in an indoor space. More specifically, $f(X_n)$ is expressed by (Expression 1) below. Note that $f(X_n)$ is expressed as $f(X_1)$ when n = 1, and as $f(X_1, .., X_n)$ when n ≥ 2.

[0031]

[Math. 1]

$$f(X_n) = \frac{1}{\sum_{k=1}^{n} a_k \cdot \ln(X_k)} \cdot \cdot \text{(Expression 1)}$$

[0032]

In (Expression 1), a_k is a coefficient. For example, when n = 3, X_1 denotes a CO_2 concentration, X_2 denotes a PM concentration, and X_3 denotes a TVOC concentration, a_1, a_2, and a_3 denote coefficients (or in other words, weights) for adjusting the degrees of influence exerted by a CO_2 concentration, a PM concentration, and a TVOC concentration on the general air quality index. A specific value of a_n is appropriately determined based on experience or experiments.

[0033]

Further, ln denotes a natural logarithm. FIG. 3 illustrates values obtained by substituting gas concentrations such as a CO_2 concentration, a PM concentration, and a TVOC concentration into equations for obtaining natural logarithms.

[0034]

In FIG. 3, the hatched values of gas concentrations show reference concentrations (in other words, reference values), and if a gas concentration exceeds its reference concentration in an indoor space, the gas has a harmful effect on human bodies. For example, the reference concentration of the CO_2 concentration is 1000 ppm, the reference concentration of the PM concentration is 30 ppm, and the reference concentration of the TVOC concentration is 400 μg/m^3. In this manner, a reference concentration greatly varies depending on a type of a gas, and thus if the value of a gas concentration is used as it is to calculate the general air quality index, the degree of influence on the general air quality index greatly varies depending on a

[0098]

For example, $f(X_n)$ is expressed by (Expression 1) above, where a_k denotes a coefficient, and g(T, H) is expressed by (Expression 2) above, where DI(T, H) denotes a function indicating a discomfort index, and α and β denote coefficients.

[0099]

In this manner, if the air quality index is calculated using natural logarithms, the influence of a gas concentration and others on the air quality index can be smoothed. In other words, a difference of the degrees of influence of a gas concentration and others on the air quality index can be decreased.

[0100]

For example, $f(X_n)$ is expressed by (Expression 1') above, where a_k and c_k denote coefficients, and g(T, H) is expressed by (Expression 2) above, where DI(T, H) denotes a function indicating a discomfort index, and α and β denote coefficients.

[0101]

In this manner, if the air quality index is calculated by normalizing a gas concentration and others, the influence of, for instance, a gas concentration and others on the air quality index can be smoothed. In other words, a difference of the degrees of influence of a gas concentration and others on the air quality index can be decreased.

[0102]

For example, controller 32 brings the air quality index close to a target range by causing air conditioner 50 disposed in the indoor space to operate when each gas concentration denoted by X_n is lower than a reference concentration.

[0103]

Such air conditioning system 10 can improve air quality by improving comfort when the gas concentrations are relatively low.

[0104]

For example, when at least one gas concentration denoted by X_n is higher than or equal to a reference concentration,

[CLAIMS]

[Claim 1]

An air conditioning system comprising:

a sensor that measures air quality in an indoor space;

an obtainer that obtains information indicating the air quality in the indoor space, the information being output by the sensor; and

a controller that calculates an air quality index based on the information obtained, and controls a ventilator that ventilates the indoor space, based on the air quality index calculated,

wherein the air quality index is expressed by $f(X_n) \times g(T, H)$, where $f(X_n)$ denotes a function with respect to X_n that indicates at least one of a CO_2 concentration, a concentration of total volatile organic compounds (TVOC), a concentration of particulate matter (PM), an NO_X concentration, an SO_X concentration, an O_3 concentration, a mold count, or a dust count, and g(T, H) denotes a function with respect to T denoting temperature and H denoting humidity in the indoor space.

[Claim 2]

The air conditioning system according to claim 1,

wherein $f(X_n)$ is expressed by

[Math. 1]

$$f(X_n) = \frac{1}{\sum_{k=1}^{n} a_k \cdot \ln(X_k)}$$

where a_k denotes a coefficient, and

g(T, H) is expressed by

[Math. 2]

$$g(T, H) = \frac{\beta}{\alpha + ABS(DI(T,H) - 67.5)}$$

where DI(T, H) denotes a function indicating a discomfort index, and α and β denote coefficients.

[Claim 3]

The air conditioning system according to claim 1,

wherein $f(X_n)$ is expressed by

[Math. 3]

$$f(X_n) = \frac{1}{\sum_{k=1}^{n} a_k \cdot X_k / C_k}$$

where a_k and c_k denote coefficients, and

g(T, H) is expressed by

[Math. 4]

$$g(T, H) = \frac{\beta}{\alpha + ABS(DI(T,H) - 67.5)}$$

where DI(T, H) denotes a function indicating a discomfort index, and α and β denote coefficients.

[Claim 4]

The air conditioning system according to any one of claims 1 to 3,

wherein the controller brings the air quality index close to a target range by causing an air conditioner disposed in the indoor space to operate when each gas concentration denoted by X_n is lower than a reference concentration.

[Claim 5]

The air conditioning system according to any one of claims 1 to 4,

wherein when at least one gas concentration denoted by X_n is higher than or equal to a reference concentration, the controller decreases the at least one gas concentration to a gas concentration below the reference concentration by causing the ventilator to operate, and thereafter causes an air conditioner disposed in the indoor space to operate to bring the air quality index close to a target range.

[Claim 6]

An air conditioning system comprising:

a sensor that measures air quality in an indoor space and air quality in an outdoor space;

an obtainer that obtains first information indicating the air quality in the indoor space and second information indicating the air quality in the outdoor space, the first information and the second information being output by the sensor; and

a controller that calculates an air quality index based on the first information obtained and the second information obtained, and controls a ventilator that ventilates the indoor space and an air conditioner disposed in the indoor space, based on the air quality index calculated,

wherein the air quality index is expressed by $f(X_n) \times g_{in}(T_{in}, H_{in}) \times g_{out}(T_{out}, H_{out})$, where $f(X_n)$ denotes a function with respect to X_n that indicates at least one of a CO_2 concentration, a concentration of total volatile organic compounds (TVOC), a concentration of particulate matter (PM), an NO_X concentration, an SO_X concentration, an O_3 concentration, a mold count, or a dust count, $g_{in}(T_{in}, H_{in})$ denoting a function with respect to T_{in} denoting temperature and H_{in} denoting humidity in the indoor space, and $g_{out}(T_{out}, H_{out})$ denoting a function with respect to T_{out} denoting temperature and H_{out} denoting humidity in the outdoor space,

when the controller determines that the air quality index obtained when $g_{in}(T_{in}, H_{in})$ is assumed to be 1 is to reach a target range as a result of the ventilator operating, the controller brings the air quality index close to the target range by causing the ventilator to operate, and

when the controller determines that the air quality index obtained when $g_{in}(T_{in}, H_{in})$ is assumed to be 1 is not to reach the target range as a result of the ventilator operating, the controller brings the air quality index close to the target range by causing the air conditioner to operate.

[Claim 7]

An air conditioning system comprising:

a sensor that measures air quality in an indoor space;

an activity amount measurer that measures an activity amount of a person staying in the indoor space;

an obtainer that obtains information indicating the air quality in the indoor space, and activity amount information indicating the activity amount of the person, the information being output by the sensor, the activity amount information being output by the activity amount measurer; and

a controller that calculates an air quality index based on the information obtained and the activity amount information obtained, and controls a ventilator that ventilates the indoor space, based on the air quality index calculated,

wherein the air quality index is expressed by $f(X_n) \times g(T, H) \times h(A)$, where $f(X_n)$ denotes a function with respect to X_n that indicates at least one of a CO_2 concentration, a concentration of total volatile organic compounds (TVOC), a concentration of particulate matter (PM), an NO_X concentration, an SO_X concentration, an O_3 concentration, a mold count, or a dust count, g(T, H) denotes a function with respect to T denoting temperature and H denoting humidity in the indoor space, and h(A) denotes a function with respect to A denoting an activity amount.

[Claim 8]

The air conditioning system according to claim 7,

wherein the function denoted by h(A) has a positive value irrespective of the activity amount denoted by A, decreases with an increase in the activity amount denoted by A, and increases with a decrease in the activity amount denoted by A.

[Claim 9]

The air conditioning system according to claim 7 or 8,

wherein when the activity amount indicated by the activity amount information is greater than or equal to a reference amount, the controller decreases a temporal change rate of the air quality index to a predetermined value or less by causing an air conditioner disposed in the indoor space to operate, and thereafter brings the air quality index close to a target range by causing the ventilator to operate.

[Claim 10]

The air conditioning system according to any one of claims 1 to 9,

wherein the ventilator includes an air supply device that supplies air to the indoor space, and has a removal function of decreasing at least one of a PM concentration, an NO_X concentration, an SO_X concentration, or an O_3 concentration in the air to be supplied to the indoor space.

[Claim 11]

The air conditioning system according to any one of claims 1 to 10, further comprising:

a removal device having a function of decreasing at least one of a PM concentration, an NO_X concentration, an SO_X concentration, or an O_3 concentration in the indoor space.

[Claim 12]

The air conditioning system according to any one of claims 1 to 11, further comprising:

a server device that includes a data processor that determines a target range of the air quality index, based on the information indicating the air quality in the indoor space measured by the sensor, an operating status of the ventilator, and the air quality index,

wherein the controller brings the air quality index close to the target range determined, by controlling at least the ventilator.