested every time a manipulation cannot be appropriately performed, a flow of an assembly work is stopped every time for the user, and the efficiency of the assembly work that is originally desired to be completed may decrease.

[0024]

In the first place, even if the general user is encouraged to record a work result in detail, data with high reliability is not always obtained. For example, even if a confirmation button is requested to be pressed each time the manipulation is completed, it is conceivable that all confirmation buttons are collectively pressed when a work is completed.

[0025]

In addition, in an environment such as a home in which the manual for the general user is expected to be referred to, a method of providing a camera as in a production site and analyzing a work video to specify an inefficient manipulation cannot be adopted.

[0026]

Second, it is difficult to find an attribute of the general user, which clearly correlates with efficiency of the general user in performing the work, such as year of employment or the number of experiences. Therefore, it is not possible to adopt a method of effectively detecting an inappropriate part of the manual by focusing on a work result of the worker having an attribute that the work is relatively inefficient. On the other hand, if it is not considered what kind of user is inefficient in performing the target work, a process, which is fine for most users but is inappropriate for some users, cannot be detected.

[0027]

For example, even if there is a process in which a work of an older adult is particularly delayed because a small symbol attached to a screw cannot be distinguished, work data from a small number of older adults does not greatly contribute to a statistical value based on work data from all users, and thus an improvement point of the process

may be overlooked.

[0028]

The technique described in the embodiment proposes the following solutions to the above problems. For example, an assembly work (for example, assembly of a chest) targeted by a manual is broken down into a "manipulation (screw fastening)", a "work element (screw fastening of a member A and a member B) including the manipulation (screw fastening) and manipulation targets (the member A and the member B)", and a "work block (assembling a drawer) including one or more work elements".

[0029]

Then, a reference history of the users is acquired in units of "work blocks" in which behavior data with high reliability can be acquired from the general users, "inefficient work blocks" are specified from the "work blocks" of the reference history, an "inefficient manipulation" included in common in the plurality of "inefficient work blocks" is specified, an "inefficient work element" including the "inefficient manipulation" among the "inefficient work blocks" is specified, and the specified "inefficient work element" is notified as an improvement target.

[0030]

Further, the general users are classified according

to characteristics (gender, age, native language, etc.) that can be extracted from the general users and that may correlate with efficiency in performing the work, and the inefficient work element is specified for each characteristic value (gender: male/female, age: older adult/middle-aged adult/younger adult, native language: Japanese/languages other than Japanese, etc.).

[0031]

Accordingly, a manual creator can determine, only by the user inputting the reference history in units of work blocks, whether the manual needs to be improved in units of work elements, and appropriateness evaluation for the manual can be facilitated. Further, it is possible to detect work elements with inappropriate descriptions for only users with a specific characteristic value even when the number of such work elements is small. In addition, by modifying the description for each characteristic value, it is possible to deliver an optimum manual to each user. The term "manual" in the present description and the like is a concept including not only a document but also a general content for instructing a user to perform a predetermined work, such as an image, a sound, and a video.

[0032]

(1. System Configuration)

FIG. 1 is a configuration diagram of an entire manual

evaluation system according to an embodiment. FIG. 1 illustrates a PC 102, a manual management server 103, and a terminal 113, where an assembly manual for furniture such as a chest will be described as a specific example.

[0033]

(1-1. Manual Management Server)

First, a configuration of the manual management server 103 will be described. The manual management server 103 is managed by, for example, a business operator that provides a product or a manual thereof. The manual management server 103 generally includes a business server or a cloud.

[0034]

The PC 102 operated by a manual creator 101 is a general personal computer including an input unit, a display unit, a storage unit, and a control unit, and is connected to a communication unit 106 of the manual management server 103 through a network line.

[0035]

The manual management server 103 is a server including a storage unit 104, a control unit 105, and a communication unit 106, and is connected to the PC 102 and a communication unit 107 of a user system 112 through the network line. The manual management server 103 further includes a general input device (input unit) and a general output device (output unit). The communication unit 107 may be considered

as one of the input device (input unit) and the output device (output unit). The PC 102 may be configured as a portion of the manual management server 103.

[0036]

The storage unit 104 of the manual management server 103 includes, as data, a manual DB 104a, a BEM table 104b, a work history table 104c, a user table 104d, a notice table 104e, and a match table 104f. The storage unit 104 can be implemented by any combination of storage devices such as a magnetic disk device and a semiconductor memory.

[0037]

The manual DB 104a stores a manual in association with a manual ID, where the manual is a content for describing a work procedure for assembling the product (for example, the chest) to be assembled, and is configured with collecting a plurality of series of descriptions related to a work block (making a drawer) including one or more work elements (fixing the member A and the member B with the screw) each including a manipulation (fixing with the screw) and members (the member A and the member B) which are manipulation targets.

[0038]

A data format of the manual may include a text, an image, a video, and an audio. Data of the manual is created in advance by the manual creator 101 or a system

administrator, and stored in the storage unit 104. The data of the manual is transmitted to the terminal 113 as necessary and used by a user 114.

[0039]

FIG. 2 is a data table illustrating an example of the BEM table 104b. The BEM table 104b is a table created in a one-to-one relation with the manual, and defines association between a work block (Block) constituting the manual, a work element (Element) constituting the work block, and a manipulation (Manipulation) included in the work element.

[0040]

FIG. 2 illustrates data for one manual. One or a plurality of work block IDs for specifying work blocks are associated with a manual ID for specifying the manual. One or a plurality of work element IDs for specifying work elements are associated with one work block ID. One work element includes a set of any number of work targets and any number of manipulations. In this example, reference work time data of the work block is included, but instead of or in addition to this, other data for evaluating work efficiency may be included.

[0041]

Data of the BEM table 104b is created in advance by the manual creator 101 or the system administrator, and stored in the storage unit 104. At this time, the work

block (Block), the work element (Element), and the manipulation (Manipulation) are defined in any manner. In the example of FIG. 2, the work element includes two manipulation targets and one manipulation, but the number of manipulation targets and manipulations is not limited thereto. The number of work elements to be included in one work block is also selected freely, but for the user 114, it is preferable to group logically segmented content into a single work block. As an example, it is conceivable that one or a plurality of work elements, descriptions of which can be displayed in one screen of the terminal 113, are associated with one work block.

[0042]

FIG. 3 is a data table illustrating an example of the work history table 104c. The work history table 104c is created in a one-to-one relation with the manual, and a user ID and information on work histories of a user are associated with each other. The work history may be any information as long as it is recorded for each work block and can be recorded by the user 114 operating a terminal. The work history table 104c is assumed to collect data from a large number of users, and statistical processing is executed on the collected data.

[0043]

In the example of FIG. 3, work histories of users with

user IDs "1" to "5" are stored for a manual with a manual ID "1". One work history is recorded for each work block such as "drawer assembly" and "storage section assembly", and in this example, work time (seconds) is stored. A recording means of the work history table 104c will be described later.

[0044]

FIG. 4 is a data table illustrating an example of the user table 104d. In the user table 104d, a user ID for specifying a user registered in a user system and values of characteristics thereof (hereinafter referred to as a characteristic value) are associated with each other. In FIG. 4, "gender", "age class", and "native language" are recorded as examples of characteristics. As an example of the characteristic value, "male" and "female" are recorded for "gender". The characteristic value may be a category or a numerical value. The characteristic and the characteristic value associated with the user may be anything as long as the characteristic and the characteristic value can be extracted from the general users.

[0045]

As a method of investigating the characteristic value, a questionnaire may be conducted before and after a work, or information acquired when a user registers in the user system 112 may be used. Alternatively, the user table 104d

can be created by the system administrator based on information collected in advance and stored in the storage unit 104. Alternatively, the user 114 may output the manual from the terminal 113 when using a manual of the manual DB 104a.

[0046]

In the notice table 104e, a notice, which notifies the manual creator 101 of a process for which the manual management server 103 determines that a description is inappropriate, is recorded in association with the manual ID. Data of the notice table 104e is created by an analysis function 105b and is stored in the storage unit 104.

[0047]

The match table 104f is a table in which a product ID and a characteristic value are set as a composite primary key and a manual ID is set as a search target, and is used to classify a plurality of manuals when the manuals are created for respective characteristic values for one product. Data of the match table 104f is created in advance by the manual creator 101 or the system administrator, and stored in the storage unit 104.

[0048]

The control unit 105 is hardware functioning as a computer, includes a central processing unit (CPU), a random access memory (RAM), and a read only memory (ROM) serving

as processing devices, and controls operations of the manual management server 103. The control unit 105 controls execution of a matching function 105a and the analysis function 105b. The matching function 105a and the analysis function 105b are implemented, for example, by the CPU executing a program stored in the RAM, the ROM, or the like. In terms of a system configuration, the matching function 105a may be understood as a matching function unit, and the analysis function 105b may be understood as an analysis function unit.

[0049]

The control unit 105 or the manual management server 103 may be implemented by a single computer, or any part of the input device, the output device, the processing device, and the storage device may be implemented by another computer connected via a network. A function equivalent to a function implemented by software can also be implemented by hardware such as a field programmable gate array (FPGA) or an application specific integrated circuit (ASIC).

[0050]

The matching function 105a plays a role of, when a request for a manual is received from the user system 112, searching for an appropriate manual from the match table 104f and transmitting the appropriate manual to the user system 112.

[0051]

The analysis function 105b plays a role of, when a manual to be evaluated is received from the PC 102, specifying a process in which an inappropriate description may be included, issuing a notice for notifying the process, and transmitting an analysis result to the PC 102.

[0052]

(1-2. User System)

Next, a configuration of the user system 112 will be described. As a specific example, the user system 112 includes a personal computer or a portable information terminal (terminal 113) used by the general user 114.

[0053]

The terminal 113 operated by the user 114 is, for example, a general smartphone, includes an input unit (touch panel) 111, a display unit 110, a storage unit 108, a control unit 109, and the communication unit 107, and can be connected to the communication unit 106 of the manual management server 103 through the network line.

[0054]

The user system 112 stores a manual DB 108a and a work history table 108b in the storage unit 108. In addition, the control unit 109 includes a work history acquisition function 109a. The user 114 is assumed to be a general user with various characteristics, for example, from an older

adult to a child.

[0055]

The control unit 109 is hardware functioning as a computer, includes a CPU, a RAM, and a ROM, and controls operations of the user system 112. The control unit 109 controls execution of the work history acquisition function 109a. The work history acquisition function 109a is implemented, for example, by the CPU executing a program stored in the RAM, the ROM, or the like. The program is downloaded from, for example, the manual management server 103.

[0056]

The work history acquisition function 109a plays a role of acquiring a work history from an operation performed by the user 114 on the terminal 113 for each work block and recording the work history in the work history table 108b to be described later. Data of the work history table 108b is transmitted to the manual management server 103 as needed and collected in the work history table 104c.

[0057]

The operation performed on the terminal 113 is, for example, "tapping a next button 304 by the user 114" on a work block screen (to be described later with reference to FIG. 6), that is, relates to screen switching timing. In this case, the work history acquisition function 109a may

record a time from when a description screen of one work block is started to be displayed to when a next button 306 is tapped (that is, corresponding to a work time of the work block) as a work history of the work block.

[0058]

The storage unit 108 has the manual DB 108a and the work history table 108b. In the manual DB 108a, a manual requested by the user 114 and sent from the manual management server 103 is stored in association with the product ID and the manual ID. In the work history table 108b, information on a history of the user referring to a manual, which is acquired by the work history acquisition function 109a, is recorded for each work block and is recorded in association with the manual ID.

[0059]

First, an example of a series of operations from when the user 114 requests a manual from the manual management server 103 to when a work history is transmitted to the manual management server 103 in the user system 112 and an example of operations from when the matching function 105a receives a request from the user 114 to when the matching function 105a searches for an appropriate manual and sends the appropriate manual to the user 114 will be described.

[0060]

(2. Description of Operation)

(2-1. Operation Example of User System)

FIG. 5 is a flowchart illustrating processing of the user system 112. First, when the user 114 powers on the terminal 113 and selects, by the input unit 111, a product whose manual is desired to be viewed, the processing illustrated in FIG. 5 is started (S201).

[0061]

When the processing is started, the control unit 109 transmits a product ID of the selected product and a user ID of the user acquired from the terminal to the manual management server 103 through the communication unit 107, and requests the manual (S202).

[0062]

After S202, a matching function 105a to be described later is processed in the manual management server 103, and an appropriate manual is sent from the manual DB 104a to the user system 112 via the communication unit 106 and the communication unit 107.

[0063]

The manual sent to the user system 112 is stored in the manual DB 108a by the control unit 109 (S203). Data of the manual DB 108a is considered to be a partial copy of data of the manual DB 104a. When the user 114 selects the manual of the product to be assembled by the input unit 111, the work history table 108b is newly created, and a manual

ID and the user ID are recorded (S204).

[0064]

When the user 114 selects start of a work by the input unit 111, a first work block screen is displayed on the display unit 110 of the terminal 113 (S206).

[0065]

FIG. 6 is an example of a work block screen displayed on the display unit 110 of the terminal 113, and includes a description 301 of a work block, descriptions 302 of work elements constituting the work block, and the next button 304. These contents correspond to a data structure of the BEM table 104b illustrated in FIG. 2, and are created based on the data of the manual DB 108a.

[0066]

Herein, the descriptions 302 of the work elements may include images 303. The image is intended to supplementarily describe a manipulation of the work element, and may include information such as an image, a video, and a sentence. In addition, a chat icon 305 may be added to the work block screen, and a chat screen may be displayed when the chat icon is pressed. In this case, the user 114 can contact a person in charge of receiving a question through chat about a question generated in performing the work block.

[0067]

When the next button 304 is pressed (S207), a work history in the first work block is acquired by the work history acquisition function 109a and stored in the work history table 108b (S208), where the acquired work history may be any work history as long as it can be recorded by the user 114 operating the terminal 113. For example, as described above, the work time estimated based on the time (completion time) from when the work block screen is displayed to when the next button 304 is tapped can be used as the work history. Alternatively, the work history may be the number of times the image is tapped (the number of times the image is viewed). Alternatively, the work history may be the number of times the video is repeatedly played. When a chat function is added, a question transmitted by the user may be acquired as the work history.

[0068]

After S208, the processing returns to S205, and a description screen for a next work block is displayed. The processing from S206 to S208 is repeated until display of description screens for all work blocks constituting the manual is completed. Thereafter, the user system 112 transmits the work history table 108b to the manual management server 103 via the communication unit 107 and the communication unit 106 (S210), and the processing of the user system ends.

[0069]

After receiving the work history table 108b, the analysis function 105b of the manual management server 103 records, in the work history table 104c, information recorded in the received table.

[0070]

The terminal 113 displays, in units of work blocks, data of the manual on one screen of a display at the same time or by performing screen scrolling, thereby facilitating the work of the user. At this time, information on the screen switching timing of the display when the user operates the next button 304 can be used as information in the work history table 104c.

[0071]

(2-2. Operation Example of Matching Function)

FIG. 7 is a flowchart of processing of the matching function 105a. When the manual management server 103 receives the request for the manual from the user system 112, the processing illustrated in FIG. 7 is started (S601). The matching function 105a first searches the user table 104d for a user matching the user ID of the request source terminal, and acquires a list of characteristic values of the user (S602).

[0072]

Thereafter, the match table 104f is searched for the

manual ID by using the product ID and elements in the characteristic value list included in the request for the manual as a key (S603), where as an example of the match table 104f, a table having a product ID and a characteristic value as key strings and a manual ID and priority as key values is considered, where a priority column is used to uniquely search for a manual having the highest priority value when there are separate manuals for a plurality of characteristic values for the same product.

[0073]

For example, a match table is considered in which "manual ID = 2, priority = 10" is registered for age = older adult, "manual ID = 3, priority = 5" is registered for gender = female, and "manual ID = 1" is registered for other characteristics regarding a manual of a product ID "1".

[0074]

At this time, when searching with product ID = 1 and characteristic values = [female, older adult, Japanese], a manual of ID = 2 having the highest priority is searched for among "manual IDs = 2, 3" in which "product ID = 1, characteristic values = female, older adult" matches the key.

[0075]

Thereafter, the manual DB 104a is searched for a manual matching the manual ID searched for in S603 (S604),

and the searched manual is sent to the request source terminal (S605), completing the processing of the matching function 105a.

[0076]

(2-3. Operation of Analysis Function)

FIG. 8 is a flowchart of the analysis function 105b. The analysis function 105b will be described with reference to the flowchart in FIG. 8. First, the manual creator 101 powers on the PC 102 and displays a manual evaluation screen.

[0077]

FIG. 9 is an image diagram illustrating an example of the manual evaluation screen displayed on the PC 102. The manual evaluation screen includes a manual ID input field 401 and a search icon 402, and the manual creator 101 inputs an ID of a manual desired to be evaluated in the manual ID input field 401, and then presses the search icon 402 to request the manual management server 103 to evaluate the manual. When the manual management server 103 receives the evaluation request, processing of the analysis function 105b illustrated in FIG. 8 is started (S501).

[0078]

After S501 is started, the analysis function 105b first searches the storage unit 104 for the work history table 104c and the BEM table 104b associated with the manual ID for which the request is received (S502). Thereafter, a

statistical value of a work history in each work block recorded in the work history table 104c is calculated for each characteristic value (S503).

[0079]

Next, the statistical value calculated in S503 is compared with a reference value stored in the BEM table 104b for each work block, and it is determined whether a description of each work block is appropriate for each characteristic value (S504).

[0080]

Next, the BEM table 104b is searched for manipulations included in a plurality of work blocks, each determined in S504 to have an inappropriate description for the user with a certain characteristic value, a manipulation included in common in the work blocks is extracted, and the manipulation is determined to be a manipulation with an inappropriate description (S505).

[0081]

Next, the BEM table 104b is searched for manipulations included in each of the work blocks determined in S503 to have the inappropriate description for the user with the certain characteristic value, and it is determined whether there is a manipulation determined in S505 to have the inappropriate description for the user with the certain characteristic value among the manipulations. If there is

such a manipulation, a work element including this manipulation in the work block is determined as a work element with the inappropriate description (S506).

[0082]

Next, a notice for notifying the manual creator 101 of the work element with the inappropriate description specified in S506 is created, and is stored in the notice table 104e in association with the manual ID (S507).

[0083]

Finally, the manual management server 103 transmits the notice table 104e to the PC 102, and the processing of the analysis function 105b ends.

[0084]

(2-4. Specific Operation Example of Analysis Function)

Hereinafter, the processing of the analysis function 105b will be specifically described by taking assembly of a chest (product ID = 1) as an example.

[0085]

The chest assembly includes four work blocks ("drawer assembly", "storage section assembly", "top panel attachment", and "caster installation"), and each work block is broken down into one or more work elements (for example, "fixing the plate A and the plate B with a bolt" or the like) defined by a combination of a manipulation and manipulation targets. Further, it is assumed that there

are four types of manipulations ("screw fastening", "adhesive bonding", "cam-lock fixing", and "bolt fixing") necessary for assembling the chest. Such an example is illustrated in FIG. 2.

[0086]

FIG. 4 is an example of the user table 104d, in which user IDs of five users are associated with respective characteristic values. In this example, it is assumed that the characteristics for classifying the users are gender, age class, and native language, and the characteristic values may be male/female, older adult/middle-aged adult/younger adult, and Japanese/languages other than Japanese for respective characteristics.

[0087]

FIG. 3 is an example of the work history table 104c, and a time (seconds) required to complete each work block is recorded as a work history for each user ID. As described above, the time required to complete the work block can be measured as a time from when a description of one work block is displayed to when the user 114 requests to display a next work block, and timing can be acquired at the timing when the user 114 taps the next button 304 (FIG. 6) on the work block screen of the terminal 113. In this example, for simplicity, five users are set as analysis targets, but in practice, in order to obtain statistics with high

reliability, it is desirable to evaluate a manual after obtaining work histories of many more users.

[0088]

The manual creator 101 powers on the PC 102, inputs "1" in the manual ID input field 401, and presses the search icon 402 on the manual evaluation screen (FIG. 9) to start the processing of the analysis function 105b (S501). The manual management server 103 searches the work history table 104c and the BEM table 104b in the storage unit 104 for data whose manual ID matches "1", and stores the data in a temporary storage area (S502). The RAM of the control unit 105 or a storage area of the storage unit 104 can be used as the temporary storage area. Data of T(work block, characteristic value), B(work block, characteristic value), M(manipulation, characteristic value), and M(manipulation, characteristic value) to be described below with reference to FIGS. 11, 13, 15, and 17 are also stored in the temporary storage area. After S502, processing in S503 is started.

[0089]

FIG. 10 is a flowchart illustrating an example of the processing in S503, and illustrates processing for obtaining an average time T(work block, characteristic value) required for users of each characteristic value to complete each work block.

[0090]

Herein, a matrix $X(P, Q)$ is an $N \times M$ matrix having a set of elements of $P = \{p_1, p_2, \dots, p_N\}$ and $Q = \{q_1, q_2, \dots, q_M\}$ as subscripts, and a component in the i -th row and the j -th column is denoted by $X(p_i, q_j)$. For example, $T(\text{"work block"}, \text{"characteristic value"})$ is a 2×2 matrix for the work block = {"drawer assembly", "storage section assembly"} and the characteristic value = {"male", "female"}, and a component $T(\text{"drawer assembly"}, \text{"male"})$ is an average time taken by the male users to complete the drawer assembly.

[0091]

First, a first row of the work history table 104c is extracted, and a user ID and a work block completion time list are acquired (S702). Next, the user table 104d is searched by using the user ID as a key, and a characteristic value list of a user matching the user ID is acquired (S703). Next, 1 is added to $N(\text{characteristic value})$, which represents the number of users with a certain characteristic value, for each element of the characteristic value list (S704).

[0092]

Next, an element of the work block completion time list is added to $V(\text{work block}, \text{characteristic value})$ that represents a total time taken by the users with a certain characteristic value to complete a certain work block (S706). After S706, the processing returns to S702 and is repeated

until extraction of all rows of the work history table is completed. Thereafter, $T(\text{work block, characteristic value})$ is obtained by dividing $V(\text{work block, characteristic value})$ by $N(\text{characteristic value})$.

[0093]

FIG. 11 illustrates $T(\text{work block, characteristic value})$ calculated based on the user table illustrated in FIG. 4 and the work history table illustrated in FIG. 3. For example, there are two users with the characteristic value "older adult", IDs 1 and 2 ($N(\text{older adult}) = 2$), and a total time taken to complete the work block "drawer assembly" is 1800 ($V(\text{drawer assembly, older adult}) = 1800$), and therefore, $T(\text{drawer assembly, older adult}) = 900$. According to $T(\text{work block, characteristic value})$, the average time T required for users (for example, older adults) of each characteristic value to complete each work block (for example, drawer assembly) is found. After completing S503, the analysis function 105b starts processing in S504.

[0094]

FIG. 12 is a flowchart illustrating an example of the processing in S504, and illustrates processing for obtaining a matrix $B(\text{work block, characteristic value})$ in which 1 is recorded if an average time taken by users with a characteristic value to complete a certain work block is

larger than an expected value, and 0 is recorded otherwise.

[0095]

First, all elements of B are set to 0 (S802). Next, a first work block row recorded in the BEM table 104b is searched for, and a value in a reference time column is recorded in TM. Next, $T(\text{work block, characteristic value})$ and TM are compared for each characteristic value (S806), and 1 is recorded in $B(\text{work block, characteristic value})$ if $T(\text{work block, characteristic value})$ is larger than TM (S807). After S807, the processing returns to S803 and is repeated until search for all work blocks recorded in the BEM table is completed.

[0096]

FIG. 13 is an example of $B(\text{work block, characteristic value})$ calculated based on the BEM table 104b illustrated in FIG. 2 and $T(\text{work block, characteristic value})$ illustrated in FIG. 11. For example, regarding the work block "drawer assembly", in a case of the characteristic value "younger adult", $B(\text{drawer assembly, younger adult}) = 0$ is obtained according to $T(\text{drawer assembly, younger adult}) = 100 < TM = 800$, whereas in a case of the characteristic value "older adult", $B(\text{drawer assembly, older adult}) = 1$ is obtained according to $T(\text{drawer assembly, older adult}) = 900 > 800$. According to $B(\text{work block, characteristic value})$, a work block, for which work efficiency for users with a

certain characteristic value is low (requiring a work time equal to or longer than a reference time), is clear. After completing S504, the analysis function 105b starts processing in S505.

[0097]

FIG. 14 is a flowchart illustrating an example of the processing in S505, and illustrates processing for calculating a matrix $M(\text{manipulation, characteristic value})$, which represents, regarding a certain manipulation, a ratio of the number of times the manipulation appears in work blocks for which a longer time is taken than the reference time, to the number of times the manipulation is performed in an entire work by the user 114 with each characteristic value.

[0098]

First, all elements of M are set to 0 (S902). Next, the BEM table 104b is searched for work blocks including a certain manipulation in a manipulation column (S903). Next, for each searched work block, the number of manipulations included in the manipulation column is recorded in K (S905), and K is added to $L(\text{manipulation})$, which represents the number of times the manipulation is performed in an entire work (S906). Subsequently, it is determined whether $B(\text{work block, characteristic value}) = 1$ for each characteristic value (S908), and if $B(\text{work block, characteristic value}) =$

1, K is added to U(manipulation, characteristic value), which represents, in an entire work of a user with a certain characteristic value, the number of times the certain manipulation appears the work blocks for which a longer time is taken than the reference time (S909). After S909, the processing returns to S903 and is repeated until the processing is completed for all manipulations.

[0099]

FIG. 15 is an example of M(manipulation, characteristic value) calculated based on the BEM table 104b illustrated in FIG. 2 and B(work block, characteristic value) illustrated in FIG. 13. For example, according to the BEM table 104b, the manipulation "bolt fixing" is performed once each in the work blocks "drawer assembly", "top panel attachment", and "caster installation", and thus $L(\text{bolt fixing}) = 3$. In a case of the characteristic value "older adult", work blocks satisfying $B(\text{work block, older adult}) = 1$ are "drawer assembly" and "top panel attachment", and thus $U(\text{bolt fixing, older adult}) = 2$. Therefore, $M(\text{bolt fixing, older adult}) = U(\text{bolt fixing, older adult}) / L(\text{bolt fixing}) = 0.67$ (rounded to the second decimal place). In the example in FIG. 2, the manipulation "bolt fixing" repeatedly appears in an entire process, but the same processing is performed even when this manipulation appears only once. In this case, M has two values of "1" or "0".

[0100]

In this way, regarding a specific type of manipulation included in work, $M(\text{manipulation, characteristic value})$ is obtained by examining the manipulation unevenly included in a work block for which work efficiency for a specific user is low. According to $M(\text{manipulation, characteristic value})$, a manipulation, for which work efficiency for a user with a specific characteristic value may be low, is clear. After completing S505, the analysis function 105b starts processing in S506.

[0101]

As described above, in the present embodiment, for example, it is possible to specify a manipulation that cannot be appropriately performed by the user 114 based on information that can be collected only by the user 114 touching the next button 304 in FIG. 6. Therefore, it is desirable to review the description focusing on this manipulation in the manual.

[0102]

FIG. 16 is a flowchart illustrating an example of the processing in S506, and illustrates processing for obtaining, for a user with a certain characteristic value, a matrix $E(\text{work element ID, characteristic value})$ in which 1 is recorded if a work element constituting a work block satisfying $B(\text{work block, characteristic value}) = 1$ includes

a manipulation for which $M(\text{manipulation, characteristic value})$ is larger than a reference value, and 0 is recorded otherwise.

[0103]

First, all elements of E are set to 0 (S1002). Next, a first work block row is extracted from a BEM table (S1003), and it is determined whether $B(\text{work block, characteristic value}) = 1$ for each characteristic value (S1005). If $B(\text{work block, characteristic value}) = 1$, for a manipulation of each work element included in the work block (S1006), it is determined whether $M(\text{manipulation, characteristic value}) > 0.6$ (S1008). If $M(\text{manipulation, characteristic value}) > 0.6$, $E(\text{work element ID, characteristic value}) = 1$ is recorded (S1009). The reference value 0.6 can be set freely, where the majority is taken as the reference value and set to 0.6. After S1009, the processing returns to S1003 and is repeated until the processing is completed for all work blocks.

[0104]

FIG. 17 is an example of $E(\text{work element, characteristic value})$ calculated based on the BEM table illustrated in FIG. 2, $B(\text{work block, characteristic value})$ illustrated in FIG. 13, and $M(\text{manipulation, characteristic value})$ illustrated in FIG. 15. In a case of the work block "drawer assembly" and the characteristic value "older adult",

$B(\text{drawer assembly, older adult}) = 1$, and thus processing in S1006 is performed.

[0105]

The work block "drawer assembly" includes work element IDs = 1, 2, and 3 corresponding to the manipulations "adhesive bonding", "screw fastening", and "bolt fixing", respectively. The manipulation satisfying $M(\text{manipulation, older adult}) > 0.6$ is "bolt fixing", and the work element ID corresponding to the manipulation "bolt fixing" is "3", and thus $E(3, \text{older adult}) = 1$. According to $E(\text{work element, characteristic value})$, it is clear which work element, in a work block for which work efficiency for a user with a specific characteristic value is low, may be a cause of decrease in work efficiency. After completing S506, the analysis function 105b starts processing in S507.

[0106]

FIG. 18 is a flowchart illustrating an example of the processing in S507, and illustrates processing, for each characteristic value, of each of work elements constituting a work block satisfying $B(\text{work block, characteristic value}) = 1$, for issuing a notice if $E(\text{work element ID, characteristic value}) = 1$, the notice for notifying that a description of a work element ID is inappropriate for the characteristic value.

[0107]

For example, processing for issuing a notice regarding the characteristic value "older adult" based on B(work block, characteristic value) illustrated in FIG. 13 and E(work element ID, characteristic value) illustrated in FIG. 17 is considered. The work blocks satisfying B(work block, older adult) = 1 are "drawer assembly" and "top panel attachment". Among the work elements (ID = 1, 2, 3) constituting the work block "drawer assembly", the work element ID corresponding to E(work element ID, older adult) = 1 is "3". Therefore, a notice "a description of the work element ID 3 seems to be inappropriate for an older adult" is issued in S1107, and is stored in a notice table (S1108).

[0108]

Similarly, among work elements constituting the work block "top panel attachment", a work element satisfying E(work element ID, older adult) = 1 is a work element ID = 7, and therefore, a notice "a description of the work element ID 7 seems to be inappropriate for an older adult" is issued in S1107, and is stored in the notice table (S1108). After completing S507, the analysis function 105b performs processing in S508, and returns the notice table to the PC 102 serving as a request source.

[0109]

Upon receiving an evaluation result from the manual management server 103, the PC 102 displays the evaluation

result on the manual evaluation screen. FIG. 9 is an example of the manual evaluation screen, in which a notice is displayed as illustrated at 403.

[0110]

The manual creator 101 may create a plurality of manuals for the same product for respective characteristic values according to notification contents. For example, when a manual creator infers from the notice 403 that "it is difficult for an older adult to fix the plate A and another plate with bolts", it is conceivable to add an "image of an appropriate posture when fixing the plate A with bolts" to images of the work elements 3 and 7 of a manual for the older adult. In this case, a unique ID (for example, "2") is assigned to the newly created manual, a row having the product ID = 1 and the characteristic value = "older adult" as the composite primary key is added to the match table 104f, and 2 is recorded in a manual ID column.

[0111]

(3. Application Example)

In the manual evaluation screen in FIG. 9, a result of performing statistical processing on the work histories in S503 may be displayed as a graph 409. In this case, the statistical value calculated in S503 is stored in the storage unit 104, and the statistical value is transmitted

to the PC terminal 102 in S508.

[0112]

In the graph 409, as an example, a value of T(work block, older adult) is displayed in a bar graph for each work block together with a reference time. At this time, a characteristic value selection field 404 may be provided to allow the value of T to be displayed for each characteristic value.

[0113]

In S503, processing for calculating various statistics (variance value, standard deviation, and the like) related to the work history of each work block may be added. In this case, a statistic other than the average value may be used in S504, S505, and S506 to specify a work element with an inappropriate description, or a statistic selection field 406 may be provided to allow a graph related to any statistic to be displayed.

[0114]

The work history targeted by the analysis function 105b is not limited to a work completion time, and may be anything as long as it can be acquired by the user operating the terminal (for example, the number of times the image 303 is tapped and viewed, the number of chat questions, or the like), and the statistical processing related to various work histories targeted may be added in S503. In this case,

statistical values related to various work histories may be used in S504, S505, and S506 to utilize a work element with an inappropriate description. In addition, when the work history is numerical value data, a work history selection field 405 may be provided to allow a statistic related to any work history to be displayed. Further, when the work history is natural language data such as a question, a frequent word may be extracted in S503, and a word cloud 410 may be displayed.

[0115]

A content to be notified by the notice may include not only the work element but also a work block or a manipulation for which description is determined to be inappropriate in S505 or S506.

[0116]

When specifying a work element with an inappropriate description, information on a "manipulation target" commonly used in work blocks may be used in addition to a manipulation. For example, when most of average completion times of work blocks including the plate A as the manipulation target exceed the reference time, a work element including the plate A as the manipulation target may hinder appropriate progress of the work. For example, by notifying such a work element, the manual creator may come up with an idea that "it is difficult for a user to

manipulate the plate A that is the heaviest member among members", and add a note such as "working in pairs" to the description of the work element including the member A as the manipulation target.

[0117]

As described above in detail in the above-described embodiment, an entire assembly process of a product requiring assembly is broken down into a process (work block) of assembling one component constituting the product and a process (work element) including a single manipulation and manipulation targets constituting the work block, and a work history is acquired for each work block from the manipulation performed by the user 114 on the terminal 113 for viewing a manual, and is stored in the manual management server 103. The manual management server 103 determines a work block in which work histories acquired from a plurality of users show unfavorable trends as an "inefficient work block", determines a manipulation commonly included in a plurality of "inefficient work blocks" as an "inefficient manipulation", determines a work element including the "inefficient manipulation" in the "inefficient work block" as an "inefficient work element", and notifies the determined "inefficient work element" as an improvement target. Accordingly, the manual creator can determine, only by the user inputting the reference history in units of work

blocks, whether the manual needs to be improved in units of work elements, and the appropriateness evaluation for the manual can be facilitated.

[0118]

In the above-described embodiment, the manual of furniture assembly is described as an example, but the invention can be widely applied to any content as long as it describes a predetermined manipulation procedure to a user, such as a manual for a cooking procedure or an operating manual for OA equipment.

[0119]

In a case of the manual for the cooking procedure, the manual DB 104a is implemented by gathering a plurality of series of descriptions, each related to a work block (for example, making a roux) that includes one or more work elements (stir-frying wheat flour and butter), where each work element includes a manipulation (for example, stir-frying) and materials which are manipulation targets (for example, the wheat flour and butter), and is used to describe a work procedure of cooking a dish (for example, curry) to be cooked.

In a case of the operating manual for the OA equipment, the manual DB 104a is implemented by gathering a plurality of series of descriptions, each related to a work block (for example, setup) that includes one or more work elements (for

example, downloading a printer driver), where each work element includes a manipulation (for example, downloading) and a member which is a manipulation target (for example, the printer driver), and is used to describe a work procedure for installing OA equipment targeted (for example, a printer).

[0120]

Accordingly, it is possible to provide a technique for effectively evaluating a manual referred to by a general user. According to the above-described embodiments, since an efficient work can be provided, less energy is consumed, carbon emission is reduced, and global warming is prevented, which contributes to implementation of a sustainable society.

Reference Signs List

[0121]

103: manual management server

104: storage unit

105: control unit

112: user system

113: terminal

CLAIMS

[Claim 1]

An information processing device comprising a control unit, a storage unit, an input unit, and an output unit, the control unit including an analysis function, wherein

the control unit has a function of providing a manual for instructing a user to perform a predetermined work from the output unit to a terminal operated by the user,

the storage unit stores a process metadata table in which a content of the manual is associated with work blocks, work elements associated with the work blocks, and manipulations to be performed by the user in the work elements, and the work blocks, the work elements, and the manipulations are stored in association with each other,

the input unit acquires, for each said work block, a processing history detected by the terminal when the user uses the manual, and records the processing history as a work history table in the storage unit, and

the analysis function refers to the process metadata table and the work history table, and analyzes which work element among the work elements, in the work block for which work efficiency for the user is low, is a cause of decrease in work efficiency.

[Claim 2]

The information processing device according to claim 1, wherein

the storage unit has a user table in which characteristic values of the user are stored in correspondence with a user ID for specifying the user,

the process metadata table stores a reference value for evaluating work efficiency for each said work block,

the work history table stores, for each of a plurality of users, a numerical value reflecting the processing history in correspondence with a combination of the user ID and the work block, and

the analysis function refers to the user table, the process metadata table, and the work history table, aggregates the numerical values of the work history table for each user with a certain characteristic value, and compares aggregation results with the respective reference values to specify, as one or a plurality of focus work blocks, the work blocks for which work efficiency for the user with the specific characteristic value is low.

[Claim 3]

The information processing device according to claim 2, wherein

the analysis function refers to the process metadata

table, and calculates, for each of a plurality of types of manipulations included in the manual, a ratio of occurrences in the focus work blocks in the manual to specify manipulations unevenly included in the focus work blocks as one or a plurality of focus manipulations.

[Claim 4]

The information processing device according to claim 3, wherein

the analysis function refers to the process metadata table, and specifies, in the focus work blocks, the work element to which at least one of the focus manipulations is associated, and

the output unit outputs information indicating the specified work element.

[Claim 5]

The information processing device according to claim 4, wherein

the output unit outputs information indicating the characteristic value of the user with low work efficiency for the focus work block together with the specified work element.

[Claim 6]

The information processing device according to claim 1, wherein

the input unit acquires, for each said work block, the processing history by detecting, for each said work block, at least one of timing and the number of terminal operations performed by the user on the terminal when the user uses the delivered manual.

[Claim 7]

The information processing device according to claim 6, wherein

the processing history detected by the terminal relates to display switching timing when the manual is displayed on the terminal in units of the work blocks.

[Claim 8]

A manual evaluation system comprising the information processing device according to claim 1 and a terminal operated by the user, wherein

the terminal displays, in units of the work blocks, data of the manual on one screen of a display at the same time or by performing screen scrolling, and

a processing history detected by the terminal is information on screen switching timing of the display.

[Claim 9]

A manual evaluation system comprising the information processing device according to claim 1 and a terminal operated by the user, wherein

a processing history detected by the terminal is at least one of information on the number of operations on an icon or an image displayed on a display of the terminal and history information of a chat function.

[Claim 10]

A manual evaluation method executed by an information processing device including a control unit, a storage unit, an input unit, and an output unit, the control unit including an analysis function, the manual evaluation method comprising:

the storage unit storing a process metadata table in which a content of a manual for instructing a user to perform a predetermined work is associated with work blocks, work elements associated with the work blocks, and manipulations to be performed by the user in the work elements, and the work blocks, the work elements, and the manipulations are stored in association with each other;

a first step of providing the manual from the output unit to a terminal operated by the user by the control unit;

a second step of acquiring, for each said work block,

a processing history detected by the terminal when the user uses the manual by the input unit;

a third step of recording a work history table in which, for each of a plurality of users, a numerical value reflecting the processing history in correspondence with a combination of the user ID and the work block by the storage unit;

a fourth step of referring to the work history table, calculating an average value of the numerical values for each said work block, and comparing the average value with a reference value to extract one or a plurality of focus work blocks from the work blocks, by the analysis function;

a fifth step of referring to the process metadata table, and specifying, among a plurality of types of manipulations included in the manual, manipulations unevenly included in the focus work blocks as one or a plurality of focus manipulations, by the analysis function;

a sixth step of referring to the process metadata table, and specifying, in the focus work blocks, the work element to which at least one of the focus manipulations is associated, by the analysis function; and

a seventh step of outputting information indicating the specified work element by the output unit.