

【DESCRIPTION】**【Invention Title】****SMART INTERACTION MANAGEMENT SYSTEM FOR EYEWEAR VIRTUAL FITTING AND AUTOMATIC VENDING****5 【Technical Field】**

【1】 The present disclosure relates to a smart interaction system for eyewear virtual fitting and automatic vending.

【Background Art】

【2】 In the prior art, a vending machine refers to a machine that automatically dispenses a
10 desired product when a user pays the corresponding amount using coins, bills, or a credit card. While vending machines have traditionally been used to provide various beverages, they are now also used to offer snacks, prepared food, and a wide range of daily necessities and industrial goods that may be stored inside the machine.

【3】 Vending machines offer the advantage of enabling product sales without the need for
15 hiring sales personnel, as they operate in an unmanned manner and may be installed in a variety of locations regardless of spatial constraints to generate sales revenue. However, inventory management of vending machines is still manually carried out by a manager (or a management company). In other words, in the conventional system, vending machine managers receive products from manufacturers, classify them, and manually store them in
20 predetermined compartments. From the manager's perspective, this method limits the number of vending machines and their geographic distribution that may be managed. Accordingly, there is a need for a system that enables more convenient inventory management from the manager's perspective.

【4】 Meanwhile, conventional vending machines display product samples in a designated
25 space visible from the outside to provide product information to users. However, such vending machines are limited to providing only basic information, such as brand names and

external appearances of products, making it difficult for users to obtain sufficient details about the products.

[5] For example, contact lenses, particularly colored contact lenses, are classified as medical devices that emphasize safety due to their direct contact with the eyes and therefore is not allowed to be worn before purchase. To induce user purchases, a system is needed that may efficiently provide not only design and color information but also various forms of indirect information, such as photos of models wearing the lenses, posters, and catalogs.

[6] Furthermore, it is practically difficult for users to determine which colored contact lenses best match their preferred eye color and style without trying them on. Therefore, to increase users' purchasing motivation and to provide the enhanced shopping experience, a system is needed that efficiently provides virtual fitting services and personalized information to the user by offering a virtual experience that leverages augmented reality (AR), virtual reality (VR), and artificial intelligence (AI) technologies, i.e., a virtual experience that offers real-time virtual images and videos of the user wearing the selected colored contact lenses or recommends suitable products tailored to the user.

【Disclosure】

【Technical Problem】

[7] To solve the problem above, the present disclosure provides a smart interaction management system for eyewear virtual fitting and automatic vending that improves the shopping environment from the user's perspective and enhances the efficiency and convenience of inventory management from the manager's perspective.

[8] Technical objects to be achieved by the present disclosure are not limited to those described above, and other technical objects not mentioned above may also be clearly understood from the descriptions given below by those skilled in the art to which the present disclosure belongs.

【Technical Solution】

[9] A smart interaction management system according to the present disclosure may comprise a cabinet comprising a plurality of reference regions delimited such that pieces of labeled eyewear are classified according to the corresponding clusters and loaded therein, and containing units allocated to reference regions such that one or more pieces of eyewear are contained therein, a controller for executing one or more instructions, a smart device comprising a user authentication unit for authenticating a user based on user information and a display unit for providing information of the eyewear, product discharge units for receiving the eyewear transferred from the containing units and discharging the same to the outside, and a product introduction unit through which the eyewear to be contained in the containing units is provided, wherein the product introduction unit may comprises opening/closing units disposed to correspond to the reference regions, respectively, such that the containing units allocated to the respective reference regions are opened/closed, and the controller selectively opens/closes the opening/closing units based on the user information through the user authentication unit.

[10] The product information generation unit may comprise a scanning unit for scanning incoming eyewear and generate product information data; and a product classification unit for matching the introduced eyewear to the corresponding cluster based on the product information data obtained by the scanning unit. The product classification unit may determine whether the eyewear introduced to the scanning unit matches any of the pre-registered clusters; if the eyewear introduced to the scanning unit matches one of the pre-registered clusters, register and update labeling information of the introduced eyewear to the matched cluster; and, if the eyewear introduced to the scanning unit does not match any of the pre-registered clusters, generate and register a new cluster and register labeling information of the introduced eyewear to the new cluster.

[11] The product information generation unit may further include a region setting unit for resetting the reference regions of the cabinet when the new cluster is generated. The region setting unit may determine whether there is any reference region to which no cluster is assigned among the reference regions; if there exists a reference region to which no cluster is assigned among the reference regions, designate the corresponding region as the new cluster; and, if there is no reference region to which the cluster is not assigned among the reference regions, extract a new region that includes unoccupied containing units, designate the new region as the new cluster, and re-segment the reference regions into modified regions including the new region.

[12] The product introduction unit may include one or more auxiliary opening/closing units disposed inside the opening/closing unit and movably provided to selectively open/close the containing units. The controller may extract a first region that includes the new region from among the reference regions, move the auxiliary opening/closing unit to shield the containing units in the region of the first region excluding the new region, and open the opening/closing unit corresponding to the first region.

[13] The display unit may provide a virtual fitting experience by generating and displaying a virtual image obtained by applying the image of the eyewear selected by the user to the user image. The controller may include a product library that stores images of the eyewear for providing the virtual fitting experience. The product library may be updated to include the product information data obtained by the scanning unit.

[14] The smart interaction management system according to one embodiment of the present disclosure may further include an optometry unit comprising a communication module configured to allow communication among the smart device, the optometry unit, and an optometrist terminal for optometric examination. The optometry unit may share, in real-time, optometry information including the optometric process with the optometrist terminal.

The smart device may receive feedback of the optometrist from the optometrist terminal.

[15] The optometry information may include optometric results authenticated by the optometrist. The controller may require, as conditions for the user's eyewear purchase, both personal authentication through the user authentication unit and optometric result authentication through the optometry unit.

【Advantageous Effects】

[16] The smart interaction management system for eyewear virtual fitting and automatic vending according to the present disclosure may improve the shopping environment from the user's perspective by providing personalized information (or, targeted information) such as virtual fitting and allow any individual authorized by a manager to manage inventory from the manager's perspective, thereby improving the efficiency and convenience of inventory management.

[17] The technical effects of the present disclosure are not limited to the technical effects described above, and other technical effects not mentioned herein may be understood to those skilled in the art to which the present disclosure belongs from the description below.

【Description of Drawings】

[18] FIGS. 1 and 2 are perspective views illustrating a smart interaction management system according to the present disclosure.

[19] FIG. 3 is a block diagram illustrating the structure of a cabinet according to the present disclosure.

[20] FIG. 4 is an exemplary diagram illustrating the matching relationship among a cluster, a reference region, and a containing unit according to the present disclosure.

[21] FIG. 5 is a block diagram illustrating the structure of a smart device according to the

present disclosure.

[22] FIG. 6 is a block diagram illustrating the structure of a product information generation unit according to the present disclosure.

[23] FIGS. 7 to 10 are exemplary diagrams illustrating the operating states of a shielding unit and an auxiliary shielding unit according to the present disclosure.

[24] FIG. 11 is a flowchart illustrating a subscription service providing process using the smart interaction management system according to one embodiment of the present disclosure.

【Mode for Invention】

10 [25] In what follows, embodiments disclosed in this document will be described in detail with reference to appended drawings, where the same or similar constituting elements are given the same reference number irrespective of their drawing symbols, and repeated descriptions thereof will be omitted. The suffixes “module” and “unit” for the constituting elements used in the following descriptions are assigned or used interchangeably only for the convenience of writing the present document and do not have separate meanings or roles distinguished from each other. Also, in describing an embodiment disclosed in the present document, if it is determined that a detailed description of a related art incorporated herein unnecessarily obscures the gist of the embodiment, the detailed description thereof will be omitted. Also, it should be understood that the appended drawings are intended only to help
15 understand embodiments disclosed in the present document and do not limit the technical principles and scope of the present disclosure; rather, it should be understood that the appended drawings include all of the modifications, equivalents, or substitutes belonging to the technical principles and scope of the present disclosure.

[26] The terms including ordinal numbers such as first and second are introduced to
25 describe various constituting elements, but the constituting elements should not be limited by

the terms. The terms are used only for the purpose of distinguishing one constituting element from the other constituting elements.

[27] If a constituting element is said to be “connected” or “attached” to a different constituting element, the former may be connected or attached directly to the different element, but another constituting element may be present between the two constituting elements. On the other hand, if a constituting element is said to be “directly connected” or “directly attached” to a different constituting element, it should be understood that there is no other constituting element between the two constituting elements.

[28] A singular expression should be understood to indicate a plural expression unless otherwise explicitly stated.

[29] In the present disclosure, the term “include” or “have” is used to indicate existence of a feature, number, step, operation, constituting element, component disclosed in the present document, or a combination thereof; and should not be understood to preclude the existence or possibility of adding one or more other features, numbers, steps, operations, constituting elements, components, or a combination thereof.

[30] FIGS. 1 and 2 are perspective views illustrating a smart interaction management system according to the present disclosure. FIG. 3 is a block diagram illustrating the structure of a cabinet according to the present disclosure. FIG. 4 is an exemplary diagram illustrating the matching relationship among a cluster, a reference region, and a containing unit according to the present disclosure. FIG. 5 is a block diagram illustrating the structure of a smart device according to the present disclosure. FIG. 6 is a block diagram illustrating the structure of a product information generation unit according to the present disclosure. FIGS. 7 to 10 are exemplary diagrams illustrating the operating states of a shielding unit and an auxiliary shielding unit according to the present disclosure.

[31] Referring to FIGS. 1 to 6, the smart interaction management system 10 for eyewear

virtual fitting and automatic vending according to the present disclosure (in what follows, referred to as a “smart interaction management system”) may comprise a cabinet 100 comprising a plurality of containing units 101, and the cabinet 100 may comprise a controller 110, an interface unit 120, a smart device 130, a product information generation unit 140, a payment unit 150, a product discharge unit 160, a product introduction unit 170, and an optometry unit 180.

[32] In the present disclosure, eyewear may include products such as contact lenses, eyeglass frames, and sunglasses that are worn on a user's head, particularly around the eyes, and are used for vision correction, eye protection, aesthetic enhancement, or fashion accessories. In what follows, for the convenience of description, it is assumed that the eyewear is a contact lens, but the present disclosure is not limited thereto. Contact lenses are optical medical devices used for vision correction and cosmetic purposes and may be broadly classified into two types: soft contact lenses and hard contact lenses. Recently, soft contact lenses have become the most widely used type of contact lenses worldwide, as they cause less foreign body sensation, offer greater wearing comfort, and are relatively inexpensive. Soft contact lenses may include transparent clear contact lenses and color contact lenses that add various colors and iris pattern designs to the transparent clear lenses.

[33] The cabinet 100 may be installed in a designated locate in an outdoor environment where users may easily access it when needed. The cabinet 100 may be configured to be movable to enhance user convenience; however, it is not limited thereto. Alternatively, the cabinet 100 may be installed indoors, such as in a retail environment including attended/unattended optical stores. For example, the cabinet 100 may be embedded into an unused wall surface of an indoor space. Accordingly, it is possible to efficiently place the cabinet into a limited indoor space, effectively improve space utilization, and enhance aesthetic elements from the interior design perspective.

[34] The cabinet 100 may include containing units 101 for accommodating contact lenses (hereinafter referred to as "products"). The containing units 101 may be arranged along the row direction (e.g., the X-axis direction) and the column direction (e.g., the Y-axis direction) inside the case. Each product may be packaged in a box, vinyl, or wrapping material and accommodated within the containing unit 101. Each containing unit 101 may accommodate at least one or more products and preferably may be configured to accommodate a plurality of products. When a plurality of products are accommodated in the containing unit 101, the containing unit 101 may include a transport means for moving products within the containing unit 101 and for discharging them, and a conveyor system publicly known to the public may be used as the transport means.

[35] The products may be labeled according to predetermined criteria. The predetermined criteria for labeling may include, but are not limited to, at least one attribute such as lens refractive power (diopter), lens material (soft or hard), expiration date (monthly, quarterly, or yearly), and lens type (clear lens or color lens).

[36] The labeled products may be classified into a plurality of clusters according to predetermined criteria. The clusters may be classified according to the manager's needs and may be grouped to facilitate inventory management. The predetermined criteria for clustering may include, but are not limited to, at least one of supplier (e.g., manufacturer, distributor, or vendor) and brand name. For the convenience of inventory management, it may be preferable for the clusters to be classified based on each supplier (and individual) that directly places products into the cabinet 100.

[37] The cabinet 100 may be partitioned into a plurality of predetermined reference regions 103. The cabinet 100 may be divided into a plurality of reference regions 103 along the row direction and/or the column direction. Adjacent reference regions 103 may be separated by partitions. Each of the reference regions 103 may be assigned at least one or

more containing units 101. The number of containing units 101 assigned to each reference region 103 may be preselected based on the manager's needs.

[38] The labeled products may be classified into the corresponding clusters and stored in the containing units 101 of the corresponding reference regions 103. In other words, each reference region 103 may be selectively matched with at least one cluster, and each product may be accommodated in the containing unit 101 of the matching reference region 103.

[39] As an example, referring to FIG. 4(a), first products 20a may be classified into a first cluster, and the first cluster may be matched with a first reference region 103a. Second products 20b may be classified into a second cluster, and the second cluster may be matched with a second reference region 103b. The first containing unit 101a included in the first reference region 103a may accommodate the first products 20a classified into the same cluster, and the second containing unit 101b included in the second reference region 103b may accommodate the second products 20b classified into the same cluster.

[40] As another example, referring to FIG. 4(b), third products 20c and fourth products 20d may both be classified into the first cluster, and the first cluster may be matched with the first reference region 103a. The first containing unit 101a1 included in the first reference region 103a may accommodate only the first products 20a having the same labeling, and the second containing unit 101a2 included in the first reference region 103a may accommodate only the second products 20b having the same labeling.

[41] The controller 110 is configured to perform overall control of the smart interaction management system 10 and may include a program code for signal processing and control, a memory (not shown) for storing the code, and a processor (not shown) for executing the code, which may be implemented by, for example, a computer. The controller 110 may execute one or more instructions.

[42] The interface unit 120 serves as an interface with all external devices connected to

the smart interaction management system 10. The interface unit 120 may receive data or power from an external device and deliver it to each constituting element inside the smart interaction management system 10 and may also enable internal data thereof to be transmitted to an external device. Also, the interface unit 120 may include wired or wireless communication interface for communication between constituting elements of the smart interaction management system 10.

[43] One or more smart devices 130 may be disposed on the front surface of the cabinet 100. A plurality of smart devices 130 may be provided so that a plurality of users may use the smart devices. The smart device 130 may include a user authentication unit 131, a display unit 133, and a user input unit 135.

[44] The user authentication unit 131 is configured to authenticate a user and may include at least one of a biometric information recognition module for recognizing the user's biometric information and an identification information recognition module for recognizing identification information assigned to the user. The user may register their biometric information through a subscription procedure or the like. The biometric information may include biometric information on the face, hand, or eye (iris, pupil, and so on) of the user. The user authentication unit 131 may further include a face recognition unit for recognizing the user's facial information.

[45] The user authentication unit 131 may provide identification information for user authentication to the user. The user may access and use the smart interaction management system 10 using the provided identification information. The identification information may be provided in the form of an identification number or an identification pattern or in a format that may be stored on a personal mobile device such as a smartphone or a tablet, such as a QR code, an NFC tag, or a barcode.

[46] The user authentication unit 131 may store biometric or identification information of

a pre-registered user and perform user authentication by recognizing the biometric information or reading the identification information of the user who wants to use the smart interaction management system 10 and comparing the information with the stored user information.

5 **[47]** The display unit 133 may include a display panel that provides the user with detailed information on stored products, inventory status, the user's product purchase history, and product search/selection history, as well as a virtual fitting experience of a product. The display panel may be implemented using technologies such as a liquid crystal display (LCD), light-emitting diode (LED), organic light-emitting diode (OLED), or the like but is not limited
10 thereto.

[48] The user input unit 135 may generate key input data for the user to control operations of and make selections within the smart interaction management system 10. To this end, the user input unit 135 may include components such as a keypad, a dome switch, or a touch pad (resistive/capacitive). In particular, when the touch pad forms a mutual layer structure
15 together with the display panel, the resulting configuration may be referred to as a touch screen.

[49] The smart device 130 may provide a virtual image-based personalized virtual experience and recommendation service to the user. The virtual experience and recommendation service may include acquiring a user image (particularly, a facial image or
20 an ocular image); receiving a virtual image of a contact lens (e.g., a color contact lens) selected by the user from a library; generating a virtual image by applying the image of the selected contact lens to the user image; and displaying the generated virtual image. The smart device 130 may further include an imaging means, such as a camera, for acquiring the user's image. For details related to the virtual experience and recommendation service,
25 references may be made to Korean Patent No. 10-2394021 (Title of Invention: Method for

user adaptive recommendation of contact lenses and apparatus for performing the method) by the same inventor as the present disclosure.

[50] The controller 110 may include a product library 190. The product library 190 may store images and information of products and may be constructed as a database (DB). The product information may include manufacturer and attributes of the product, as well as labeling information and cluster information. The product library 190 may store images of products sold through the smart interaction management system 10, and the product images may be updated based on the stocking status. The images and information of stored products may be provided to the user through the smart device 130.

[51] The product information generation unit 140 may, when a new product is introduced into the cabinet 100, acquire information and images of the product and store them into the product library 190. The product information generation unit 140 may include a scanning unit 141, a product classifier 143, and a region setting unit 145.

[52] The scanning unit 141 may scan (or image) the stocked product to generate product information data. The product information data may include two-dimensional and/or three-dimensional images, and the scanning unit 141 may include a 3D scanner or a camera for acquiring the product information data. The product information data acquired by the scanning unit 141 may be stored in and updated to the product library 190 and may be used as data for the virtual fitting and recommendation service provided by the smart device 130.

For example, the scanning unit 141 may convert information on the shape, form, and color of a stocked color contact lens and generate two-dimensional and/or three-dimensional data, and the acquired data may be used as product images in the virtual fitting and recommendation service. Accordingly, the smart interaction management system 10 may easily acquire virtual images of newly stocked products through the scanning unit 141 and advantageously link stocked products with the virtual fitting and recommendation service.

[53] The product classification unit 143 may label the input product according to preset criteria based on the product information data acquired by the scanning unit 141 and match the labeled input product to the corresponding cluster. To this end, the product classification unit 143 may utilize a known vision recognition algorithm to extract features of the product based on a specific image of the product. Alternatively, the product classification unit 143 may perform the labeling and cluster matching operation based on the information acquired from the user via the user input unit 135. In another example, the scanning unit 141 may further include a data capture means capable of reading product identifiers printed on the product package, and the product classification unit 143 may perform the labeling operation based on the information read via the data capture means. The data capture means may include a digital camera or a barcode scanner, and the product identifier may correspond to a machine-readable product identifier such as a 1D barcode, a 2D barcode, a 3D barcode, an UPC, or an SKU but is not limited thereto.

[54] The product classifier 143 may determine whether the product input to the scanning unit 141 matches a pre-stored cluster. If the product input to the scanning unit 141 matches a pre-stored cluster, the labeling information of the product may be registered and updated in the matched cluster. If the product input to the scanning unit 141 does not match a pre-stored cluster, a new cluster may be created and registered, and the labeling information of the product may be registered in the new cluster.

[55] When a new cluster is created, the region setting unit 145 may reconfigure the regions of the cabinet 100 to assign a region for placing the corresponding products to the new cluster. The region setting unit 145 may determine whether there is a reference region 103 to which no cluster has been assigned. If there is a reference region 103 to which no cluster has been assigned, the region setting unit 145 may designate the corresponding region as a new cluster. If there is no reference region 103 to which a cluster has not been assigned

yet, the region setting unit 145 may extract a new region including a predetermined number or more of empty containing units 101 and designate the new region as a new cluster. Subsequently, the region setting unit 145 may partition the reference regions 103 into virtual modified regions to include the new region.

5 **[56]** The payment unit 150 may be a means for processing payment for the product selected to be purchased by the user. The payment unit 150 may be activated in response to a control signal from the controller 110. The user may pay the amount for the selected product via the activated payment unit 150. The payment method may include not only cash, credit card, and debit card but also apps such as QR code or Samsung Pay. To this end, the
10 payment unit 150 may include a card reader, a code reader, and the like. Alternatively, the payment unit 150 may perform the payment process by linking with a financial payment server in response to the payment method pre-registered by the user, such as a credit card, a debit card, a bank transfer, or a mobile phone.

[57] The product discharge unit 160 may be the portion that opens toward the outside,
15 through which the product selected by the user is retrieved from the corresponding containing unit 101 and discharged. In other words, the product selected to be purchased by the user may be discharged through the product discharge unit 160 after payment. The product discharge unit 160 may be disposed adjacent to the smart device 130 and may be provided in a quantity corresponding to the number of smart devices 130. Although not shown, the
20 product discharge unit 160 may include a door for opening and closing the internal space, and the door may be opened either by the user's physical force or in response to a product purchase completion signal.

[58] The smart interaction management system 10 may further include a product transfer unit, but the present disclosure is not limited to the specific case. The product transfer unit
25 may, in response to a control signal from the controller 110, receive the product corresponding

to the user's selection from the containing unit 101 and transfer the received product to the product discharge unit 160.

[59] The product introduction unit 170 may be a portion that receives the product to be stocked in the cabinet 100 by the user. Here, the user may refer to a person who performs the task of actually placing products into the cabinet 100 when replenishment is needed due to insufficient stock of an existing product or there is a need to stock a new product. In other words, the user of the product introduction unit 170 may include not only the manager of the smart interaction management system 10 but also anyone who intends to stock products in the cabinet 100 for their own needs(purposes). The user may be requested prior approval from the manager, and access to and use of the product introduction unit 170 may be selectively granted through authentication via the user authentication unit 131.

[60] The product introduction unit 170 may include an opening/closing unit 150 that selectively opens and closes the containing units 101 in response to a control signal from the controller 110. The opening/closing unit 150 may be disposed corresponding to each of the reference regions 103 and may open and close the containing units 101 assigned to each reference region 103. The number of opening/closing units 150 may correspond to the number of reference regions 103. The opening/closing unit 150 may be provided in the form of a door in which locking is controlled through authentication via the user authentication unit 131. The opening/closing unit 150 may be formed on at least one of the front or rear surfaces of the cabinet 100 and may open the containing unit 101 in either the front or rear direction.

[61] Preferably, clusters may be classified based on vendors, and reference regions 103 may be assigned accordingly to each vendor. The controller 110 may control the opening/closing unit 150 to selectively open the containing units 101 based on user information obtained through the user authentication unit 131. In other words, a vendor

representative may request the opening of only the containing units 101 of the reference region 103 assigned to them via user authentication and may place products in the opened containing units 101. In this case, unlike conventional methods in which a manager receives products from all vendors and then places them into containing units, a vendor may directly place their products after obtaining prior approval from the manager, thereby eliminating unnecessary managerial efforts and improving convenience and efficiency of inventory management. Also, since each vendor may request opening of only the containing units 101 within their assigned reference region 103, inventory management may be efficiently carried out while maintaining security. Meanwhile, the manager of the smart interaction management system 10, as a user, may receive products from each vendor and directly stock them into the containing units 101 assigned to each vendor.

[62] The product introduction unit 170 may further include a sub opening/closing unit 155 that is movably provided to selectively open and close the containing units 101. The sub opening/closing unit 155 may be configured to be movable to block at least a portion of the containing units 101 opened by the opening/closing unit 150 in response to a control signal from the controller 110.

[63] The sub opening/closing unit 155 may be configured to slide in the X-axis and/or Y-axis direction inside the opening/closing unit 150. The sub opening/closing unit 155 may be movably provided along a guide rail (not illustrated) for guiding its movement. If necessary, a plurality of sub opening/closing units 155 may be provided, each configured to move only in a selected region or in a selected direction. The sub opening/closing unit 155 may have a rectangular or square plate shape, but the present disclosure is not limited to the specific shape. The number of containing units 101 blocked by the sub opening/closing unit 155 may be determined based on the shape and size of the sub opening/closing unit 155.

[64] The opening/closing unit 150 and the sub opening/closing unit 155 may operate in

conjunction with the region setting unit 145 under the control of the controller 110. As described above, when a new cluster is created, the region setting unit 145 may reconfigure the region of the cabinet 100 to assign a region for placing products corresponding to the new cluster. The region setting unit 145 may determine whether there is a reference region 103 to which no cluster has been assigned. If there is no reference region 103 without an assigned cluster, the region setting unit 145 may extract a new region that includes a predetermined number or more of empty containing units 101 and designate the new region as a new cluster. Subsequently, the region setting unit 145 may reconfigure the containing units 101 of the cabinet 100 as virtual modified regions to include the new region.

[65] The opening/closing unit 150 and the sub opening/closing unit 155 may, in response to a control signal from the controller 110, selectively open and close only the containing units 101 of the region corresponding to the cluster selected by the user. For example, to open only the containing units 101 assigned to the new region among the modified regions, the controller 110 may control the opening/closing unit 150 and the sub opening/closing unit 155 as follows.

[66] For example, referring to FIG. 7, 1) the controller 110 may extract a first region 103a that includes a new region 104 among the reference regions 103a, 103b. 2) The controller 110 may move the sub opening/closing unit 155 to block the containing units 101 in the region of the first region 103a excluding the new region 104. 3) The controller 110 may open the opening/closing unit 150a corresponding to the first region 103a. Accordingly, only the new region 104 may be opened, and the user may place new products in the new region.

[67] In another example, referring to FIG. 8, 1) the controller 110 may extract a first region 103a and a second region 103b that include the new region 104 among the reference regions 103. 2) The controller 110 may move the sub opening/closing unit 155 to block the

containing units 101 in the region of the first region 103a excluding the new region 104. 3) The controller 110 may open the first opening/closing unit 150a corresponding to the first region 103a. Accordingly, some of the containing units 101 in the new region 104 within the first region 103a may be opened, and the user may place new products in the opened containing units 101. 4) The controller 110 may close the first opening/closing unit 150a corresponding to the first region 103a. 5) The controller 110 may move the sub opening/closing unit 155 to block the containing units 101 in the area of the second region 103b excluding the new region 104. 6) The controller 110 may open the second opening/closing unit 150b corresponding to the second region 103b. Accordingly, some of the containing units 101 in the new region 104 within the second region 103b may be opened, and the user may place new products in a portion of the opened containing units 101.

[68] In yet another example, referring to FIG. 9, 1) the controller 110 may extract a first region 103a and a second region 103b that include the new region 104 among the reference regions 103. 2) The controller 110 may move the sub opening/closing unit 155 to block the containing units 101 in the region of the first region 103a and the second region 103b excluding the new region. 3) The controller 110 may open the first opening/closing unit 150a corresponding to the first region 103a and the second opening/closing unit 150b corresponding to the second region 103b either simultaneously or sequentially. Accordingly, only the new region 104 may be opened, and the user may place new products in the containing units 101 of the new region 104.

[69] In still another example, referring to FIG. 10, 1) the controller 110 may extract a first region 103a and a second region 103b that include the new region among the reference regions 103. 2) The controller 110 may move the first sub opening/closing unit 155a to block the containing units 101 in the first region 103a excluding the new region 104 and move the second sub opening/closing unit 155b to block the containing units 101 in the second

region 103b excluding the new region 104. 3) The controller 110 may open the first opening/closing unit 150a corresponding to the first region 103a and the second opening/closing unit 150b corresponding to the second region 103b either simultaneously or sequentially. Accordingly, only the new region 104 may be opened, and the user may place new products in the containing units 101 of the new region 104.

[70] The optometry unit 180 may perform a function of measuring ocular conditions such as visual acuity of the user (e.g., examinee) in a non-face-to-face manner. The optometry unit 180 may include an optometry device and at least one imaging means and may be implemented as an optometry system in conjunction with the smart device 130. The user may use the optometry unit 180 through authentication via the user authentication unit 131.

[71] The optometry device may include detailed configurations of a known optometry device, and the detailed configurations may be arranged on or accommodated within the cabinet 100. For example, the optometry device may include an eye contact unit, where the user's eyes come into contact with the device, and a light source unit. The optometry device may be configured to perform the steps of projecting measurement light from the light source unit onto the user's eyes, aligning the measurement light with a designated region of the eyes (i.e., pupil or iris) based on the movement of the user's eyes, and analyzing the image of the measurement light included in the reflected light reflected from the eyes and determining the conditions of the eyes (i.e., measuring visual acuity) by the controller 110.

[72] As an optometry system, the smart device 130 may serve as a means of non-face-to-face connection between the user and the terminal of a specialist (in what follows, referred to as the "optometrist") who performs optometry, and diagnosis and treatment related to the eyes, such as an optometrist or an ophthalmologist. The smart device 130 may provide non-face-to-face interaction services between the user and the optometrist.

[73] The optometry unit 180 may include a communication module to enable at least one

of wireless or wired communication between the smart device 130 and the optometrist terminal. The optometrist terminal may be a device capable of at least one of wireless or wired communication, any type of IT device may serve as the optometrist terminal, as long as the device is equipped with communication and display functions, such as a PC, a laptop, a smartphone, or a smart pad.

[74] In the optometry system, the optometry process performed for the user by the optometry unit 180 may be shared in real-time with the optometrist via the optometrist terminal, and the user may receive feedback on the optometry result through the smart device 130. For example, the optometry information shared with the optometrist may include real-time information on the alignment between the user's designated eye region and the measurement light, which may be provided as a composite image showing the measurement light projected onto the designated eye region. To this end, the imaging means may capture real-time images of the measurement light projected onto the user's eye during the optometry process, and the information captured by the imaging means may be shared with the optometrist. Feedback from the optometrist who has received the corresponding information may be provided through the smart device 130 in the form of video, audio, or text, and/or by remotely controlling the eye contact unit of the optometry device.

[75] In the optometry system, the optometry result may be provided to the user through the smart interaction management system 10. If necessary, the optometry result may also be provided to the user's terminal. The optometry result may be issued as a certified optometric prescription under the responsibility of the optometrist and may be delivered in the form of an electronic document to the smart device 130 and/or the user's terminal.

[76] Based on the optometry result, the controller 110 may reconstruct a list of purchasable products or a list of recommended products and provide the list to the user through the display unit 133 of the smart device 130. Depending on the needs and

characteristics of the product, the controller 110 may require the following secondary authentication as a prerequisite for product purchase by the user. 1) Personal authentication via the user authentication unit 131, and 2) authentication of the optometry result via the optometry unit 180.

5 [77] FIG. 11 is a flowchart illustrating a subscription service providing process using the smart interaction management system according to one embodiment of the present disclosure.

[78] Referring to FIG. 11, the smart interaction management system 10 according to one embodiment of the present disclosure may provide a subscription service to the user. The subscription service may refer to a service in which the user regularly receives curated
10 information of interest from the manager or others, either for a fee or free of charge.

[79] The smart interaction management system 10 may include a communication network that enables communication with a user (e.g., subscriber) terminal. The communication network may be configured in various forms regardless of communication type, such as wired or wireless, and may be implemented to support communication between servers and between
15 a server and a terminal.

[80] The user terminal may be a terminal used by a user registered in the smart interaction management system 10. The user terminal may be at least one of IT devices having communication and display functions, such as a PC, a laptop, a smartphone, or a smart pad.

[81] The user terminal may access a webpage operated by the manager of the smart
20 interaction management system 10 or an application distributed by the manager to be installed on the terminal. The user terminal may be linked to the smart interaction management system 10 through the webpage or application.

[82] A subscription service based on the user's usage history and/or purchase history may proceed as follows.

25 [83] The smart interaction management system 10 may acquire user information S101.

The user information may be the information of the user registered with the smart interaction management system 10. The user information may be the information acquired through the user authentication unit 131.

[84] The smart interaction management system 10 may extract the user's product
 5 purchase history and product search history (e.g., including products that the user has tried through virtual experience) and generate interest information for the products S102. The interest information may include information extracted by identifying identical or similar features among the products based on the user's purchase history and product search history. The interest information may include a list of similar products having the same or similar
 10 features as the extracted products. The interest information may include virtual images obtained by applying images of the similar products to the user (e.g., virtual images related to virtual fitting or recommendation services). The interest information may include influencer information such as photos or videos of influencers wearing the similar products with the same or similar features. The interest information may include a list of products from
 15 manufacturers based on the user's preferences. The interest information may include not only product information but also external design information. The interest information may include the replacement cycle or expiration date of the products purchased by the user. The interest information may be periodically updated.

[85] The smart interaction management system 10 may periodically transmit a
 20 subscription service based on the interest information to the user terminal S103.

[86] The smart interaction management system 10 may receive feedback on the interest information from the user S104. Here, the feedback may include at least one of the user's intent to purchase a product and the user's level of interest in the product.

[87] The smart interaction management system 10 may provide the user with the location
 25 of a cabinet 100 where the product may be purchased, based on the user's feedback S105.

For example, the smart interaction management system 10 may include a plurality of cabinets 100 disposed in different regions and connected through a communication network, and the cabinets 100 may be stocked with different products. In this case, the smart interaction management system 10 may provide the user with the location of a cabinet 100 that is stocked with the product the user wants, based on the user's feedback. The smart interaction management system 10 may provide the user with the location of the cabinet 100 but may provide the location of a cabinet 100 nearest or easily accessible to the current location of the user. The smart interaction management system 10 according to one embodiment of the present disclosure may improve the user convenience and enhance economic efficiency by regularly providing a subscription service to the user.

[88] The embodiments described above may be implemented as a hardware component, a software component, and/or a combination of the hardware and software components. For example, the device, method, and the components described in the embodiments may be implemented using one or more general-purpose computers or special-purpose computers including, for example, a processor, a controller, an Arithmetic Logic Unit (ALU), a digital signal processor, a microcomputer, a Field Programmable Array (FPA), a Programmable Logic Unit (PLU), a microprocessor, or any other device capable of executing and responding to instructions. The processing device may execute an operating system (OS) and one or more software applications run on the operating system. Also, the processing device may access, store, manipulate, process, and generate data in response to the execution of the software. For the convenience of understanding, it is often assumed that one processing device is employed; however, it should be understood by those skilled in the art that the processing device may include a plurality of processing elements and/or a plurality of processing element types. For example, the processing device may include a plurality of processors or one processor and one controller. Other processing configurations are also

possible, such as parallel processors.

[89] The methods according to the embodiments of the present disclosure may be implemented in the form of program commands which may be executed through various types of computer means and recorded in a computer-readable recording medium. The computer-readable recording medium may include program commands, data files, and data structures separately or in combination thereof. The program commands recorded in the medium may be those designed and configured specifically for the present disclosure or may be those commonly available for those skilled in the field of computer software. Examples of a computer-readable recording medium may include magnetic media such as hard-disks, floppy disks, and magnetic tapes; optical media such as CD-ROMs and DVDs; magneto-optical media such as floptical disks; and hardware devices specially designed to store and execute program commands such as a ROM, a RAM, and a flash memory. Examples of program commands include not only the machine code such as those generated by a compiler but also the high-level language code which may be executed by a computer through an interpreter and the like. For example, the hardware device may be configured to operate as a module consisting of one or more software modules to perform the operation of the embodiments of the present disclosure and vice versa.

[90] Software may include a computer program, code, instructions, or a combination of one or more of the above; and may configure a processing device to operate in a desired manner or instruct the processing device independently or collectively. The software and/or data may be embodied in a particular type of machine, component, physical equipment, virtual equipment, computer storage medium, or device to be interpreted by the processing device or to provide instructions or data to the processing device. The software may be distributed over computer systems connected to each other through a network to be stored or executed in a distributed manner. The software and data may be stored in one or more

computer-readable recording media.

[91] As described above, although the present disclosure has been described with reference to a limited number of embodiments and drawings, the present disclosure may be modified and changed in various ways from the descriptions above by those skilled in the art to which the present disclosure belongs. For example, an appropriate result may still be achieved even if the technical elements described above are executed in a different order from that of the method described above and/or the constituting elements such as the system, the structure, and the circuit described above are merged or combined in a form different from that described above or replaced or substituted by other constituting elements or equivalents.

[92] [DETAILED DESCRIPTION OF MAIN ELEMENTS]

[93] 10: Smart interaction management system 100: Cabinet

[94] 110: Controller 120: Interface unit

[95] 130: Smart device 140: Product information generation unit

[96] 150: Payment unit 160: Product discharge unit

[97] 170: Product introduction unit 180: Optometry unit

【CLAIMS】**【Claim 1】**

A smart interaction management system comprising:

a cabinet comprising a plurality of reference regions delimited such that pieces of
5 labeled eyewear are classified according to the corresponding clusters and loaded therein, and
containing units allocated to reference regions such that one or more pieces of eyewear are
contained therein;

a controller for executing one or more instructions;

a smart device comprising a user authentication unit for authenticating a user based
10 on user information and a display unit for providing information of the eyewear;

product discharge units for receiving the eyewear transferred from the containing
units and discharging the same to the outside; and

a product introduction unit through which the eyewear to be contained in the
containing units is provided,

15 wherein the product introduction unit comprises opening/closing units disposed to
correspond to the reference regions, respectively, such that the containing units allocated to
the respective reference regions are opened/closed, and

the controller selectively opens/closes the opening/closing units based on the user
information through the user authentication unit.

20

【Claim 2】

The system of claim 1, wherein the product information generation unit comprises:

a scanning unit for scanning incoming eyewear and generate product information
data; and

25 a product classification unit for matching the introduced eyewear to the

corresponding cluster based on the product information data obtained by the scanning unit,

wherein the product classification unit determines whether the eyewear introduced to the scanning unit matches any of the pre-registered clusters;

5 if the eyewear introduced to the scanning unit matches one of the pre-registered clusters, registers and updates labeling information of the introduced eyewear to the matched cluster; and,

if the eyewear introduced to the scanning unit does not match any of the pre-registered clusters, generates and registers a new cluster and register labeling information of the introduced eyewear to the new cluster.

10

【Claim 3】

The system of claim 2, wherein the product information generation unit further includes:

15 a region setting unit for resetting the reference regions of the cabinet when the new cluster is generated,

wherein the region setting unit determines whether there is any reference region to which no cluster is assigned among the reference regions;

if there exists a reference region to which no cluster is assigned among the reference regions, designates the corresponding region as the new cluster; and,

20 if there is no reference region to which the cluster is not assigned among the reference regions, extracts a new region that includes unoccupied containing units, designates the new region as the new cluster, and re-segments the reference regions into modified regions including the new region.

【Claim 4】

25 The system of claim 3, wherein the product introduction unit includes one or more

auxiliary opening/closing units disposed inside the opening/closing unit and movably provided to selectively open/close the containing units, and

the controller extracts a first region that includes the new region from among the reference regions, moves the auxiliary opening/closing unit to shield the containing units in the region of the first region excluding the new region, and opens the opening/closing unit corresponding to the first region.

【Claim 5】

The system of claim 2, wherein the display unit provides a virtual fitting experience by generating and displaying a virtual image obtained by applying the image of the eyewear selected by the user to the user image, and

the controller includes a product library that stores images of the eyewear for providing the virtual fitting experience, and

the product library is updated to include the product information data obtained by the scanning unit.

【Claim 6】

The system of claim 1, wherein the smart interaction management system further includes an optometry unit comprising a communication module configured to allow communication among the smart device, the optometry unit, and an optometrist terminal for optometric examination,

wherein the optometry unit shares, in real-time, optometry information including the optometric process with the optometrist terminal, and

the smart device receives feedback of the optometrist from the optometrist terminal.

【Claim 7】

The system of claim 6, wherein the optometry information includes optometric results authenticated by the optometrist, and

the controller requires, as conditions for the user's eyewear purchase, both personal
5 authentication through the user authentication unit and optometric result authentication through the optometry unit.