

[DESCRIPTION]

[Title of Invention] AIR QUALITY INFORMATION PROCESSING
SYSTEM AND AIR QUALITY INFORMATION PROCESSING METHOD

5 [Technical Field]

[0001]

The present invention relates to an air quality information
processing system and an air quality information processing method.

[Background Art]

10 [0002]

In recent years, there has been increasing interest in the
health effects of particulate matter (PM) floating in the air.
Therefore, a fine particle detection device for detecting fine particles
in the air has been developed (see Patent Literature 1 (PTL 1)).

15 [Citation List]

[Patent Literature]

[0003]

[PTL 1] Japanese Unexamined Patent Application Publication No.
2019-109225

20

[Summary of Invention]

[Technical Problem]

[0004]

25 The fine particle detection device as described above is
arranged at the detection point in each area, and the fine particle
distribution is generated based on the concentration of the detected
fine particles. With such a fine particle distribution, it is possible to
know a rough fine particle distribution over a wide range including
each area.

30 [0005]

However, with such a fine particle distribution, it is not
possible to know the fine particle distribution in the vicinity of the
position where the user is. That is, the user cannot know the
detailed fine particle distribution in a narrow range.

35 [0006]

Therefore, an object of the present invention is to provide an air quality information processing system and an air quality information processing method that are capable of generating a fine particle distribution in a narrower range than before.

5 [Solution to Problem]

[0007]

An air quality information processing system according to one aspect of the present invention includes: an obtainer that obtains a first detection result of detecting fine particles from each of a plurality of first fine particle sensors provided along a road for
10 detecting fine particles in air; a generator that generates a first fine particle distribution indicating a distribution of the fine particles based on the first detection result; and an outputter that outputs first information based on the first fine particle distribution.

15 [0008]

In addition, an air quality information processing method according to one aspect of the present invention includes: obtaining a detection result of detecting fine particles from each of a plurality of fine particle sensors provided along a road for detecting fine
20 particles in air; generating a fine particle distribution indicating a distribution of the fine particles based on the detection result; and outputting information based on the fine particle distribution.

[Advantageous Effects of Invention]

[0009]

25 According to one aspect of the present invention, it is possible to generate a fine particle distribution in a narrower range than before.

[Brief Description of Drawings]

30 [0010]

[FIG. 1]

FIG. 1 is a schematic diagram showing a configuration of an air quality information processing system according to Embodiment 1.

[FIG. 2]

35 FIG. 2 is a block diagram showing a functional configuration of

an air quality information processing system according to Embodiment 1.

[FIG. 3]

FIG. 3 is a perspective view showing the appearance of the sensor device according to Embodiment 1.

[FIG. 4A]

FIG. 4A is a cross-sectional view showing Example 1 of the sensor device according to Embodiment 1.

[FIG. 4B]

FIG. 4B is a cross-sectional view showing Example 2 of the sensor device according to Embodiment 1.

[FIG. 4C]

FIG. 4C is a cross-sectional view showing Example 3 of the sensor device according to Embodiment 1.

[FIG. 5]

FIG. 5 is a diagram showing an example of an information table including various information obtained by the first server according to Embodiment 1.

[FIG. 6]

FIG. 6 is a flowchart showing the operation of the air quality information processing system according to Embodiment 1.

[FIG. 7]

FIG. 7 is a diagram showing an example of a PM concentration distribution output from the air quality information processing system according to Embodiment 1.

[FIG. 8]

FIG. 8 is a flowchart showing the operation of the air quality information processing system according to Variation 1 of Embodiment 1.

[FIG. 9]

FIG. 9 is a diagram showing an example of route information output by the air quality information processing system according to Variation 1 of Embodiment 1.

[FIG. 10]

FIG. 10 is a flowchart showing the operation of the air quality

information processing system according to Variation 2 of Embodiment 1.

[FIG. 11]

FIG. 11 is a diagram showing an example of integrated information output by the air quality information processing system according to Variation 2 of Embodiment 1.

[FIG. 12]

FIG. 12 is a block diagram showing a functional configuration of an air quality information processing system according to Embodiment 2.

[FIG. 13]

FIG. 13 is a flowchart showing the operation of the first server according to Embodiment 2.

[FIG. 14]

FIG. 14 is a flowchart showing the operation of the controller provided indoors according to Embodiment 2.

[FIG. 15]

FIG. 15 is a diagram showing an example of information, which shows the effect of operating the ventilation equipment, output by the air quality information processing system according to Embodiment 2.

[FIG. 16]

FIG. 16 is a diagram for explaining cooperation with other air quality information processing systems in the air quality information processing system according to other embodiments.

[Description of Embodiments]

[0011]

Hereinafter, embodiments will be described with reference to the drawings. It should be noted that all of the embodiments described below show comprehensive or specific examples. Numerical values, shapes, materials, components, arrangement positions and connection forms of components, steps, order of steps, and the like shown in the following embodiments are examples, and are not intended to limit the present invention. In addition, among

the components in the following embodiments, the components not described in the independent claims will be described as arbitrary components.

[0012]

5 It should be noted that each figure is a schematic diagram and is not necessarily exactly illustrated. In addition, in each figure, substantially the same configuration may be designated by the same reference numerals, and duplicate description may be omitted or simplified.

10 [0013]

 In addition, in the present specification, terms indicating relationships between elements such as equal and terms indicating the shape of elements such as rectangle as well as numerical values and numerical ranges are not expressions that express only strict
15 meanings, but are expressions meaning that a substantially equivalent range, for example, a difference of about several percent is included.

[Embodiment 1]

[0014]

20 [1-1. Configuration of air quality information processing system]

 The configuration of air quality information processing system 1 according to the present embodiment will be described with reference to FIG. 1 to FIG. 5. FIG. 1 is a schematic view showing the configuration of air quality information processing system 1
25 according to the present embodiment. FIG. 2 is a block diagram showing a functional configuration of air quality information processing system 1 according to the present embodiment.

[0015]

 As shown in FIG. 1 and FIG. 2, air quality information
30 processing system 1 includes a plurality of PM sensors 10 provided along road 100 and one or more PM sensors 20 provided at a place different from road 100, one or more PM sensors 30 provided in building 300, one or more PM sensors 40 provided in moving body 120, mobile terminal 50, first server 60, and second server 70. Air
35 quality information processing system 1 is an information processing

system that generates a PM distribution based on the detection results of Particulate Matter (PM) obtained from the plurality of PM sensors. PM is an example of fine particles, and PM distribution is an example of fine particle distribution. In addition, among PM sensors 10, 20, 30, and 40, only PM sensors 10 and 40 are shown in FIG. 2. The configurations of PM sensors 20 and 30 are the same as, for example, the configuration of PM sensor 10.

[0016]

Each of PM sensors 10, 20, 30, and 40 is a sensor module provided outdoors to detect the outdoor air quality, and is an example of a fine particle sensor. PM sensors 10, 20, 30, and 40 detect PM in the air. PM sensors 10, 20, 30, and 40 are, for example, PM2.5 sensors. The fine particle sensor is included in the air quality sensor. In the following, PM sensors 10, 20, 30, and 40 will also be referred to as PM sensors 10 and the like.

[0017]

PM sensor 10 is, for example, a sensor module provided along road 100 to detect PM in the air. In the example of FIG. 1, PM sensor 10 shows an example of being provided on each of a plurality of lighting fixtures 110 provided along road 100. Accordingly, PM sensor 10 can receive electric power from the power source for lighting fixture 110, so that it is not necessary to prepare a power source dedicated to PM sensor 10 when PM sensor 10 is provided. For that reason, the sensor device having PM sensor 10 (for example, sensor device 80 shown in FIG. 3) can be miniaturized.

[0018]

It should be noted that the target to which PM sensor 10 is provided is not particularly limited. PM sensor 10 may be provided on a traffic light, a road sign, a utility pole, or the like disposed along road 100, or may be provided on a support (for example, a pole). The support may have a device for transmitting evacuation information and the like, an image pickup device, a communication device, a notification device, and the like. The image pickup device is, for example, a security camera or the like. The communication device is, for example, a device having a communication interface

that operates as a wireless base station. The notification device is, for example, a sound output device that emits a siren sound or the like, a display device that displays an image, or the like.

[0019]

5 In addition, PM sensor 10 may be provided in building 300 provided along road 100, or may be embedded in road 100 in a state where PM in the air can be detected.

[0020]

10 By providing PM sensor 10 along road 100 in this way, it is possible to efficiently detect the PM concentration in the vicinity of the vehicle traveling, which is the source of PM.

[0021]

15 PM sensors 10 may be arranged, for example, at predetermined intervals. The predetermined interval may be, for example, 500 m, 100 m, or 50 m. In addition, at least one PM sensor 10 may be arranged so as to be provided between intersections or between traffic lights. In addition, PM sensor 10 may be arranged two-dimensionally when the ground is viewed from above.

20 [0022]

In addition, it is advised that PM sensor 10 is provided at, for example, an intersection, a public facility, or the like. For example, it is advised that along road 100, the arrangement density of PM sensors 10 in a predetermined region including an intersection or a public facility is higher than, for example, the provision density of PM sensors 10 in another region along road 100. PM sensor 10 is an example of the first fine particle sensor.

[0023]

30 PM sensor 20 is, for example, a sensor module provided at a place different from road 100 and detects PM in the air. In the example of FIG. 1, an example in which PM sensor 20 is provided at a place where people enter and exit, such as park 200 is shown. PM sensor 20 is provided, for example, on lighting fixture 210, but is not limited thereto, and may be provided on a signboard, a vending machine, or the like.

35

[0024]

PM sensor 30 is, for example, a sensor module provided on building 300 for detecting PM in the air. PM sensor 30 is provided, for example, at a position where the heights of PM sensors 30 are different from one another in building 300. One PM sensor 30c of two or more PM sensors 30 provided in one building 300 may be provided in a first height range close to the ground, another PM sensor 30b may be provided in a second height range higher than the first height range, and yet another PM sensor 30a may be provided in a third height range higher than the second height range.

[0025]

The first height range to the third height range are not particularly limited as long as they do not overlap one another. For example, the first height range may be a range of 0 m or higher and lower than 3 m above the ground, the second height range may be a range of 3 m or higher and lower than 6 m above the ground, and the third height range may be a range of 6 m or higher and lower than 9 m above the ground. In this way, two or more PM sensors 30 may be provided, for example, so that the positions on the two-dimensional map are the same and the heights are different from one another. In addition, PM sensor 30 may be provided on each floor of building 300. In addition, PM sensor 30 may be provided at a height different from that of PM sensor 10. It should be noted that in the example of FIG. 1, an example in which PM sensor 30 is provided in an office building is shown, but the object to be provided is not particularly limited. Building 300 may be a building such as a commercial building or a residential building. In addition, building 300 may be a building included in facilities such as a school, a supermarket, a sports facility, a hotel, a hospital, a museum, a museum, a warehouse, and an auditorium.

[0026]

PM sensor 40 is a sensor module provided on moving body 120 and detecting PM in the air while moving together with moving body 120. In the example of FIG. 1, an example in which PM sensor 40 is provided in an automobile is shown, but the object to be provided is

not particularly limited. PM sensor 40 may be provided on a bicycle, a person, an animal, or the like, or may be provided on a self-propelled device that moves outdoors. For example, when the moving body is a person, PM sensor 40 is provided on a wristwatch,
5 a wearable terminal, or the like. In addition, for example, when the moving body is an animal, PM sensor 40 is provided on a collar or the like.

[0027]

In addition, PM sensor 40 may be provided on a vehicle
10 traveling on a preset route such as a bus or a railroad. PM sensor 40 is an example of a second fine particle sensor.

[0028]

It should be noted that air quality information processing system 1 is only needed to include at least PM sensor 10 among PM
15 sensors 10 and the like.

[0029]

It should be noted that PM is an air pollutant floating in the air, for example, PM_{2.5} having a particle size of 2.5 μm or less.

[0030]

In addition, PM may be a so-called aerosol particle containing at least one of dust, smoke, mist, and the like, or a so-called bioaerosol particle containing at least one of fungi, bacteria, viruses, pollens, animal or plant cell fragments, and the like. Each of PM
20 sensors 10 and the like is a sensor capable of detecting at least one of aerosol particles or bioaerosol particles.

[0031]

As shown in FIG. 2, PM sensor 10a, which is one of the plurality of PM sensors 10, includes sensor 11a and communicator 12a. In addition, PM sensor 10b, which is the other one of the plurality of PM
30 sensors 10, has sensor 11b and communicator 12b. PM sensor 10a and PM sensor 10b form sensor network 13. Sensor network 13 is included in air quality information processing system 1. It should be noted that the number of PM sensors 10 forming sensor network 13 is not particularly limited as long as it is 2 or more.

[0032]

Sensor 11a is a sensor unit that detects PM in the air. The method for detecting PM in sensor 11a is not particularly limited, but PM may be detected, for example, based on the light receiving intensity of scattered light by particles passing through the detection region. It should be noted that the scattered light is, for example, Mie scattered light. In addition, sensor 11a may be configured to generate convection by heating the air with a heater and detect PM contained in the air passing through the detection region by the convection.

[0033]

Communicator 12a communicates with PM sensor 10b and first server 60. Communicator 12a obtains the detection result in which sensor 11b detects PM by directly communicating with communicator 12b. In addition, communicator 12a transmits the detection result that sensor 11a detected PM to first server 60, for example, by communicating with first server 60 via network N, and also transfers the detection result obtained from PM sensor 10b to first server 60. In addition, communicator 12a may transmit the identification information for identifying the PM sensor that detected the detection result and the time information indicating the time when the detection result is detected together. When communicator 12a transmits the time information, each of PM sensors 10 existing in sensor network 13 may have a real-time clock or the like for measuring the current date and time. It should be noted that the timing at which communicator 12a transmits the detection result to first server 60 is not particularly limited, and communicator 12a may, for example, periodically transmit the detection result.

[0034]

Sensor 11b is a sensor that detects PM in the air. Sensor 11b has the same configuration as sensor 11a, and the description thereof will be omitted.

[0035]

Communicator 12b communicates with PM sensor 10a. In other words, communicator 12b does not communicate with first server 60. Communicator 12b transmits the detection result

detected by sensor 11b to PM sensor 10a. In addition, communicator 12b may obtain the detection result detected by the PM sensor from another PM sensor included in sensor network 13 and transfer the obtained detection result to PM sensor 10a.

5 Communicator 12b may have a wireless hopping function.

[0036]

In this way, in sensor network 13, the detection result detected by PM sensor 10b having communicator 12b that does not communicate with first server 60 may be transferred by multi-hop
10 communication to PM sensor 10a having communicator 12a that communicates with first server 60. It should be noted that each of the plurality of PM sensors 10 may have communicator 12a that communicates with first server 60, and each of the plurality of PM sensors 10 may directly communicate with first server 60. Of the
15 plurality of PM sensors 10 in sensor network 13, at least one PM sensor 10 is only needed to be able to communicate with first server 60.

[0037]

In addition, communicator 12a may transmit the state
20 information on the states of sensors 11a and 11b to first server 60. The state information includes at least one of information indicating whether sensors 11a and 11b are operating normally, information indicating the operation integrated time of sensors 11a and 11b, or information on maintenance of sensors 11a and 11b. The
25 information on maintenance includes at least one of information indicating when maintenance is expected to be required or information indicating whether maintenance is required.

[0038]

In this case, communicator 12a obtains the state information
30 of sensor 11b from communicator 12b. In addition, PM sensor 10a includes, for example, at least one of a detector (not shown) for detecting the state of sensor 11a, a measurer (not shown) for measuring the operating time, or a processor (not shown) for information on maintenance. PM sensor 10b includes, for example,
35 at least one of a detector (not shown) for detecting the state of

sensor 11b, a measurer (not shown) for measuring the operating time, or a processor (not shown) for information on maintenance.

[0039]

It should be noted that the method of establishing the communication connection between PM sensor 10a and PM sensor 10b is not particularly limited, and for example, it may be performed by an autonomous connection in which a connection between PM sensor 10a and PM sensor 10b is autonomously established. It should be noted that the connection method of the plurality of PM sensors 10 in sensor network 13 is not particularly limited, and for example, it may be a cascade connection.

[0040]

It should be noted that sensor network 13 may be formed by including at least one PM sensor 20 and at least one PM sensor 30.

[0041]

PM sensor 40 includes sensor 41, communicator 42, and position measurer 43. Since sensor 41 is the same as sensor 11a and communicator 42 is the same as communicator 12a, the description thereof will be omitted. It should be noted that communicator 42 transmits the detection result and the position information that indicates the current position of PM sensor 40 measured by position measurer 43 to first server 60.

[0042]

Position measurer 43 measures the current position of PM sensor 40. Position measurer 43 is realized by, for example, a GPS module that obtains global positioning system (GPS) signals (that is, radio waves transmitted from satellites) and measures the current position of PM sensor 40 based on the obtained GPS signals.

[0043]

It should be noted that position measurer 43 is not limited to the GPS module. Position measurer 43 may be a wireless communication module (that is, a wireless communication circuit) that measures the current position using the position of the access point or the base station of the mobile phone, the received signal strength, and the like by communicating with the access point of the

nearby wireless LAN or the base station of the mobile phone.

[0044]

It should be noted that PM sensor 40 may not have position measurer 43, for example, when moving body 120 to be provided has the position measurer. Then, communicator 42 may transmit the current position of moving body 120 measured by the position measurer of moving body 120 to first server 60 as the current position of PM sensor 40.

[0045]

Each of PM sensors 10 and the like is accommodated in a housing (for example, housing 90 shown in FIG. 3) and provided. Here, sensor d the PM sensor will be described with reference to FIG. 3 to FIG. 4C. It should be noted that it will be described using PM sensor 10 in FIG. 3 to FIG. 4C, but the same applies to PM sensors 20, 30, and 40, respectively. FIG. 3 is a perspective view showing the appearance of sensor device 80 according to the present embodiment. FIG. 4A is a cross-sectional view showing Example 1 of sensor device 80 according to the present embodiment. It should be noted that sensor device 80 is included in air quality information processing system 1.

[0046]

As shown in FIG. 3 and FIG. 4A, sensor device 80 includes PM sensor 10 and housing 90. Housing 90 is a case in which PM sensor 10 is housed inside. Housing 90 may further accommodate a detector that detects the state of sensor 11a, a measurer that measures the operating time, a processor for information on maintenance, a power supply, and the like.

[0047]

Sensor device 80 has, for example, a size small enough to be easily carried by a person or to cause no problem in traveling even if it is attached to moving body 120. That is, sensor device 80 is a small device.

[0048]

Housing 90 is formed with air supply port 91 disposed below PM sensor 10 and two exhaust ports 92 for discharging air from PM

sensor 10 to the outside. PM sensor 10 is provided on the paths of airflows A formed between air supply port 91 and exhaust ports 92. Exhaust ports 92 are provided, for example, above air supply port 91.
[0049]

5 Housing 90 has a configuration that prevents water droplets such as rain from entering housing 90. Air supply port 91 is provided, for example, on the lower surface of housing 90. Exhaust port 92 has, for example, blades 93 that point downwards toward the outside. It is advised that housing 90 comprises, for example, a
10 weather resistant material. It is advised that housing 90 comprises, for example, a material having moisture resistance, raindrop resistance, light resistance, and the like. In addition, it is advised that housing 90 has a raindrop-proof structure such as providing a raindrop-proof cover for avoiding rain.

15 [0050]

 In addition, housing 90 has a configuration for suppressing the invasion of pests and the like into housing 90. Housing 90 may have a mesh-shaped member for suppressing the invasion of pests at each of air supply port 91 and exhaust ports 92. It is advised that the
20 mesh-shaped member has a configuration that suppresses the invasion of pests and does not obstruct the invasion of PM into housing 90. In addition, housing 90 may be configured to contain a repellent or may be coated with a repellent.

[0051]

25 Sensor device 80 may have a hot-swap function from the viewpoint of improving workability in replacement. In this case, when PM sensor 10 is replaced, the worker can safely replace PM sensor 10 without performing an operation of stopping the power supply from the power supply to PM sensor 10.

30 [0052]

 In addition, it is advised that sensor device 80 is detachably attached to an object to be provided. For example, sensor device 80 may be attached to an object with a one-touch detachable mount portion (not shown), and sensor device 80 may be attached to the
35 mount portion with one touch.

[0053]

In addition, sensor device 80 may accommodate a sensor other than PM sensor 10. Other sensors may accommodate, for example, at least one of a temperature and humidity sensor that
5 measures the temperature and humidity around PM sensor 10, a pressure sensor that measures the pressure around PM sensor 10, an airflow sensor that measures at least one of the wind velocity or the wind direction around sensor device 80, a sound sensor that measures the sound around sensor device 80, an optical sensor that
10 measures the light around sensor device 80 (for example, an illuminance sensor), and a gas sensor (for example, an NO₂ sensor) that measures the gas components around sensor device 80. That is, PM sensor 10 and another sensor may be provided adjacent to the object.

15 [0054]

Since sensor device 80 includes a temperature and humidity sensor and a barometric pressure sensor, the detection result of PM sensor 10 can be corrected according to the measurement result of each sensor. Accordingly, a more accurate detection result of PM
20 sensor 10 can be obtained. Furthermore, since communicator 12a transmits the temperature and humidity measurement result to first server 60, first server 60 can also generate a temperature and humidity distribution. In addition, since sensor device 80 includes the airflow sensor, communicator 12a can transmit the measurement
25 result to first server 60. Accordingly, first server 60 can use the measurement result for predicting the PM distribution. In addition, since sensor device 80 includes a sound sensor, the traffic volume of an automobile or the like can be measured. Furthermore, since the sound sensor measures the abnormal noise in sensor device 80, for
30 example, a failure or the like of PM sensor 10 can be detected at an early stage. In addition, since sensor device 80 includes the optical sensor, the current time zone, the weather, and the like can be estimated from the measurement result of the optical sensor. Accordingly, since PM sensor 10 may not have a real-time clock or the
35 like, PM sensor 10 can be further miniaturized. In addition, since

sensor device 80 includes a gas sensor, the measurement related to the exhaust gas of a vehicle such as an automobile can be performed. For example, the gas sensor can perform the measurement related to the pollution caused by exhaust gas. It should be noted that the gas measured by the gas sensor is not limited to NO₂, and may be CO₂, HC, or the like.

[0055]

It should be noted that the other sensor may be provided outside sensor device 80, and may be provided, for example, on an object (for example, lighting fixture 110) on which sensor device 80 is provided. In this case, communicator 12a may transmit the detection results of the other sensors to first server 60.

[0056]

It should be noted that the cross-sectional structure of sensor device 80 is not limited to FIG. 4A, and may be FIG. 4B or FIG. 4C. FIG. 4B is a cross-sectional view showing Example 2 of sensor device 80a according to the present embodiment. FIG. 4C is a cross-sectional view showing Example 3 of sensor device 80b according to the present embodiment.

[0057]

As shown in FIG. 4B, one air supply port 91a and one exhaust port 92a may be formed in housing 90a. Then, air supply port 91a and exhaust port 92a may be provided at diagonal positions in the cross-sectional view of housing 90a. In addition, sensor device 80a may include fan 94 for generating airflow A. Since sensor device 80a includes fan 94, airflow A can be stably generated even if sensor device 80a is provided outdoors. It should be noted that fan 94 is preferably disposed on exhaust port 92a side from the viewpoint of stably generating an airflow in housing 90a, but may be disposed on air supply port 91a side. It should be noted that exhaust port 92a side includes being disposed at a position closer to exhaust port 92a than PM sensor 10. In addition, air supply port 91a side includes being disposed at a position closer to air supply port 91a than PM sensor 10.

[0058]

In addition, as shown in FIG. 4C, one air supply port 91b and one exhaust port 92b may be formed in housing 90b. Then, air supply port 91b and exhaust port 92b may be provided on the same side surface in a cross-sectional view of housing 90b. In addition, sensor device 80b may have fan 94 for generating airflow A.

[0059]

In this way, the housing for accommodating PM sensor 10 is only needed to have at least two openings.

[0060]

With reference to FIG. 1 and FIG. 2 again, mobile terminal 50 is a terminal device that is possessed by a user or the like and is capable of wireless communication. For example, mobile terminal 50 transmits the position information indicating the current position of the own terminal to first server 60 via network N as the information indicating the position of the user. In addition, mobile terminal 50, for example, outputs information transmitted from first server 60 to the user via network N. Mobile terminal 50 may be realized by any device as long as it can communicate with first server 60 and can transmit the position information of the own terminal to first server 60. Mobile terminal 50 may be a smartphone, a tablet, a wearable terminal, or the like. It should be noted that the number of mobile terminals 50 included in air quality information processing system 1 is not particularly limited. In addition, air quality information processing system 1 may not include mobile terminal 50.

[0061]

First server 60 obtains the detection result of PM contained in the air from each of the plurality of PM sensors 10 provided at least along road 100, and generates a PM distribution based on the obtained detection result. The detection result may be the concentration of PM or may be the number of PM. In addition, the PM distribution may indicate the distribution of PM based on the detection result, and, for example, may be the concentration distribution of PM or may be the distribution of the number of PM. In the following, an example in which the PM distribution is a PM concentration distribution will be described. The PM concentration

distribution indicates, for example, the position distribution of the PM concentration.

[0062]

As shown in FIG. 2, first server 60 includes communicator 61,
5 controller 62, and memory 63.

[0063]

Communicator 61 communicates with mobile terminal 50 and
second server 70, respectively, of PM sensors 10 and the like via
network N. Communicator 61 obtains at least the detection result of
10 PM in the air from each of PM sensors 10 and the like. In addition,
communicator 61 obtains position information indicating the current
position of the user from mobile terminal 50. The position
information may be two-dimensional position information indicating
latitude and longitude, or may be three-dimensional position
15 information indicating latitude, longitude, and altitude.

[0064]

In addition, communicator 61 obtains information other than
the above from second server 70. For example, communicator 61
may transmit the generated PM concentration distribution to second
20 server 70 and obtain information based on the PM concentration
distribution from second server 70. In addition, communicator 61
may obtain the user's position information, traffic information,
weather information, and the like from second server 70. In this
way, communicator 61 functions as an obtainer.

25 [0065]

In addition, communicator 61 outputs information based on
the PM concentration distribution generated by controller 62.
Communicator 61 transmits the PM concentration distribution to
mobile terminal 50 or second server 70, for example, via network N.
30 In this way, communicator 61 also functions as an outputter. It
should be noted that the information based on the PM concentration
distribution may be the PM concentration distribution itself, or may
be information generated based on the PM concentration distribution
and other information (for example, information obtained from
35 second server 70).

[0066]

Controller 62 generates information based on the PM concentration distribution based on the information obtained via communicator 61. In the present embodiment, controller 62
5 generates a PM concentration distribution based on at least the detection results obtained from each of a plurality of PM sensors 10. Controller 62 functions as a generator. In addition, controller 62 controls each component of first server 60.

[0067]

10 Here, the information obtained by controller 62 will be described with reference to FIG. 5. FIG. 5 is a diagram showing an example of information table T including various information obtained by first server 60 according to the present embodiment.

[0068]

15 As shown in FIG. 5, controller 62 obtains sensor information and external information. The sensor information is information based on the information obtained from sensor device 80. The external information is information obtained from other than sensor device 80.

20 [0069]

Sensor information includes environmental information, position information, provision attributes, linkage attributes, time information, and status information. The environmental information is information indicating the environment around the
25 place where sensor device 80 is provided, and includes information on air quality. Environmental information includes, for example, information on PM2.5, temperature and humidity, and the like. The position information is information indicating the current position of sensor device 80 (for example, PM sensor 10 or the like), and
30 includes, for example, a horizontal position. Controller 62 may obtain position information from each of PM sensors 10 and the like, or may obtain the identification information of the PM sensor from PM sensors 10 and the like to obtain position information of each of PM
35 sensors 10 and the like based on the obtained identification information and a table in which the identification information is

linked to the position information. It should be noted that controller 62 obtains position information from at least PM sensor 40 by communication.

[0070]

5 The provision attributes are information indicating the attributes of the object on which PM sensor 10 or the like is provided, and for example, includes information indicating whether PM sensor 10 or the like is provided on a fixed object (for example, a structure) or it is provided on a moving object (for example, an automobile).
10 Specifically, the provision attributes include street lights, evacuation information transmission poles, cars, and the like. Controller 62 may obtain the provision attributes from each of PM sensors 10 and the like, or may obtain the identification information of the PM sensor from PM sensors 10 and the like to obtain provision attributes of each
15 of PM sensors 10 and the like based on the obtained identification information and a table in which the identification information is linked to the provision attributes.

[0071]

 In addition, the provision attribute may include information
20 indicating whether PM sensor 10 is provided along road 100 or in a place other than road 100. The place other than along road 100 is a place separated from road 100 by a predetermined distance, for example, a park or the like.

[0072]

25 The linkage attribute is information on the linkage of two or more PM sensors 10 and the like. Information on linked attributes is preset. For example, the linked attribute may be that the provision positions of PM sensors 10 and the like are in a vertical positional relationship. The linkage attribute may include, for example, the
30 number of linked PM sensors 10 and the like (which is the number of interlocking PM sensors 10 and the like, and also referred to as interlocking number), information for specifying PM sensors 10 and the like linked with the own device, and the like. Controller 62 may obtain the linkage attributes from each of PM sensors 10 and the like,
35 or may obtain the identification information of the PM sensor from PM

sensors 10 and the like to obtain linkage attributes of each of PM sensors 10 and the like based on the obtained identification information and a table in which the identification information is linked to the linkage attributes.

5 [0073]

The case where the attribute is that the provision positions of PM sensors 10 and the like are vertical will be described with reference to FIG. 1. In FIG. 1, PM sensors 30a, 30b and 30c have the same latitude and longitude, but differ only in altitude. Each of
10 such PM sensors 30a, 30b and 30c has linkage. In this case, for example, the interlocking number is 3.

[0074]

From the detection results of linked PM sensors 30a, 30b and 30c, for example, it can be determined whether a pollution source is
15 present nearby. For example, when the respective detection results of PM sensors 30a, 30b and 30c are similar (for example, when the PM concentrations are similar), it can be determined that there is no pollution source in the vicinity of PM sensors 30a, 30b and 30c. In addition, when one PM sensor of PM sensors 30a, 30b and 30c has a
20 higher detection result (for example, a higher PM concentration) than the other two PM sensors, it can be determined that there is a pollution source in the vicinity of the one PM sensor. In this way, it is possible to obtain information on air pollution such as the position of the pollution source from the respective detection results of the
25 linked PM sensors 30a, 30b and 30c.

[0075]

It should be noted that the linked attributes are not limited to the provision positions of PM sensor 10 and the like being vertical. The linked attributes are set in advance by the user. For example,
30 the linked attribute may be that the provision position of PM sensor 10 and the like has the same altitude and at least one of the longitude or the latitude is different.

[0076]

With reference to FIG. 5 again, the time information is
35 information related to the time in the detection of PM, and includes,

for example, the current time indicating the time when the detection result is detected and the elapsed operation time indicating the operation time of PM sensor 10 or the like. The state information is information indicating the state of PM sensor 10 or the like, and includes, for example, the presence or absence of a failure.

[0077]

External information includes personal position information indicating the user's current position, medical information indicating the user's consultation status with a medical institution, weather information, and traffic information. It should be noted that controller 62 may estimate the weather information based on the measurement result of the optical sensor, or may estimate the traffic information based on the measurement result of the sound sensor.

[0078]

It should be noted that in the present embodiment, controller 62 is only needed to obtain at least the detection result of PM_{2.5} of the sensor information and the current time.

[0079]

With reference to FIG. 2 again, memory 63 stores various information required for the processing of controller 62. Memory 63 may store for example, the various tables described above. In addition, memory 63 may store the information obtained by communicator 61.

[0080]

Second server 70 is a server different from first server 60, and outputs predetermined information to, for example, first server 60. For example, second server 70 adds other information obtained by second server 70 to the information (for example, PM concentration distribution) obtained from first server 60 and outputs the information to first server 60, or executes a process of outputting information (for example, external information) other than the sensor information shown in FIG. 5 to the first server 60.

[0081]

In addition, second server 70 may be, for example, a server owned by a predetermined institution or the like that receives

information based on the PM concentration distribution generated by controller 62. The predetermined institution may be, for example, a management and operation organization (for example, a developer) that manages the block, or an administrative organization.

5 Accordingly, for example, when the PM concentration of the PM concentration distribution is low, the predetermined institution can use the distribution for the promotion of the block, and when the PM concentration of the PM concentration distribution is high, the distribution can be used for pollution control measures in the block.

10 [0082]

In addition, second server 70 may be, for example, a position information server that manages the user's position information, a traffic information server that manages traffic information, a weather information server that manages weather information, and

15 the like.

[0083]

It should be noted that each of first server 60 and second server 70 may be a cloud server.

[0084]

20 [1-2. Operation of air quality information processing system]

Next, the operation of air quality information processing system 1 according to the present embodiment will be described with reference to FIG. 6 and FIG. 7. FIG. 6 is a flowchart showing the operation of air quality information processing system 1 according to

25 the present embodiment. Specifically, FIG. 6 shows the operation of first server 60.

[0085]

As shown in FIG. 6, communicator 61 obtains the PM concentration from each of the plurality of PM sensors 10 (S11).

30 Communicator 61 obtains, for example, information indicating the PM concentration from each of the plurality of PM sensors 10. In addition, in step S11, communicator 61 may further obtain the PM concentration from each of one or more PM sensors 20, 30, and 40. Communicator 61 outputs the obtained PM concentration to

35 controller 62. The PM concentration obtained from each of the

plurality of PM sensors 10 is an example of the first detection result.
[0086]

Next, controller 62 generates a PM concentration distribution based on the obtained plurality of PM concentrations (S12).
5 Controller 62 obtains information indicating the PM concentration distribution based on, for example, a plurality of PM concentrations. Controller 62 obtains information indicating the PM concentration distribution based on the position information of each of the plurality of PM sensors 10 and the plurality of PM concentrations measured by
10 each of the plurality of PM sensors 10. In addition, controller 62 generates a PM concentration distribution based on, for example, a plurality of PM concentrations detected at the same time. The PM concentration distribution shows the distribution of PM concentration in a region where each of the plurality of PM sensors 10 detects PM
15 (for example, first region R shown in FIG. 7 described later). The PM concentration distribution is an example of the fine particle distribution. It should be noted that the same time here includes the fact that the times match and that there is a difference of about several minutes between the times.

20 [0087]

Here, the PM concentration distribution will be described with reference to FIG. 7. FIG. 7 is a diagram showing an example of PM concentration distributions D1 to D6 output from air quality information processing system 1 according to the present
25 embodiment. It should be noted that each of the PM concentration distributions D1 to D6 shows the PM concentration distribution in the same region (first region R). First region R may be, for example, a region (for example, a block) managed by a management and operation organization or an administration, or may be a region of a
30 predetermined size. First region R is, for example, a rectangular region having side lengths X and Y, but the shape and size of first region R are not particularly limited. First region R is a region including a plurality of PM sensors 10 provided along road 100.

[0088]

35 As shown in FIG. 7, controller 62 generates, for example,

three-dimensional PM concentration distributions D1 to D6 in first region R. PM concentration distributions D1 to D3 are PM concentration distributions when the altitudes are the same (altitude: Z1) and the times are different. Specifically, PM concentration distributions D1 to D3 are PM concentration distributions at times t1, t2, and tn. PM concentration distributions D4 to D6 are PM concentration distributions when the altitudes are the same (altitude: Z2) and the times are different. Specifically, PM concentration distributions D4 to D6 are PM concentration distributions at times t1, t2, and tn. In this way, controller 62 generates the PM concentration distribution for each time or each altitude. It should be noted that the display mode of the PM concentration distribution is not particularly limited, and may be a two-dimensional PM concentration distribution or may be another.

[0089]

Controller 62 can generate PM concentration distributions having different altitudes at the same time, such as PM concentration distributions D1 and D4, by communicator 61 obtaining PM concentration distributions from PM sensors 30a, 30b, and 30c, respectively.

[0090]

It should be noted that at least one of times t1, t2, and tn may be the PM concentration distribution predicted by controller 62. Controller 62 may predict the PM concentration distribution at time tn based on, for example, known PM concentration distributions of time t1, t2, and the like and environmental data such as wind speed and wind direction measured by the airflow sensor. Controller 62 may predict the PM concentration distribution at time tn based on, for example, the PM concentration distribution at at least one of the time t1 or t2 and at least one of the wind speed or the wind direction measured by the airflow sensor.

[0091]

It should be noted that first region R may be a region within a hot and humid area such as a tropical climate. That is, air quality information processing system 1 may be used in a hot and humid

area such as a tropical climate. Each of the plurality of PM sensors 10 and the like is provided, for example, in a hot and humid area such as a tropical climate.

[0092]

5 With reference to FIG. 6 again, communicator 61 then outputs the PM concentration distribution generated by controller 62 to an external device (S13). Communicator 61 outputs, for example, the PM concentration distribution at least at the current time among the PM concentration distributions D1 to D6. The current time may be,
10 for example, the time most recent to the current time. Controller 62 can notify the user who owns mobile terminal 50 of the air pollution status by PM, for example, by outputting the PM concentration distribution to mobile terminal 50. In addition, controller 62 can provide air pollution information of first region R, for example, by
15 outputting the PM concentration distribution to second server 70. In this case, controller 62 may further output information on pollution control measures. For example, when the region where the PM concentration is high is along road 100, controller 62 may output information including limiting the traffic volume.

20 [0093]

In addition, when controller 62 obtains the state information indicating that it is out of order via communicator 61, controller 62 may output the state information to second server 70 managed by the management and operation organization or the administration.
25 In addition, when controller 62 obtains the time information including the elapsed operation time of PM sensor 10 or the like via communicator 61, controller 62 may generate information indicating the replacement time of PM sensor 10 or the like, failure prediction of PM sensor 10 or the like, or the proposal of maintenance work based
30 on the time information, and output the information to second server 70 managed by the management and operation organization or the administration. In this way, controller 62 may provide maintenance information. Accordingly, maintenance of PM sensor 10 and the like can be performed efficiently.

35 [0094]

In addition, as shown in PM concentration distributions D1 to D3 in FIG. 7, communicator 61 may output information for displaying the PM concentration distributions at a plurality of times in chronological order side by side. This makes it possible to know the change in the PM concentration distribution over time. In addition, as shown in PM concentration distributions D1 and D4 in FIG. 7, communicator 61 may output information for displaying the PM concentration distributions in a plurality of altitudes side by side. This allows the user to know the change in the PM concentration distribution due to the change in altitude. In addition, when communicator 61 obtains the position information including the altitude from mobile terminal 50, communicator 61 may select the PM concentration distribution close to the altitude included in the position information from the plurality of PM concentration distributions having different altitudes, and output only the selected PM concentration distribution. Accordingly, it is possible to output a PM concentration distribution suitable for the user who owns mobile terminal 50, and it is possible to reduce the amount of communication.

[0095]

[1-3. Effect etc.]

As described above, air quality information processing system 1 includes: communicator 61 that obtains a PM concentration of detecting PM from each of a plurality of PM sensors 10 provided along road 100 that detect PM in the air; controller 62 that generates PM concentration distribution D1 and the like indicating a PM distribution based on the PM concentration; and communicator 61 that outputs information based on the PM concentration distribution. It should be noted that PM is an example of fine particles, PM concentration is an example of the first detection result, and PM concentration distribution is an example of the first fine particle distribution. In addition, communicator 61 is an example of an obtainer and an outputter, PM sensor 10 is an example of the first fine particle sensor, and controller 62 is an example of the generator.

[0096]

Accordingly, air quality information processing system 1 can obtain the detection result from a plurality of PM sensors 10 provided along road 100. That is, air quality information processing system 1 can obtain detection results from a plurality of PM sensors 10 provided in a narrow region. Therefore, air quality information processing system 1 can generate PM concentration distribution D1 and the like in a narrower range than the case where air quality information processing system 1 is arranged for each area as in the conventional case. It should be noted that since the PM concentration distribution is generated from the detection results of the plurality of PM sensors 10, the distribution becomes more accurate.

[0097]

In addition, communicator 61 obtains the PM concentration at which PM is detected from each of one or more PM sensors 40 that detect PM in the air provided in moving body 120. Then, based on the PM concentration distribution, controller 62 generates PM concentration distribution D1 and the like. It should be noted that PM sensor 40 is an example of the second fine particle sensor, and the PM concentration distribution obtained from PM sensor 40 is an example of the second detection result.

[0098]

Accordingly, air quality information processing system 1 can generate a finer PM concentration distribution because the number of PM concentrations for generating the PM concentration distribution increases. In addition, for example, when the moving body is an automobile, air quality information processing system 1 can generate finer PM concentration distribution around a place where many automobiles are gathered, that is, where the traffic is congested. Therefore, it is possible to generate a finer PM concentration distribution in a place where it is presumed that the PM concentration is high and the air quality is poor. In addition, for example, when the moving body is a person, air quality information processing system 1 can generate a finer PM concentration distribution around a place where many people gather.

[0099]

In addition, at least one of the plurality of PM sensors 10 is provided in a second height range different from the first height range in which other first fine particle sensors are provided. Then, controller 62 generates PM concentration distribution D10 and the like for each height range.

[0100]

Accordingly, air quality information processing system 1 can generate a PM concentration distribution suitable for each user at different altitudes, for example, for each user on the upper floor and a lower floor of a high-rise building.

[0101]

In addition, air quality information processing system 1 includes a plurality of PM sensors 10.

[0102]

Accordingly, air quality information processing system 1 can generate a PM concentration distribution without obtaining information from a device outside the system.

[0103]

In addition, as described above, the air quality information processing method includes: obtaining a PM concentration obtained by detecting PM from each of a plurality of PM sensors 10 provided along road 100 for detecting fine PM in the air (S11); generating PM concentration distribution D1 and the like indicating a distribution of PM based on the PM concentration (S12); and outputting information based on PM concentration distribution D1 and the like (S13). It should be noted that first region R is an example of the region, the PM concentration is an example of the detection result, and the PM concentration distribution is an example of the fine particle distribution.

[0104]

Accordingly, the same effect as that of air quality information processing system 1 described above is obtained.

[0105]

(Variation 1 of Embodiment 1)

Hereinafter, the air quality information processing system and the like according to the present variation will be described with reference to FIG. 8 and FIG. 9. It should be noted that in the following description, the differences from Embodiment 1 will be
5 mainly described, the same configurations as those in Embodiment 1 will be designated by the same reference numerals, and the description thereof may be omitted or simplified. The configuration of the air quality information processing system according to the present variation is the same as that of air quality information
10 processing system 1 according to Embodiment 1, and the description thereof will be omitted.

[0106]

FIG. 8 is a flowchart showing the operation of air quality information processing system 1 according to the present variation.
15 Air quality information processing system 1 according to the present variation generates route information on the movement route of moving body 120 based on at least (i) the PM concentration distribution based on the PM concentration obtained from a plurality of PM sensors 10 and (ii) the traffic information. The route
20 information is, for example, information indicating a movement route. It should be noted that steps S11 and S12 are the same as the steps shown in FIG. 6 of Embodiment 1, and the description thereof will be omitted.

[0107]

As shown in FIG. 8, communicator 61 obtains, for example, traffic information (S21). Communicator 61 obtains traffic information at the current time from, for example, a traffic information server (for example, second server 70). The traffic information is, for example, traffic congestion information, traffic
30 volume, accident information, and the like. Communicator 61 outputs the obtained traffic information to controller 62. It should be noted that the traffic information is advised to be the information obtained at the time when the PM concentration obtained in step S11 is detected.

[0108]

It should be noted that in step S21, controller 62 may estimate the traffic information based on the measurement result of the sound sensor obtained by communicator 61.

[0109]

5 Next, controller 62 generates route information on the movement route based on the PM concentration distribution and the traffic information (S22). Controller 62 generates route information on the movement route between the user's current position and the destination. FIG. 9 is a diagram showing an example of route
10 information I1 output by air quality information processing system 1 according to the present variation. FIG. 9 shows an example in which the user is a driver who drives an automobile, which is an example of moving body 120. It should be noted that route information I1 is an example of the first information.

15 [0110]

In addition, the density of the dot hatch shown in FIG. 9 indicates the PM concentration. It is shown that the higher the density of the dot hatch, the higher the PM concentration. PM concentration distribution D7 is a region having a concentration that
20 is a first concentration or higher and is less than a second concentration higher than the first concentration. PM concentration distribution D8 is a region of the second concentration or higher. The region without the dot hatch is a region where the PM concentration is less than the first concentration.

25 [0111]

In addition, the arrows (traffic information TI1 and TI2) shown in FIG. 9 indicate the traffic volume. It is shown that the blacker the arrow, the heavier the traffic. Traffic information TI1 indicates that the traveling direction side of moving body 120 is congested on road
30 100a. Traffic information TI2 indicates that road 100b is not congested.

[0112]

As shown in FIG. 9, route information I1 may be information in which traffic information TI1 and TI2, PM concentration distributions
35 D7 and D8, and movement route TR of moving body 120 are

superimposed on the map. The position where moving body 120 is shown indicates current position P of moving body 120. In addition, destination B indicates the destination of moving body 120. Controller 62 determines movement route TR from current position P of moving body 120 to destination B based on PM concentration distributions D7 and D8 and traffic information TI1 and TI2. It should be noted that controller 62 obtains the information for identifying destination B and the information indicating current position P via, for example, communicator 61.

[0113]

For example, as shown in FIG. 9, controller 62 may determine movement route TR so as to preferentially travel on road 100b having a low PM concentration and a low traffic volume. Accordingly, controller 62 can propose to the user, for example, the optimum route for air pollution. In addition, controller 62 may determine movement route TR so as to preferentially travel on road 100 having a low traffic volume even if the PM concentration is high. In addition, controller 62 may determine movement route TR so that the exposure amount to the PM by the user is reduced between current position P and destination B, or may determine movement route TR by another method. In addition, controller 62 may, for example, obtain the user's preference in advance and determine movement route TR according to the user's preference. For example, when the user's preference is to dislike passing through a region having a PM concentration of the first concentration or higher, controller 62 may determine movement route TR that bypasses the regions of PM concentration distributions D7 and D8.

[0114]

With reference to FIG. 8 again, communicator 61 then outputs route information I1 generated by controller 62 to an external device (S23). For example, by transmitting route information I1 to the driver who drives moving body 120, communicator 61 can propose, to the user, movement route TR or the like in which the degree of air pollution at that time is low or movement route TR or the like in which the PM concentration does not locally increase due to the exhaust gas

of an automobile or the like. Controller 62 can propose, for example, movement route TR for alleviating traffic congestion to the user.

[0115]

In addition, the display device mounted on moving body 120 displays route information I1 to the user, so that the user can be assisted in determining the movement route. The user can determine the movement route in consideration of PM concentration distributions D7 and D8 and traffic information TI1 and TI2.

[0116]

In the above, the example in which the user is a driver who drives moving body 120 has been described, but the user is not particularly limited as long as the user is a person who is in the first region and has an information terminal (for example, mobile terminal 50) that can communicate with first server 60, and may be, for example, a pedestrian or an indoor person. In this case, controller 62 can propose, for example, movement route TR (walking route) in which the degree of air pollution at that time is low to the user who owns mobile terminal 50 by transmitting route information I1 to mobile terminal 50.

[0117]

It should be noted that, in FIG. 8, an example in which controller 62 generates movement route TR using traffic information has been described, but other information may be used as long as it is possible to determine movement route TR with the information.

Controller 62 may determine movement route TR, for example, in place of the traffic information or by using the weather information together with the traffic information. It is only needed that controller 62 determines movement route TR based on at least one of the traffic information or the weather information.

[0118]

It should be noted that controller 62 may generate route information based only on the PM concentration distributions among the PM concentration distributions and the traffic information. Controller 62 may generate, for example, route information including a movement route that bypasses the region where the PM

concentration is high.

[0119]

As described above, communicator 61 of air quality information processing system 1 obtains position information indicating current position P of the user present in a vicinity of road 100. Then, controller 62 further generates the first information on the user based on the PM concentration distributions and the position information. It should be noted that present in a vicinity of road 100 means, for example, existing in first region R.

[0120]

Accordingly, by obtaining the position information of the user, the PM concentration distributions can be used for various information services for the user. That is, the usefulness of the PM concentration distributions is improved. In addition, since the first concentration distribution shows a fine distribution of PM concentration, it is possible to provide a finer service to the user.

[0121]

In addition, controller 62 generates route information I1 on movement route TR from current position P to destination B for the user. It should be noted that route information I1 is an example of the first information.

[0122]

Accordingly, air quality information processing system 1 can propose movement route TR in consideration of the PM concentration to the user. Air quality information processing system 1 can propose to the user, for example, movement route TR that reduces the influence of the PM concentration.

[0123]

In addition, communicator 61 obtains at least one of the traffic information of road 100 or the weather information around road 100. Then, controller 62 generates route information I1 based on at least one of the traffic information or the weather information. It should be noted that the traffic information on road 100 may be, for example, the traffic information in first region R. In addition, the weather information around road 100 may be, for example, the weather

information in first region R.

[0124]

Accordingly, air quality information processing system 1 can further propose, to the user, movement route TR in consideration of traffic information or weather information.

[0125]

(Variation 2 of Embodiment 1)

Hereinafter, the air quality information processing system and the like according to the present variation will be described with reference to FIG. 10 and FIG. 11. It should be noted that in the following description, the differences from Embodiment 1 will be mainly described, the same configurations as those in Embodiment 1 will be designated by the same reference numerals, and the description thereof may be omitted or simplified. The configuration of the air quality information processing system according to the present variation is the same as that of air quality information processing system 1 according to Embodiment 1, and the description thereof will be omitted.

[0126]

[FIG. 10]

FIG. 10 is a flowchart showing the operation of air quality information processing system 1 according to the present variation. Air quality information processing system 1 according to the present variation generates integrated information indicating an integrated value of the user's PM exposure amount based on at least (i) the PM concentration distribution based on the PM concentration obtained from a plurality of PM sensors 10 and (ii) the position information. It should be noted that steps S11 and S12 are the same as the steps shown in FIG. 6 of Embodiment 1, and the description thereof will be omitted.

[0127]

As shown in FIG. 10, communicator 61 obtains the user's position information (S31). When the user is a pedestrian or the like, communicator 61 obtains position information indicating the current position of the user from mobile terminal 50 owned by the

user. Communicator 61 outputs the obtained position information to controller 62. It should be noted that the position information is advised to be the information obtained at the time when the PM concentration obtained in step S11 is detected.

5 [0128]

Next, controller 62 calculates the exposure amount of PM based on the PM concentration distribution and the position information (S32). Controller 62 calculates the exposure amount of PM of the user at the time when the PM concentration distribution and the position information are obtained. Controller 62 calculates, for example, the exposure amount of PM_{2.5} of the user. Controller 62 stores, for example, the calculated exposure amount in memory 63. Accordingly, even if the user himself/herself does not have the PM sensor, the exposure amount of the user can be obtained.

15 [0129]

Next, controller 62 integrates the exposure amount of PM of the user (S33). Controller 62 integrates the exposure amount calculated in step S32 and the exposure amount stored in memory 63.

20 [0130]

Next, controller 62 determines whether a predetermined period has elapsed since the process of integrating the exposure amount was started (S34). The predetermined period is a period for integrating the exposure amount, and may be, for example, one day, one month, or one year. The predetermined period may be, for example, arbitrarily set by the user. Hereinafter, an example in which the predetermined period is one day will be described. When the predetermined period is one day, controller 62 calculates the integrated value of PM that the user has been exposed to during the day every day.

30 [0131]

When the predetermined period has been elapsed (Yes in S34), controller 62 generates integrated information indicating the integrated value of the exposure amount of PM for the user (S35). Controller 62 generates, for example, integrated information I2

shown in FIG. 11. FIG. 11 is a diagram showing an example of integrated information I2 output by air quality information processing system 1 according to the present variation. It should be noted that integrated information I2 is an example of the first information.

[0132]

As shown in FIG. 11, controller 62 may generate integrated information I2 indicating the integrated value of the exposure amount of PM for the user on a daily basis. In addition, integrated information I2 may include a target value of the integrated value of the exposure amount. The target value is, for example, an upper limit of the integrated value of the exposure amount, and it is advised that the target value is appropriately set according to the health condition of the user or the like. For example, controller 62 may set a target value based on the integrated value of the exposure amount of the user in the past, or when communicator 61 obtains the medical information of the user, the target value may be set based on the medical information.

[0133]

It should be noted that the display mode of the integrated value of the exposure amount of PM is not limited to the display mode shown in FIG. 11. Integrated information I2 may be represented by, for example, a numerical value of the integrated value of the exposure amount of PM, or may be represented by different colors or the like. In addition, integrated information I2 may include information indicating the degree of influence on health according to the integrated value.

[0134]

With reference to FIG. 10 again, communicator 61 then outputs integrated information I2 generated by controller 62 to an external device (S36). Communicator 61 may output integrated information I2 to, for example, mobile terminal 50 of the user who is outdoors. Accordingly, the user can be informed of the integrated value of the exposure amount of PM on that day. In addition, controller 62 may output integrated information I2 to the medical

institution via communicator 61. Second server 70 may be, for example, a server that manages medical information. Accordingly, integrated information I2 can be useful for the health management of the user.

5 [0135]

In addition, if the predetermined period has not been elapsed (No in S34), the process returns to step S11 and controller 62 continues the process for integrating the integrated value of the exposure amount of PM.

10 [0136]

It should be noted that the process from obtaining the PM concentration from each of the plurality of PM sensors 10 executed by controller 62 (S11) to integrating the exposure amount of PM (S33) may be executed at predetermined time intervals, or may be
15 executed at a preset time. When the predetermined period is one day, the predetermined time interval may be 10 minutes, 30 minutes, or 60 minutes. In addition, when the integrated value of the exposure amount exceeds a predetermined value (for example, the target value shown in FIG. 11), communicator 61 may output
20 information indicating that the predetermined value has been exceeded.

[0137]

As described above, controller 62 of air quality information processing system 1 generates integrated information I2 indicating
25 the exposure amount of PM for the user based on the time series data of the PM concentration distribution and the position information. It should be noted that integrated information I2 is an example of the first information.

[0138]

30 Accordingly, air quality information processing system 1 can obtain the exposure amount of the user. For example, the user can know the integrated value of the exposure amount even if the user does not have the PM sensor. By the user confirming the record of the exposure amount, it can be useful for the health management of
35 the user.

[Embodiment 2]

[0139]

[2-1. Configuration of air quality information processing system]

The configuration of air quality information processing system
5 1a according to the present embodiment will be described with
reference to FIG. 12. FIG. 12 is a block diagram showing a
functional configuration of air quality information processing system
1a according to the present embodiment. It should be noted that in
the following description, the differences from Embodiment 1 will be
10 mainly described, the same configurations as those in Embodiment 1
will be designated by the same reference numerals, and the
description thereof may be omitted or simplified.

[0140]

As shown in FIG. 12, air quality information processing system
15 1a according to the present embodiment includes communicator 410
provided in residence 400, controller 420, indoor sensor 430,
ventilation equipment 440, and display 450 in addition to air quality
information processing system 1 shown in Embodiment 1 and the like.
It should be noted that communicator 410, controller 420, indoor
20 sensor 430, ventilation equipment 440, and display 450 may be
provided indoors in a building other than residence 400. Residence
400 is an example of a building.

[0141]

Communicator 410 communicates with first server 60 and the
25 like. Communicator 410 obtains, for example, the PM concentration
in the vicinity of residence 400 from first server 60.

[0142]

Controller 420 controls each component in residence 400.
Controller 420 controls indoor sensor 430 to detect the PM
30 concentration in the space inside residence 400. In addition,
controller 420 controls ventilation equipment 440 to ventilate the air
in residence 400. In addition, controller 420 controls display 450 to
display predetermined information. In the present embodiment,
the information displayed by controller 420 on display 450 is
35 characteristic.

[0143]

Indoor sensor 430 is an air quality sensor that detects the air quality in residence 400, and in the present embodiment, it is a PM sensor that detects PM in the air. Indoor sensor 430 may be, for example, a PM2.5 sensor. One or more indoor sensors 430 are provided in residence 400. Indoor sensor 430 is an example of an indoor fine particle sensor.

[0144]

Ventilation equipment 440 is provided in the construction material of residence 400 to ventilate the indoor air. Ventilation equipment 440 has, for example, a function of supplying outdoor air indoors and exhausting indoor air to the outside. Ventilation equipment 440 may be, for example, a heat exchange type ventilation device. The ventilation device includes an air supply air passage that communicates from the outdoor suction port to the indoor air supply port, an exhaust air passage that communicates from the indoor exhaust port to the outdoor exhaust port, and a heat exchange element that exchanges heat between the indoor air and the outdoor air. The heat exchange element has a function of recovering the heat of the indoor air passing through the exhaust air passage and giving the recovered heat to the outdoor air passing through the air supply air passage. It should be noted that the building material is, for example, a wall, a ceiling, or the like of residence 400.

[0145]

Ventilation equipment 440 has an air purifier having a function of removing pollutants contained in the outdoor air when the outdoor air is supplied indoors. The air purifier is provided, for example, on the air supply air passage of ventilation equipment 440. The air purifier includes, for example, an air filter. As the air filter, for example, a high efficiency particulate air (HEPA) filter or the like is used. The air purifier may be provided, for example, to remove contaminants only when the outdoor air is more polluted than the indoor air. Accordingly, when the outdoor air is cleaner than the indoor air, it is possible to suppress a decrease in the flow rate due to

the air filter, so that ventilation can be effectively performed.

[0146]

It should be noted that ventilation equipment 440 is not limited to the heat exchange type ventilation equipment.

5 Ventilation equipment 440 may have, for example, a configuration having an air supply fan that supplies outdoor air indoors. In this case, ventilation equipment 440 can be suitably used even in an area other than the hot and humid area. The indoor air may be naturally exhausted by the air supply fan supplying the outdoor air.

10 [0147]

Display 450 displays predetermined information under the control of controller 420. Display 450 displays, for example, information on air quality. Specifically, display 450 displays information indicating the difference in air quality between indoors
15 and outdoors. Display 450 displays, for example, information indicating the effect of operating ventilation equipment 440. Display 450 is, for example, a liquid crystal panel, an organic EL panel, or the like. The information indicating the effect of the operating ventilation equipment 440 is the information indicating the
20 effect on PM by operating ventilation equipment 440, and for example, it may be information indicating the degree of removal of PM contained in the outdoor air when the outdoor air is taken indoors.

[0148]

25 Display 450 may be attached to, for example, a building material or the like in residence 400, or may be a display included in a mobile terminal or the like.

[0149]

[2-2. Operation of air quality information processing system]

30 Next, the operation of air quality information processing system 1a according to the present embodiment will be described with reference to FIG. 13 to FIG. 15. FIG. 13 is a flowchart showing the operation of first server 60 according to the present embodiment. It should be noted that steps S11 and S12 are the same as the steps
35 shown in FIG. 6 of Embodiment 1, and the description thereof will be

omitted.

[0150]

As shown in FIG. 13, communicator 61 obtains the position information of residence 400 (S41). Communicator 61 may obtain the position information of residence 400 via communicator 410. Controller 62 outputs the position information of residence 400 to controller 62.

[0151]

Next, controller 62 estimates the outdoor PM concentration, which is the outdoor PM concentration of residence 400, based on the PM concentration distribution and the position information of residence 400 (S42). For example, controller 62 may estimate the outdoor PM concentration of residence 400 from the tendency of the PM concentration distribution, or may regard the PM concentration obtained from PM sensor 10 or the like provided at the position closest to residence 400 as the outdoor PM concentration of residence 400. Controller 62 generates concentration information indicating the outdoor PM concentration. The concentration information is an example of information based on the fine particle distribution. The outdoor PM concentration of residence 400 may be the current outdoor PM concentration of residence 400 or the future outdoor PM concentration of residence 400. The future may be, for example, minutes after the present, hours after the present, or days after the present.

[0152]

Next, communicator 61 outputs the concentration information generated by controller 62 to an external device (S43). Communicator 61 transmits the concentration information to, for example, communicator 410 of residence 400. Accordingly, controller 420 in residence 400 can obtain the outdoor PM concentration of residence 400.

[0153]

Subsequently, the operation of controller 420 will be described with reference to FIG. 14. FIG. 14 is a flowchart showing the operation of controller 420 provided indoors according to the present

embodiment.

[0154]

Controller 420 obtains the concentration information including the outdoor PM concentration of residence 400 from first server 60 via communicator 410 (S51). The concentration information may include information indicating the time when the PM concentration is detected and the like.

[0155]

Next, controller 420 obtains the indoor PM concentration, which is the detection result of detecting the PM concentration in residence 400 from indoor sensor 430 (S52). It is advised that the indoor PM concentration obtained from indoor sensor 430 is, for example, the PM concentration detected at the same time as the time included in the concentration information.

[0156]

Next, controller 420 controls display 450 to display the outdoor PM concentration and the indoor PM concentration (S53). Controller 420 displays, for example, the information shown in FIG. 15. FIG. 15 is a diagram showing an example of information indicating the effect of operating ventilation equipment 440, which is output by air quality information processing system 1a according to the present embodiment.

[0157]

As shown in FIG. 15, controller 420 displays, for example, comparative information I3 for comparing the outdoor PM concentration and the indoor PM concentration. Specifically, controller 420 displays the outdoor PM concentration and the indoor PM concentration side by side on the same screen. In this way, controller 420 displays, for example, the outdoor PM concentration and the indoor PM concentration at the same time. Comparative information I3 is an example of the second information.

[0158]

It should be noted that the display mode of the information indicating the effect of the operation of ventilation equipment 440 displayed by display 450 is not limited to the display mode shown in

FIG. 15 as long as the effect of the operation of ventilation equipment 440 can be known. Controller 420 may display, for example, time-series data (for example, a line graph) of the outdoor PM concentration and the indoor PM concentration on display 450.

5 Accordingly, the user in residence 400 can visually recognize the effect of ventilation equipment 440 on an hourly basis. In addition, controller 420 may cause display 450 to display, for example, the exposure amount of PM of the user indoors when ventilation equipment 440 estimated from the outdoor PM concentration is not
10 used, and the exposure amount of PM of the user indoors when ventilation equipment 440 is used. Accordingly, the user in residence 400 can visually recognize the effect of reducing the exposure amount of PM by ventilation equipment 440.

[0159]

15 In addition, controller 420 is not limited to displaying the indoor and outdoor PM concentrations as information indicating the effect of the operation of ventilation equipment 440. For example, controller 420 may display the information indicating the recommended degree of window opening on display 450 as the
20 information. For example, a lower recommendation for opening windows means that the outdoor air is more polluted than the indoor air. This can also be said to indicate that ventilation equipment 440 removes pollutants contained in the outdoor air and the indoor air is clean. In addition, controller 420 may display, for example, the
25 weight of the PM removed by ventilation equipment 440 on display 450 as the information.

[0160]

In addition, controller 62 may operate ventilation equipment 440 in an energy-saving manner when the outdoor PM concentration
30 is lower than or equal to a predetermined value. Accordingly, it is possible to suppress the pollution of the indoor air and reduce the power consumption consumed by ventilation equipment 440.

[0161]

In addition, controller 62 may display the laundry index on
35 display 450 based on the outdoor PM concentration, or the outdoor

PM concentration and the indoor PM concentration. The laundry index is the degree to which it is recommended to dry the laundry outdoors. For example, when the outdoor PM concentration is lower than or equal to a predetermined value, or the difference between the outdoor PM concentration and the indoor PM concentration is within a predetermined value, controller 62 highly recommends that the laundry be dried outdoors.

[0162]

In addition, controller 62 may display the recommended degree of going out when the user goes outdoors on display 450 based on the outdoor PM concentration or the outdoor PM concentration and the indoor PM concentration. In addition, controller 62 may propose preventive measures against pollutants when the user goes out outdoors based on the outdoor PM concentration or the outdoor PM concentration and the indoor PM concentration. For example, when the outdoor PM concentration is greater than or equal to a predetermined value, or the difference between the outdoor PM concentration and the indoor PM concentration is greater than or equal to a predetermined value, controller 62 may propose to the user to wear a mask.

[0163]

In addition, controller 62 may display the degree of ventilation necessity on display 450 based on the indoor PM concentration, or the outdoor PM concentration and the indoor PM concentration. When the indoor PM concentration is greater than or equal to a predetermined value and the outdoor PM concentration is lower than the indoor PM concentration, controller 62 may display a high degree of ventilation necessity on display 450. In addition, it can be said that the low degree of ventilation necessity indicates that, for example, the effect of operating ventilation equipment 440 was high.

[0164]

[2-3. Effect etc.]

As described above, air quality information processing system 1a includes ventilation equipment 440 provided in residence 400 located in the vicinity of road 100 and display 450 that displays the

second information indicating the effect of the operation of ventilation equipment 440. It should be noted that residence 400 is an example of a building. In addition, being located in the vicinity of road 100 may mean, for example, being located in first region R.

5 [0165]

Accordingly, the user can know the effect of operating ventilation equipment 440 by checking display 450.

[0166]

10 In addition, air quality information processing system 1a includes indoor sensor 430 provided inside residence 400. Then, display 450 displays comparative information I3 including the first concentration of PM outdoors of residence 400 based on the PM concentration distribution and the second concentration of PM detected by indoor sensor 430. It should be noted that indoor
15 sensor 430 is an example of an indoor fine particle sensor, and comparative information I3 is an example of the second information.

[0167]

Accordingly, the user can check the PM concentration indoors and outdoors, so that the effect of operating ventilation equipment
20 440 can be known in more details.

[Other Embodiments]

[0168]

Although each embodiment and variation (hereinafter, also referred to as the embodiments and the like) have been described
25 above, the present invention is not limited to the above embodiments and the like.

[0169]

For example, the first server in the above embodiments and the like may generate a PM concentration distribution including the
30 PM concentration distribution in the second region, for example, in cooperation with a second server that generates the PM concentration distribution in a second region different from the first region. The air quality information processing system in the above embodiments and the like may operate in cooperation with another
35 air quality information processing system. FIG. 16 is a diagram for

explaining cooperation with other air quality information processing systems in the air quality information processing system according to another embodiment.

[0170]

5 As shown in (a) in FIG. 16, the first air quality information processing system generates PM concentration distribution D9 based on the PM concentrations detected by a plurality of PM sensors provided along the road in first region R1 (for example, a rectangular region whose side lengths are X1 and Y1). In addition, as shown in
10 (b) in FIG. 16, the second air quality information processing system generates PM concentration distribution D10 based on the PM concentrations detected by a plurality of PM sensors provided along the road in second region R2 (for example, a rectangular region whose side lengths are X2 and Y2). The first air quality information
15 processing system obtains PM concentration distribution D10 from the second air quality information processing system. It should be noted that PM concentration distribution D10 is generated based on the PM concentration at which fine particles in the air are detected, which is obtained from each of the plurality of first fine particle
20 sensors provided along the road in second region R2.

[0171]

Then, as shown in (c) in FIG. 16, the first air quality information processing system generates PM concentration distribution D11 in the region including first region R1 and second
25 region R2 based on PM concentration distribution D9 and PM concentration distribution D10. In this way, the first air quality information processing system and the second air quality information processing system may cooperate to generate the PM concentration distribution. PM concentration distribution D9 is an example of the
30 first fine particle distribution, PM concentration distribution D10 is an example of the second fine particle distribution, and PM concentration distribution D11 is an example of the third fine particle distribution. It should be noted that the first region (for example, the first block) and the second region (for example, the second
35 block) may be adjacent regions. It should be noted that PM

concentration distribution D11 is an example of the first information.
[0172]

As described above, PM concentration distribution D9 is the distribution of the PM concentration in first region R1 in which each of the plurality of PM sensors provided along the road detects PM. Then, communicator 61 of the air quality information processing system obtains PM concentration distribution D10 indicating the distribution of PM in second region R2 different from first region R1, and controller 62 generates PM concentration distribution D11 indicating the distribution of PM in first region R1 and second region R2. PM concentration distribution D11 is, for example, a distribution including PM concentration distributions D9 and D10. It should be noted that PM concentration distribution D9 is an example of the first fine particle distribution, PM concentration distribution D10 is an example of the second fine particle distribution, and PM concentration distribution D11 is an example of the third fine particle distribution.

[0173]

This allows the air quality information processing system to generate a wider PM concentration distribution. Therefore, the user can know the PM concentration distribution in the second region even if the user is in the first region.

[0174]

In addition, the first server in the above embodiments and the like may give advice on pollution control measures for reducing air pollution by, for example, analyzing the PM concentration distribution or the time change in the PM concentration distribution. The first server may propose effective pollution control advice for both the first region and the second region by using PM concentration distribution D11 described above.

[0175]

In addition, the PM concentration in the above embodiment is an actually measured value of the concentration of PM, but may be, for example, information indicating the high or low concentration. The information may be, for example, "Rank 1" when the measured

value is lower than or equal to a predetermined value, "Rank 2" when the measured value is greater than the predetermined value, and the like.

[0176]

5 In addition, in the above embodiments and the like, an example in which the PM sensor is provided has been described, but the present invention is not limited thereto. A water level sensor may be provided in place of the PM sensor or together with the PM sensor. Then, the first server may obtain the detection result of the
10 water level from each of the plurality of water level sensors provided along the road, and generate the water level distribution based on the obtained detection result of the water level. Accordingly, for example, the water level distribution can be used for determining the evacuation route in the event of a flood. In addition, in a system
15 having such a water level sensor, when the water level sensor is provided on a pole having a lighting fixture, a display device, a security camera, and the like, the system can guide evacuation by causing the lighting fixture to emit light according to the water level distribution, causing the display device to display according to the
20 water level, or causing the image of the security camera to be linked with the water level distribution information.

[0177]

 In addition, the first server in the above embodiments and the like may obtain information for generating information based on the
25 PM concentration distribution, for example, from an information provider who provides the information. For example, the first server may obtain the PM concentration at a position where a plurality of PM sensors included in the air quality information processing system are not provided in the first region from the
30 information provider. In this case, the first server may give the information provider a reward (for example, points) according to the information.

[0178]

 In addition, the second server in the above embodiments and
35 the like may be a server managed by the providing intermediary,

which obtains the PM concentration distribution from the first server, generates information on the user by performing a predetermined process on the obtained PM concentration distribution, and provides the generated information to the user.

5 [0179]

In addition, the first server and the second server in the air quality information processing system may be realized by a single device or may be realized by a plurality of devices. For example, the first server and the second server may be realized by one server
10 device, or may be realized by three or more server devices. When the air quality information processing system is realized by a plurality of server devices, the components included in the air quality information processing system may be distributed to the plurality of server devices in any way.

15 [0180]

In addition, in the above embodiments or the like, each component may be configured by dedicated hardware or may be realized by executing a software program suitable for each component. Each component may be realized by a program
20 executor such as a CPU or a processor reading out and executing a software program recorded on a recording medium such as a hard disk or a semiconductor memory.

[0181]

In addition, in the above embodiments or the like, another
25 processor may execute the processing executed by the specific processor. In addition, the order of processing described in the flowchart of the above embodiment is an example. The order of the plurality of processes may be changed, or the plurality of processes may be executed in parallel.

30 [0182]

In addition, in the above embodiments or the like, each component may be realized by executing a software program suitable for each component. Each component may be realized by a program
35 executor such as a CPU or a processor reading out and executing a software program recorded on a recording medium such as a hard

disk or a semiconductor memory.

[0183]

In addition, each component may be realized by hardware. For example, each component may be a circuit (or integrated circuit).

- 5 These circuits may form one circuit as a whole, or may be separate circuits from each other. In addition, each of these circuits may be a general-purpose circuit or a dedicated circuit.

[0184]

- 10 In addition, the division of the functional block in the block diagram is an example, and a plurality of functional blocks may be realized as one functional block, one functional block may be divided into a plurality of ones, and some functions may be transferred to other functional blocks. In addition, the functions of a plurality of functional blocks having similar functions may be processed by a
15 single hardware or software in parallel or in a time division manner.

[0185]

- In addition, a comprehensive or specific aspect of the present invention may be realized by a system, a method, an integrated circuit, a computer program, or a computer-readable recording
20 medium such as a CD-ROM. In addition, a comprehensive or specific aspect of the present invention may be realized by any combination of a system, a method, an integrated circuit, a computer program or a recording medium.

[0186]

- 25 In addition, forms obtained by applying various modifications to each embodiment conceived by a person skilled in the art or forms realized by arbitrarily combining the components and functions in each embodiment without departing from the spirit of the present invention are also included in this invention.

- 30 [Reference Signs List]

[0187]

- 1, 1a Air quality information processing system
10, 10a, 10b PM sensor (first fine particle sensor)
40 PM sensor (second fine particle sensor)
35 61 Communicator (obtainer, outputter)

	62	Controller (generator)
	100, 100a, 100b	Road
	120	Mobile body
	400	Residence (building)
5	430	Indoor sensor (indoor fine particle sensor)
	440	Ventilation equipment
	450	Display
	B	Destination
10	D1 to D8	PM concentration distribution (first PM concentration distribution, first fine particle distribution)
	D9	PM concentration distribution (first fine particle distribution)
	D10	PM concentration distribution (second fine particle distribution)
15	D11	PM concentration distribution (third fine particle distribution)
	I1	Route information (first information)
	I2	Integrated information (first information)
	I3	Comparison information (second information)
20	P	Current position
	R, R1	First region
	R2	Second region
	TI1, TI2	Traffic information
	TR	Movement route

[CLAIMS]

[Claim 1]

An air quality information processing system comprising:

an obtainer that obtains a first detection result of detecting
5 fine particles in air from each of a plurality of first fine particle
sensors provided along a road for detecting the fine particles;

a generator that generates a first fine particle distribution
indicating a distribution of the fine particles, based on the first
detection result; and

10 an outputter that outputs first information based on the first
fine particle distribution.

[Claim 2]

The air quality information processing system according to
15 claim 1,

wherein the obtainer obtains position information indicating a
current position of a user present in a vicinity of the road, and

the generator generates the first information on the user
based on the first fine particle distribution and the position
20 information.

[Claim 3]

The air quality information processing system according to
claim 2,

25 wherein the generator generates the first information
indicating an exposure amount of the fine particles to the user based
on time series data of the first fine particle distribution and time
series data of the position information.

30 [Claim 4]

The air quality information processing system according to
claim 2,

wherein the generator generates the first information on a
movement route of the user from the current position to a
35 destination.

[Claim 5]

The air quality information processing system according to claim 4,

- 5 wherein the obtainer obtains at least one of traffic information of the road or weather information in the vicinity of the road, and
 the generator generates the first information based on at least one of the traffic information or the weather information.

10 [Claim 6]

The air quality information processing system according to any one of claims 1 to 5, further comprising:

- ventilation equipment provided in a building located in a vicinity of the road; and
15 a display that displays second information indicating an effect of an operation of the ventilation equipment.

[Claim 7]

20 The air quality information processing system according to claim 6, further comprising:

- an indoor fine particle sensor provided inside the building,
 wherein the display displays second information including a first concentration of the fine particles outside the building based on the first fine particle distribution and a second concentration of the
25 fine particles detected by the indoor fine particle sensor.

[Claim 8]

The air quality information processing system according to any one of claims 1 to 7,

- 30 wherein the obtainer obtains a second detection result of detecting the fine particles from each of one or more second fine particle sensors provided on a moving body for detecting the fine particles in the air, and
 the generator generates the first fine particle distribution
35 based on the second detection result.

[Claim 9]

The air quality information processing system according to any one of claims 1 to 8,

5 wherein at least one of the plurality of first fine particle sensors is provided in a second height range different from a first height range in which an other of the plurality of first fine particle sensors is provided, and
 the generator generates the first fine particle distribution for
10 each of height ranges.

[Claim 10]

The air quality information processing system according to any one of claims 1 to 9,

15 wherein the first fine particle distribution is a distribution in a first region in which each of the plurality of first fine particle sensors detects the fine particles,
 the obtainer obtains a second fine particle distribution indicating a distribution of the fine particles in a second region
20 different from the first region, and
 the generator generates a third fine particle distribution indicating a distribution of the fine particles in the first region and the second region.

25 [Claim 11]

The air quality information processing system according to any one of claims 1 to 10, further comprising:

 the plurality of first fine particle sensors.

30 [Claim 12]

An air quality information processing method comprising:

 obtaining a detection result of detecting fine particles from each of a plurality of fine particle sensors provided along a road for detecting fine particles in air;

35 generating a fine particle distribution indicating a distribution

of the fine particles based on the detection result; and
outputting information based on the fine particle distribution.