

DESCRIPTION

Title of the Invention: COOKING METHOD DETERMINATION SYSTEM
AND COOKING METHOD DETERMINATION METHOD

TECHNICAL FIELD

[0001]

The present invention relates to a cooking method determination system and a cooking method determination method.

BACKGROUND ART

[0002]

There are many consumers who are concerned about what kind of meals they should take to maintain their health. To address such a concern, there is a need for optimized nutritional food, which is an ideal diet containing necessary nutrients. For optimized nutritional food as processed food, it is required to consider not only recipe design that includes the necessary nutrients, but also changes in the nutrients due to variations in ingredients, processing and sales period. However, nutrients may be decayed depending on cooking conditions, storage conditions, and the like. In particular, for nutrients such as vitamins, the content of which is decreased in the processes of combining, processing, and storing ingredients, it is necessary to sufficiently consider selection and the content of the ingredients in recipe design.

[0003]

In such recipe design, it is necessary to predict and determine whether the content of nutrients remains within a prescribed value during the consumption period, in consideration of the nutrients contained in ingredients of processed food, environmental conditions such as heat and light during processing, and product forms such as frozen, room temperature, solid, liquid, and the like. In the known art, changes in content of nutrients of combinations of various ingredients and/or nutrients due to changes in the set values of processing conditions were collected as experimental data, and the experimental data was used to predict changes in nutrients, and to perform recipe design for processed food. Documents in which this type of technology is described include Patent Document 1 and Patent Document 2.

[0004]

Patent Document 1 relates to a recipe customization support system and a recipe customization support method that upon receiving a change in a component value of a specific nutrient component contained in a dish from information on the ingredients, the amounts, and cooking conditions that are used for the dish, change the amount and ingredients based on information on each ingredient and cooking method, and provide a customized recipe. Patent Document 2 relates to a recipe nutritive value calculation apparatus and a recipe nutritive value calculation program that calculate nutritive values contained in food ingredients for each recipe, and provide

them to a user.

Citation List

Patent Documents

[0005]

Patent Document 1: Japanese Unexamined Patent Application,
Publication No. 2006-139694

Patent Document 2: Japanese Unexamined Patent Application,
Publication No. 2003-216737

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

[0006]

However, in order to predict changes in nutrients by the accumulation of experimental data, experimental data suitable for various conditions were required, and there were limitations in developing recipes for a variety of processed food. In addition, for processed food, adjustment of a recipe may be required from the viewpoint of taste, flavor, and the like, and it was difficult to predict whether the content of nutrients can be achieved without excess or deficiency for each condition.

[0007]

The present invention is made in view of the above circumstances, and it is an object of the present invention to provide a cooking method determination system and a cooking method determination method that can appropriately and easily determine excess or deficiency of content of nutrients.

Means for Solving the Problems

[0008]

In order to achieve the above-described object, one aspect of the present invention is directed to a cooking method determination system including machine learning means that generates a learning model by using influencing factor data pertaining to a cooking process for processed food, and nutrient content data indicating nutrient content that changes depending on an influencing factor, learning model recording means that records the learning model generated by learning, estimated value calculating means that calculates an estimated value of the nutrient content in the processed food by using the learning model, prescribed value recording means that records a prescribed value of the nutrient content set for each processed food, and determining means that determines whether the nutrient content is within the prescribed value by reading a prescribed value of each nutrient from the prescribed value recording means, and comparing the prescribed value with the estimated value.

[0009]

Furthermore, one aspect of the present invention is directed to a cooking method determination method using a computer, which is a cooking method determination method including a machine learning step of performing machine learning that generates a learning model by using influencing factor data pertaining to a cooking process for processed food, and nutrient content data indicating nutrient content

that changes depending on an influencing factor, a learning model recording step of recording a learning model generated by learning, an estimated value calculating step of calculating an estimated value of the nutrient content in the processed food by using the learning model, a prescribed value recording step of recording a prescribed value of the nutrient content set for each processed food, and a determining step of determining whether the nutrient content is within a prescribed value by reading a prescribed value of each nutrient recorded in the prescribed value recording step, and comparing the prescribed value with the estimated value.

Effects of the Invention

[0010]

According to the present invention, it is possible to provide a cooking method determination system, and a cooking method determination method capable of appropriately and easily determining the excess or deficiency of content of nutrients.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a diagram showing a cooking method determination system according to one embodiment of the present invention; FIG. 2 is a block diagram showing a hardware configuration of an information processing apparatus of the cooking method determination system according to the present embodiment; FIG. 3 is a table showing examples of ingredients

corresponding to recipes;

FIG. 4 is a table showing examples of nutrients corresponding to the ingredients;

FIG. 5 is a table showing examples of change amounts of nutrients for each of the recipes;

FIG. 6 is a table showing decay rates of nutrients that change with a lapse of period;

FIG. 7 is a table showing cooking conditions and storage conditions for each of the recipes;

FIG. 8 is a flowchart showing an example of a flow of a process from construction to recording of a learning model;

FIG. 9 is a table showing ingredient and cooking substitute data; and

FIG. 10 is a flowchart showing an example of a flow of a determining process of nutrition content by the cooking method determination system according to the present embodiment.

PREFERRED MODE FOR CARRYING OUT THE INVENTION

[0012]

Hereinafter, an embodiment of the present invention will be described by using the drawings.

[0013]

<System Configuration>

First, an overall system configuration will be described. FIG. 1 is a diagram showing a cooking method determination system 100 according to an embodiment of the present invention. The cooking method determination system 100

provides a service for predicting decay of nutrient content contained in recipe design of optimized nutritional food and the like, and presenting to the user a recipe design that satisfies the regulation of the content of nutrients from processing to sales. In the present embodiment, for example, creation and storage are performed according to a recipe (optimized nutritional food), and decay data regarding nutrients is collected. At this time, data (auxiliary data) relating to pH, a moisture content, heating time, storage temperature, light, and the like are also taken. Then, a learning model is generated by using auxiliary data and the decay result of the nutrients as learning data. By using such a learning model, it is possible to estimate (predict) the amount of decay of nutrients when predetermined cooking, storage, or the like is performed. For example, when developing a new recipe, it is possible to estimate decay of nutrients corresponding to a process in accordance with input of ingredients and the process. Furthermore, it is also possible to propose a change of the cooking method corresponding to the estimation result, propose addition of ingredients, or propose another menu that should be combined for an insufficient nutrient.

[0014]

The cooking method determination system 100 is implemented by an information processing apparatus 1 that performs transmission and reception of various types of information with a user terminal 2 via a communication network such as the

Internet. The information processing apparatus 1 functions as a server that provides various types of information relating to a cooking method and nutrients to the user terminal 2.

[0015]

The user terminal 2 is an information processing apparatus that is used by a user or the like who examines recipe design. The user terminal 2 is configured by a personal computer, a tablet, a smartphone, or the like. The user terminal 2 may exchange various types of information with the information processing apparatus 1 by a program installed in advance or may exchange various types of information through a web browser.

[0016]

<Hardware Configuration>

Next, an example of hardware that configures the information processing apparatus 1 will be described. FIG. 2 is a block diagram showing a hardware configuration of the information processing apparatus 1 of the cooking method determination system 100 according to the present embodiment. The information processing apparatus 1 includes a CPU (Central Processing Unit) 11 as a processor, a ROM (Read Only Memory) 12, a RAM (Random Access Memory) 13, a bus 14, an input/output interface 15, an output unit 16, an input unit 17, a storage unit 18, a communication unit 19, and a drive 20.

[0017]

The CPU 11 executes various processes according to a program recorded in the ROM 12, or a program loaded into the

RAM 13 from the storage unit 18. In the RAM 13, data and the like that are necessary for the CPU 11 to execute various processes are also appropriately stored. The CPU 11, the ROM 12, and the RAM 13 are connected to each other via the bus 14. The input/output interface 15 is also connected to the bus 14.

[0018]

The output unit 16, the input unit 17, the storage unit 18, the communication unit 19, and the drive 20 are connected to the input/output interface 15. The output unit 16 is composed of a display, a speaker, and the like, and outputs various types of information as images and sounds. The input unit 17 is composed of a keyboard, a mouse, or a touchscreen display, and the like, and inputs various types of information. The storage unit 18 is composed of a hard disk, a DRAM (Dynamic Random Access Memory), and the like, and stores various types of data. The communication unit 19 communicates with another apparatus via a network including the Internet.

[0019]

A removable media 21 made of a magnetic disk, an optical disk, a magneto-optical disk, a semiconductor memory, or the like is appropriately attached to the drive 20. A program that is read from the removable media 21 by the drive 20 is installed in the storage unit 18 as necessary. In addition, the removable media 21 can also store various types of data stored in the storage unit 18 in the same manner as the storage unit 18.

[0020]

The hardware configuration described here is merely an example. The computer described in the present embodiment and including the information processing apparatus 1 may have a configuration common to the configuration of FIG. 2, or may have a different configuration. For example, the user terminal 2 in FIG. 1 may have a configuration having a configuration similar to the hardware configuration shown in FIG. 2 or may have a different configuration. Furthermore, the computer may be configured by two or more computers.

[0021]

<Functional Configuration>

Next, a functional configuration of the information processing apparatus 1 will be described. As shown in FIG. 1, the information processing apparatus 1 includes a machine learning unit 30, a classification determining unit 31, a learning model recording unit 32, an estimated value calculating unit 33, a prescribed value recording unit 34, a determining unit 35, a presenting unit 36, and an ingredient recording unit 40, as functional units implemented on the processor (CPU 11).

[0022]

The machine learning unit 30 is machine learning means for performing supervised learning or the like by using a data set that includes influencing factor data pertaining to a cooking process for processed food, and nutrient content data indicating nutrient content that changes depending on an influencing factor. The data set is, for example, ingredient

characteristic data, chemical characteristic data, environmental characteristic data, or the like. An example of the data set used for machine learning will be described with reference to FIG. 3 to FIG. 7.

[0023]

The ingredient characteristic data indicating the characteristics of ingredients will be described with reference to FIG. 3 and FIG. 4. FIG. 3 is a table showing examples of ingredients corresponding to recipes. FIG. 3 shows ingredients corresponding to recipe IDs specifying recipes as processing methods, and information for specifying the amounts of the ingredients. In this example, white sauce, cheese, ham, chicken, penne, bacon, mushroom, tomato, and the like are shown as the ingredients. In addition, numbers are indicated as information indicating the amounts of the respective ingredients. In the table, 0 indicates that no ingredient is used.

[0024]

FIG. 4 is a table showing examples of nutrients corresponding to the ingredients. FIG. 4 shows information for specifying a content (mg) of each of nutrients per predetermined weight (100 g) of the ingredients. In this example, vitamin C, vitamin A, calcium, and iron are shown as the nutrients corresponding to the ingredients. Note that the ingredients illustrated in FIG. 4 correspond to the ingredients illustrated in FIG. 3.

[0025]

Chemical characteristic data indicating changes in nutrients of ingredients will be described with reference to FIG. 5 and FIG. 6. FIG. 5 is a table showing examples of change amounts of nutrients for each recipe. FIG. 5 shows nutrient contents before and after cooking corresponding to the recipe ID, related information relating to the nutrients, and test information. In this example, an initial vitamin C content and an initial calcium content are shown as the nutrient content before cooking, and a post-cooking vitamin C content and a post-cooking calcium content are shown as the nutrient content after cooking. In addition, a pH value and a moisture content (%) are shown as the related information relating to the nutrients. Furthermore, as the test information, the number of tests performed to specify the nutrient content before and after cooking for each recipe is shown. The data with the number of tests of 0 is a theoretical value extracted from papers or the like. Note that in a case where a plurality of tests are performed, for the above-described content, a mean value in the plurality of tests may be used, and a value weighted according to the importance of the test data may be used.

[0026]

FIG. 6 is a table showing decay rates of nutrients that change with a lapse of period. FIG. 6 shows elapsed periods, decay rates of nutrients corresponding to the elapsed periods, and test information. In this example, elapsed months in which a time immediately after the processing is set to 0 are shown

in unit of months as the elapsed periods. In addition, a vitamin C decay rate (%), and a calcium decay rate (%) corresponding to the elapsed period (elapsed month) are shown as the decay rates of nutrients. Furthermore, as the test information, the number of tests performed to confirm the decay rates of the nutrients is shown. Note that the data with the number of tests of 0 is a theoretical value extracted from papers or the like. Note that when a theoretical value extracted from papers or the like is used, the decay rate of the nutrient alone is assumed, but the present invention is not limited to this, and when the decay rate for each recipe can be measured (estimated), the decay rate for each recipe may be used.

[0027]

The environmental characteristic data indicating cooking conditions and storage conditions will be described with reference to FIG. 7. FIG. 7 is a table showing the cooking conditions and the storage conditions for each recipe. FIG. 7 shows information indicating the cooking conditions corresponding to recipe ID, information indicating the storage conditions, and test information. In this example, a cooking temperature (°C), and heating time (minute) are shown as the information indicating the cooking conditions. Further, a freezing temperature (°C), a freezing period, light (lux), an irradiation period of irradiation light, and a packaging form are shown as the information indicating the storage conditions. Furthermore, as the test information, the number

of tests in which cooking and storage that satisfy the cooking conditions and the storage conditions were performed is shown. Note that the data with the number of tests of 0 is a theoretical value extracted from papers or the like.

[0028]

Next, the classification determining unit 31 will be described. The classification determining unit 31 is classification determination means that determines reliability of data in the data set based on the test information and a determination criterion set in advance. The classification determining unit 31 of the present embodiment performs a process of dividing the data included in the data set into first influencing factor data with high reliability, and second influencing factor data with low reliability using the number of tests as a criterion of reliability.

[0029]

For example, a case will be described, where the determination criterion for determining the data as the first influencing factor data with reliability when the number of tests is two (predetermined number) or more, and determining the data as the second influencing factor data with low reliability when the number of tests is less than two (predetermined number) is set. In this case, since the number of tests of recipe ID "A0001" in the table of FIG. 5 is three, the data regarding this recipe ID is determined as the first influencing factor data. On the other hand, since the numbers of tests of recipe IDs "A0002" and "A0003" are zero, data

regarding these recipe IDs are determined as the second influencing factor data.

[0030]

Next, the learning model recording unit 32 is learning model recording means that performs a process of storing a learning model in the storage unit 18 by using the data set.

[0031]

Construction and recording of a learning model by the machine learning unit 30, the classification determining unit 31, and the learning model recording unit 32 will be described with reference to FIG. 8. FIG. 8 is a flowchart showing an example of a flow of a process from construction to recording of a learning model.

[0032]

In step S11, the classification determining unit 31 acquires the influencing factor data pertaining to the processing and storage of processed food, and stores the influencing factor data in the storage unit 18. The influencing factor data is data regarding recipes, ingredients for each recipe, nutrient content for each ingredient (nutrient content before cooking), cooking conditions for the recipe, storage conditions, and an elapsed period from processing, and the like in the aforementioned data set.

[0033]

In step S12, the classification determining unit 31 acquires data regarding changes in nutrients due to the influencing factor data, and stores the change data in the

storage unit 18. The data regarding changes in nutrients is data indicating nutrient content after cooking, the decay rate corresponding to the elapsed period, and the like in the aforementioned data set, and is data corresponding to the influencing factors.

[0034]

In step S13, the classification determining unit 31 performs a classifying process to determine reliability with respect to data for which the number of tests is set. The classification determining unit 31 of the present embodiment classifies the first influencing factor data with high reliability and the second influencing factor data with low reliability based on the number of tests set for each data of the data set.

[0035]

In step S14, the classification determining unit 31 determines whether or not data with high reliability of the data set is sufficient. For example, the classification determining unit 31 determines that sufficient data is prepared when the number of the first influencing factor data is equal to or larger than a threshold value that is set in advance, or when the first influencing factor data accounts for a certain percentage or more.

[0036]

When it is determined that there is sufficient data for learning, the process proceeds to step S15 (step S14: Yes). When it is determined that there is no sufficient data

necessary for learning, the condition for performing machine learning is not satisfied, and therefore the learning process ends.

[0037]

In step S15, the machine learning unit 30 executes machine learning based on the influencing factor data classified by the classification determining unit 31 and the data set of the nutrient change, and constructs a learning model.

[0038]

In step S16, the learning model recording unit 32 stores the learned model in the storage unit 18 in order to use the learned model for determination of the cooking method described later. By the series of processes, the learning model can be used in the information processing apparatus 1.

[0039]

Next, returning to FIG. 1, the estimated value calculating unit 33, the prescribed value recording unit 34, the determining unit 35, the presenting unit 36, and the ingredient recording unit 40 will be described as functional units for determining the cooking method.

[0040]

The estimated value calculating unit 33 is estimated value calculating means that calculates an estimated value of nutrient content for processed food to be estimated. The estimated value calculating unit 33 calculates an estimated value of nutrient content by using the learning model that is made usable by the learning model recording unit 32.

[0041]

The prescribed value recording unit 34 is prescribed value recording means that records a prescribed value of nutrient content set for each processed food (recipe). The prescribed value is a numerical value serving as a reference for determining whether or not the nutrient content is appropriate. Note that although the prescribed value is not particularly limited, an example in which the prescribed value is an upper limit value and/or a lower limit value that is set in advance for each nutrient to satisfy a predetermined criterion in the optimized nutritional food will be described in the present embodiment.

[0042]

The determining unit 35 is determining means that determines whether or not the estimated value of the nutrient content calculated by the estimated value calculating unit 33 is within the prescribed value. The determining unit 35 reads a prescribed value of each nutrient recorded by the prescribed value recording unit 34 and compares the prescribed value with the estimated value of the nutrient content.

[0043]

The presenting unit 36 is presenting means that presents substitute information regarding the ingredient and/or the cooking method. The presenting unit 36 presents the substitute information regarding the ingredient and/or the cooking method when the determining unit 35 determines that the estimated value of the nutrient content does not match the prescribed

value. The presenting unit 36 can also present a plurality of types of substitute information when there are a plurality of variations in substitute method.

[0044]

The ingredient recording unit 40 is ingredient recording means that records ingredient and cooking substitute data that are presented by the presenting unit 36.

[0045]

FIG. 9 is a table showing ingredient and cooking substitute data. The table of FIG. 9 shows target ingredients, substitute ingredients, cost evaluations, change in taste, use threshold values, and change in calorie corresponding to each nutrient. In this example, vitamin C, calcium, and iron are shown as nutrients. The target ingredient is an ingredient to be substituted, and a green pepper, salmon, short-neck clam, and the like are shown.

[0046]

In the substitute ingredient, a plurality of types (variations) are set for a combination of the same nutrient and target ingredient. For example, for a combination of vitamin C and green pepper, a vitamin C additive is shown as a first substitute ingredient, and lemon juice as a second substitute ingredient is shown. In addition, for a combination of calcium and salmon, a calcium additive is shown as the first substitute ingredient, and cheese as the second substitute ingredient is shown. In addition, for a combination of iron and a short-neck clam, an iron additive is shown as

the first substitute ingredient, and a deep-fried bean curd as the second substitute ingredient is shown.

[0047]

A cost evaluation, a change in taste, a use threshold value, and a change in calories are set for each of the substitute ingredients. The cost evaluation is a numerical value indicating a degree of cost when switching to the substitute ingredient. The cost evaluation may be a numerical value indicating direct money, or may be an index indicating the degree of cost increase. The change in taste is information indicating a degree of change in taste when switching to the substitute ingredient. In the present embodiment, "large" is set when the degree of the change in taste is large, "middle" is set when the change in taste is moderate, "slight" is set when the degree of the change in taste is slight, and "none" is set when there arises little change in taste, or no change in taste is felt.

[0048]

The use threshold value is a numeral value that serves as a criterion for setting the substitute information by the presenting unit 36. In the present embodiment, the condition that the estimated value of the decay rate of a nutrient is larger than the use threshold value is a condition for presenting the substitute information by the presenting unit 36. Note that the presenting unit 36 may present a nutrient additive when the estimated value of the nutrient of the substitute ingredient is equal to or less than the use

threshold value.

[0049]

The change in calories is a numeral value indicating a degree of a change in calories when switching to the substitute ingredient. The change in calories may be calories that directly change, or may be an index indicating the degree of calories. The change in calories can be used as a criterion for determining substitute selection by the presenting unit 36.

[0050]

Next, a series of processes to determine a cooking method based on information that is inputted from the user terminal 2 will be described with reference to FIG. 10. FIG. 10 is a flowchart showing an example of a flow of a determination process of nutrient content by the cooking method determination system 100 according to the present embodiment.

[0051]

In step S21, the estimated value calculating unit 33 acquires the influencing factor data pertaining to the ingredient, processing, and storage in the recipe design from the user terminal 2. The influencing factor data are data regarding recipes, ingredients for each recipe, nutrient content (nutrient content before cooking) for each ingredient, cooking conditions of each recipe, storage conditions, an elapsed period from processing, and the like.

[0052]

In step S22, the estimated value calculating unit 33

inputs the influencing factor data acquired from the user terminal 2 into the learning model that is recorded by the learning model recording unit 32, and causes the learning model to calculate an estimated value of the nutrient content. The estimated value of the nutrient content that is outputted by the learning model includes, for example, the change amount of the nutrient content after cooking to which the recipe is applied, the change amount of the nutrient content by the storage method, the decay rate according to the elapsed period after processing, and the like.

[0053]

In step S23, the determining unit 35 acquires a prescribed value corresponding to the recipe to be determined from the prescribed value of the nutrient content for each recipe recorded by the prescribed value recording unit 34.

[0054]

In step S24, the determining unit 35 compares the estimated value of the nutrient content outputted by the learning model, and the prescribed value of the nutrient content.

[0055]

In step S25, when the estimated value satisfies the prescribed value, the determining unit 35 advances the process to step S26 (step S25; Yes). In step S26, the determining unit 35 displays, on the user terminal 2, that the recipe design specified by the user matches the prescribed value. After the process of step S26, the process of the flowchart ends.

[0056]

In step S25, when the estimated value does not satisfy the prescribed value, the determining unit 35 advances the process to step S27 (step S25; No). In step S27, the presenting unit 36 acquires a substitute ingredient corresponding to a target ingredient that does not satisfy the prescribed value from the substitute ingredients recorded by the ingredient recording unit 40.

[0057]

In step S28, the presenting unit 36 acquires a use threshold value that is set for the acquired substitute ingredient.

[0058]

In step S29, the presenting unit 36 determines whether or not the use threshold value is larger than the estimated value of the decay rate. When the use threshold value is larger than the estimated value of the decay rate, the presenting unit 36 advances the process to step S30 (step S29; Yes). When the use threshold value is equal to or less than the estimated value of the decay rate, the process is advanced to step S35 (step S29; No).

[0059]

In step S30, when the use threshold value of the substitute ingredient is smaller than the decay rate of the nutrient estimated in the first recipe design, the presenting unit 36 creates the influencing factor data on the substitute ingredient, because use of the substitute ingredient is

effective.

[0060]

In step S31, the estimated value calculating unit 33 inputs the influencing factor data corresponding to the substitute ingredient into the learning model, and causes the learning model to calculate an estimated value of nutrient content of a recipe reflecting the substitute ingredient.

[0061]

In step S32, when the estimated value of the recipe reflecting the substitute ingredient satisfies the prescribed value, the determining unit 35 advances the process to step S33 (step S32; Yes). When the estimated value of the substitute ingredient does not satisfy the prescribed value, the determining unit 35 advances the process to step S35 (step S32; No).

[0062]

In step S33, the determining unit 35 determines whether or not a change in calories set for the substitute ingredient is smaller than the prescribed value. When the change in calories is smaller than the prescribed value, the determining unit 35 advances the process to step S34 (step S33; Yes). When the change in calories is not smaller than the prescribed value, the determining unit 35 advances the process to step S35 (step S33; No).

[0063]

In step S34, the presenting unit 36 presents the substitute ingredient that satisfies the prescribed value of

the nutrient content and has a small change in the amount of calories, and information relating to the substitute ingredient, to the user terminal 2, and ends the process of the flowchart.

[0064]

On the other hand, in step S35, since there is no suitable substitute ingredient, the presenting unit 36 displays re-creation information regarding the recipe design on the user terminal 2, and ends the process of the flowchart. The re-creation information includes text that instructs the user terminal 2 to re-create the recipe design, data regarding nutrient additives together with information regarding cost and taste of the ingredients and substitute ingredients of the recipe design designated by the user, and the like.

[0065]

(1) As described above, the cooking method determination system 100 of the present embodiment has the machine learning unit 30 that generates a learning model by using influencing factor data pertaining to a cooking process for processed food, and nutrient content data indicating nutrient content that changes depending on an influencing factor, the learning model recording unit 32 that records a learned model generated by learning, the estimated value calculating unit 33 that calculates an estimated value of the nutrient content in the processed food by using the learning model, the prescribed value recording unit 34 that records a prescribed value of the nutrient content set for each processed food, and the

determining unit 35 that determines whether the nutrient content is within the prescribed value by reading a prescribed value of each nutrient from the prescribed value recording unit 34, and comparing the prescribed value with the estimated value. Accordingly, it is possible to appropriately and easily estimate the nutrient content of the processed food, which varies depending on various conditions of the cooking method, the storage method, and the like, and is difficult to estimate, by using machine learning.

[0066]

(2) Further, the cooking method determination system 100 of the present embodiment, wherein the influencing factor data includes data relating to ingredient characteristics, environmental characteristics, and chemical characteristics pertaining to cooking of the processed food, the cooking method determination system 100 further has the classification determining unit 31 that classifies the data into the first influencing factor data and the second influencing factor data according to the reliability based on the number of tests. Accordingly, it is possible to determine the reliability of learning source data that is used in construction of the learning model based on the classification result by the classification determining unit 31.

[0067]

(3) Further, in the present embodiment, the machine learning unit 30 generates the learning model by using both of, or either data selected from, the first influencing factor

data and the second influencing factor data in machine learning, based on a determination result by the classification determining unit 31. Accordingly, it is possible to construct a learning model corresponding to the application and purpose in such a manner that when high precision is required, machine learning is performed by using only the first influencing factor data to construct a learning model with high precision, and when a large amount of data necessary for learning is required, machine learning is performed by using both the first influencing factor data and the second influencing factor data to construct a learning model.

[0068]

(4) Furthermore, the cooking method determination system 100 of the present embodiment further has the ingredient recording unit 40 in which substitute information regarding ingredients and cooking methods is recorded, and the presenting unit 36 that, based on a determination result of the determining unit 35, refers to the ingredient recording unit 40, and presents substitute information. Accordingly, since a substitute is presented when the estimated value of the nutrient content is less than the prescribed value, it is not necessary to redo the design of the recipe from the beginning, and it is possible to smoothly advance the recipe design.

[0069]

(5) Furthermore, in the present embodiment, the presenting

unit 36 presents data regarding a nutrient additive together with information regarding cost and taste in a case where the estimated value of the nutrient of the processed food using the ingredient and/or the cooking method presented by the presenting unit 36 is not within a prescribed value after a predetermined period has elapsed. Accordingly, even when the nutrient is not within the prescribed value, even with the substitute, it is possible to consider design of a new recipe with reference to the information regarding cost and taste, and the data regarding the nutrient additive that are presented.

[0070]

(6) Further, in the present embodiment, the presenting unit 36 acquires a calorie value of the processed food, and determines whether a change amount of the calorie value is smaller than a prescribed value based on the substitute information regarding the ingredient and/or the cooking method. Accordingly, it is possible to prevent selection of a substitute with which the calorie value, which is an important determination index in the processed food, changes greatly.

[0071]

(7) Furthermore, a cooking method determination method of the present embodiment includes a machine learning step of performing machine learning that generates a learning model by using influencing factor data pertaining to a cooking process for processed food, and nutrient content data indicating nutrient content that changes depending on an influencing

factor, a learning model recording step of recording a learning model generated by learning, an estimated value calculating step of calculating an estimated value of the nutrient content in the processed food by using the learning model, a prescribed value recording step of recording a prescribed value of the nutrient content set for each processed food, and a determining step of determining whether the nutrient content is within a prescribed value by reading the prescribed value of each nutrient recorded in the prescribed value recording step, and comparing the prescribed value with the estimated value.

[0072]

One embodiment of the present invention is described above, but the present invention is not limited to the aforementioned embodiment, and modifications, alterations, and the like within the range in which the object of the present invention can be achieved are included in the present invention.

[0073]

The presenting unit 36 may be configured to perform a process of presenting a recommendation to change an amount of ingredient (increase the ingredient) corresponding to a nutrient, when the nutrient (estimated result) contained in the ingredient is lower than a predetermined value after the lapse of a predetermined period, and the nutrient is a first nutrient for which an upper limit is not set for an intake amount. Accordingly, since the amount of the ingredient is

increased only when the upper limit is not set, it is possible to avoid occurrence of a situation where excessively large amounts of nutrients for which upper limits are set are set.

[0074]

Furthermore, the presenting unit 36 may be configured to perform a process of presenting a substitute (substitute process) or addition of an additive, when a nutrient contained in the ingredient (estimated result) after the lapse of a predetermined period is lower than a predetermined value, and the nutrient is a second nutrient for which an upper limit is set for an intake amount (for example, potassium).

Accordingly, when a larger amount of nutrient is set with decay after processing taken into account, it is possible to avoid occurrence of a situation where the amount of a nutrient for which an upper limit is set, of the processed food exceeds the upper limit of the intake amount.

[0075]

Furthermore, the presenting unit 36 may be configured to present a substitute, or addition of an additive in consideration of a degree of influence of taste. For example, according to the degree of change in the taste in the table of FIG. 9, the substitute, or addition of an additive to be displayed on the user terminal 2 may be determined, or those with minimal changes in taste may be preferentially displayed. In addition, parameters of strong bitterness and the like may be added as the degree of influence of taste, and a substitute or addition of an additive may be presented according to a

degree of bitterness.

[0076]

Further, the presenting unit 36 may take calories into account when presenting a substitute or addition of an additive. For example, the presenting unit 36 may present (select) substitute information so that the calories (change amount) fall within a predetermined range.

[0077]

Further, the series of processes described above can be executed by hardware, or can be executed by software. In other words, the functional configuration described above is merely an example, and is not particularly limited. That is, it is sufficient if the information processing apparatus 1 includes the function capable of executing the series of processes described above as a whole, and which functional block is used to realize this function is not particularly limited to the example described above. Furthermore, the location of the functional block is not particularly limited and may be arbitrary. For example, the functional block of the information processing apparatus 1 may be transferred to another apparatus or the like. Conversely, the functional block of the other apparatus may be transferred to a server or the like. Furthermore, one functional block may be composed of a single piece of hardware, a single piece of software, or a combination thereof.

[0078]

When a series of processes is executed by software, a

program constituting the software is installed in a computer or the like from a network or a recording medium. The computer may be a computer incorporated in dedicated hardware.

Furthermore, the computer may be a computer that can execute various functions by installing various programs, for example, a server, a general-purpose smartphone, or a personal computer.

[0079]

The recording medium including such a program is not only made up of a removable medium not shown that is distributed separately from the apparatus main body in order to provide the program, but also made up of a recording medium or the like that is provided in a state of being incorporated in the apparatus main body in advance. Since the program can be distributed via a network, the recording medium may be installed, or accessible to a computer that is connected to or connectible to the network.

[0080]

Note that, in the present specification, the step of describing the program recorded in the recording medium includes not only the process that is performed in time series in an order thereof, but also the process executed in parallel or individually without necessarily being processed in time series. Furthermore, in the present specification, the term "system" means an overall apparatus made up of a plurality of apparatuses, a plurality of kinds of means, and the like.

EXPLANATION OF REFERENCE NUMERALS

[0081]

- 1 information processing apparatus
- 2 user terminal
- 30 machine learning unit
- 31 classification determining unit
- 32 learning model recording unit
- 33 estimated value calculating unit
- 34 prescribed value recording unit
- 35 determining unit
- 36 presenting unit
- 40 ingredient recording unit
- 100 cooking method determination system

CLAIMS

[Claim 1]

A cooking method determination system, comprising:

machine learning means that generates a learning model by using influencing factor data pertaining to a cooking process for processed food, and nutrient content data indicating nutrient content that changes depending on an influencing factor;

learning model recording means that records the learning model generated by learning;

estimated value calculating means that calculates an estimated value of the nutrient content in the processed food by using the learning model;

prescribed value recording means that records a prescribed value of the nutrient content set for each processed food; and

determining means that determines whether the nutrient content is within the prescribed value by reading a prescribed value of each nutrient from the prescribed value recording means and comparing the prescribed value with the estimated value.

[Claim 2]

The cooking method determination system according to claim 1, wherein

the influencing factor data includes data relating to ingredient characteristics, environmental characteristics, and

chemical characteristics pertaining to cooking of the processed food,

the cooking method determination system further comprising classification determining means that classifies the data into first influencing factor data and second influencing factor data according to reliability based on a number of tests.

[Claim 3]

The cooking method determination system according to claim 2, wherein

the machine learning means generates the learning model by using both of, or either data selected from, the first influencing factor data and the second influencing factor data in machine learning, based on a determination result by the classification determining means.

[Claim 4]

The cooking method determination system according to claim 1, further comprising:

ingredient recording means in which substitute information regarding an ingredient and a cooking method is recorded; and

presenting means that, based on a determination result of the determining means, refers to the ingredient recording means and presents substitute information.

[Claim 5]

The cooking method determination system according to claim

4, wherein

the presenting means presents data regarding a nutrient additive together with information regarding cost and taste in a case where the estimated value of the nutrient of the processed food using the ingredient and/or the cooking method presented by the substitute information presented by the presenting means is not within a prescribed value after a predetermined period has elapsed.

[Claim 6]

The cooking method determination system according to claim 4, wherein

the presenting means acquires a calorie value of the processed food, and determines whether a change amount of the calorie value is smaller than a prescribed value based on the substitute information regarding the ingredient and/or the cooking method.

[Claim 7]

A cooking method determination method using a computer, comprising:

a machine learning step of performing machine learning that generates a learning model by using influencing factor data pertaining to a cooking process for processed food, and nutrient content data indicating nutrient content that changes depending on an influencing factor;

a learning model recording step of recording a learning

model generated by learning;

an estimated value calculating step of calculating an estimated value of the nutrient content in the processed food by using the learning model;

a prescribed value recording step of recording a prescribed value of the nutrient content set for each processed food; and

a determining step of determining whether the nutrient content is within a prescribed value by reading a prescribed value of each nutrient recorded in the prescribed value recording step, and comparing the prescribed value with the estimated value.