

Description

Title of Invention

VEHICLE DATA PROCESSING SYSTEM, VEHICLE DATA PROCESSING
5 METHOD, VEHICLE DATA PROCESSING DEVICE, PROGRAM, AND
RECORDING MEDIUM

Technical Field

[0001]

10 The present invention relates to a vehicle data processing system, a vehicle data processing method, a vehicle data processing device, a program, and a recording medium. In particular, the present invention relates to a vehicle data processing system, a vehicle data processing method, and a vehicle data processing device for processing data related to vehicles running on a road, a program for causing a computer to function as the
15 vehicle data processing device, and a recording medium recording the program.

Priority is claimed on Japanese Patent Application No. 2012-067889, filed March 23, 2012, the content of which is incorporated herein by reference.

Background Art

20 [0002]

Road pricing is means for managing traffic demand such as promotion of mitigation of road congestion by charging a fee to a road user for the use of a specific road. In particular, a scheme of implementing the road pricing using an electric facility is referred to as electronic road pricing (ERP).

25 [0003]

Fig. 14 illustrates an example of a usage environment of ERP 900. The user of the ERP 900 needs to mount vehicle-mounted equipment on a vehicle when using the ERP 900. Here, the vehicle-mounted equipment is a wireless device for wirelessly communicating necessary information for charging a toll between roadside antennas 930 and 960. On the vehicle, the vehicle-mounted equipment for performing a process of charging a toll according to a vehicle type is mounted on the vehicle.

[0004]

In the ERP 900, the roadside antenna 930, a camera 940, a sensor 950, and the roadside antenna 960 are sequentially provided on the same lane. Then, when the vehicle enters a communication area of the roadside antenna 930 of the lane, the vehicle-mounted equipment subtracts a toll from the remainder of electronic money with which an integrated circuit (IC) card inserted into the vehicle-mounted equipment is charged.

[0005]

Then, when the vehicle enters a detection range of the sensor 950, the sensor 950, for example, detects a size of the vehicle and transmits data representing the size to a control device 920. Upon receiving data transmitted from the sensor 950, the control device 920, for example, specifies a vehicle type of the vehicle based on the size of the vehicle represented by the data.

[0006]

Then, when the vehicle enters a communication area of the roadside antenna 960, the roadside antenna 960 receives data representing a toll subtracted from the remainder of electronic money from the vehicle-mounted equipment, and transfers the data to the control device 920.

[0007]

Upon receiving the data transferred from the roadside antenna 960, the control device 920 determines whether a subtracted amount of the toll represented by the data is correct as the toll of the specified vehicle type as described above. For example, when the vehicle-mounted equipment mounted on the vehicle does not correspond to a vehicle type of the vehicle, the control device 920 determines that the subtracted amount is not correct as the toll because the toll corresponding to the specified vehicle type is not subtracted. In addition, even when the remainder of electronic money is insufficient, the vehicle-mounted equipment is not mounted, or the like, the control device 920 determines that the subtracted amount is not correct as the toll.

10 [0008]

When the control device 920 determines that the subtracted amount is not correct as the toll, the camera 940 transmits image data to the control device 920 by imaging a rear end of the vehicle if the rear end of the vehicle is detected by the sensor 950. Here, a number plate provided on the rear end of the vehicle is shown in an image captured by the camera 940. Upon receiving the image data transmitted from the camera 940, the control device 920 transmits the image data to a server 910.

[0009]

Upon receiving the image data transmitted from the control device 920, the server 910 reads a vehicle number displayed on the number plate by performing optical character recognition on the image data. Thus, a provider of a road can specify the vehicle number of a violating vehicle.

[0010]

As technology related to this background, various technologies are known (for example, see PLT 1). In PLT 1, a mobile object charging method for reducing construction cost is disclosed. In this mobile object charging method, it is recognized

that vehicle-mounted equipment mounted on a mobile object and configured to store a charging zone representing a region in which charging is performed and vehicle-mounted equipment identification information allocated to individually identify the vehicle-mounted equipment has entered the charging zone based on position information
5 obtained according to a Global Positioning System (GPS) function.

Then, in the mobile object charging method, a local side computer system generates photographing data by capturing a mobile object image within the charging zone. Then, in the mobile object charging method, a center side computer system receives the mobile object image from the local side computer. Then, in the mobile
10 object charging method, information of a number plate is extracted from the mobile object image and the extracted information is stored. Then, in the mobile object charging method, the vehicle-mounted equipment transmits transaction information including vehicle-mounted equipment identification information when the vehicle-mounted equipment has entered the charging zone to an authenticating computer
15 according to wireless communication at a predetermined timing. Then, in the mobile object charging method, the authenticating computer performs authentication for performing charging on the mobile object equipped with the vehicle-mounted equipment based on matching between the vehicle-mounted device identification information received from the vehicle-mounted equipment and pre-registered identification
20 information.

Citation List

Patent Literature

[0011]

25 PLT 1: Japanese Unexamined Patent Application, First Publication No.

2007-207220

Summary of Invention

Technical Problem

5 [0012]

Incidentally, in the ERP, there is a demand for acquiring information of dimensions of a vehicle along with information of a vehicle number of a number plate of the vehicle.

10 Solution to Problem

[0013]

In order to solve the aforementioned problems, according to a first aspect of the present invention, a vehicle data processing system is provided for processing data related to vehicles running on a road, and includes: a plurality of imaging devices placed
15 above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof; a measuring device configured to measure dimensions of vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road; and a vehicle data
20 processing device configured to process data related to the vehicles running on the road. The vehicle data processing device includes: a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by the imaging device among a measurement data including information of the vehicles measured by the measuring device with (ii) one
25 piece of imaging data including the information of the one vehicle captured by the

imaging device.

[0014]

The vehicle data processing device may further include: an identical vehicle type classification search unit configured to retrieve measurement data including information of a vehicle of the same vehicle type classification as vehicle type classification of a target vehicle of the one piece of the imaging data including the information of the one vehicle captured by the imaging device among the measurement data including the information of the vehicles measured by the measuring device. If the identical vehicle type classification search unit has found one piece of the measurement data, the data associating unit may associate the one piece of the measurement data with the one piece of the imaging data.

[0015]

The vehicle data processing device may further include: an identical time zone search unit configured to retrieve measurement data including information of a vehicle measured in the same period of time as a period of time in which the target vehicle of the one piece of the imaging data including the information of the one vehicle captured by the imaging device has been captured among the measurement data including the information of the vehicles measured by the measuring device, and the identical vehicle type classification search unit may retrieve measurement data including information of a vehicle of the same vehicle type classification as the vehicle type classification of the target vehicle of the one piece of imaging data among the measurement data found by the identical time zone search unit.

[0016]

The vehicle data processing device may further include: an identical position search unit configured to retrieve measurement data including information of a vehicle

measured at the same position as a captured position of the target vehicle of the one piece of the imaging data including the information of the one vehicle captured by the imaging device among the measurement data including the information of the vehicles measured by the measuring device, and the identical time zone search unit may retrieve

5 measurement data including information of a vehicle measured in the same period of time as the period of time in which the target vehicle of the one piece of the imaging data has been captured among the measurement data found by the identical position search unit.

[0017]

10 The vehicle data processing device may further include: a vehicle speed evaluating unit configured to evaluate a degree of matching between a vehicle speed of a vehicle targeted by each of the measurement data and a vehicle speed of the target vehicle of the one piece of the imaging data if the identical vehicle type classification search unit has found the measurement data, and the data associating unit may associate
15 one piece of the measurement data targeting a vehicle of a vehicle speed having a high degree of matching evaluated by the vehicle speed evaluating unit among the measurement data found by the identical vehicle type classification search unit with the one piece of the imaging data.

[0018]

20 The vehicle data processing device may further include: a time zone evaluating unit configured to evaluate a degree of matching between a period of time in which a vehicle targeted by each of the measurement data has been measured and a period of time in which the target vehicle of the one piece of the imaging data has been captured if the identical vehicle type classification search unit has found the measurement data, and the
25 data associating unit may associate one piece of the measurement data targeting a vehicle

measured in a period of time having a high degree of matching evaluated by the time zone evaluating unit among the measurement data found by the identical vehicle type classification search unit with the one piece of the imaging data.

[0019]

5 The vehicle data processing device may further include: a position evaluating unit configured to evaluate a degree of matching between a position at which a vehicle targeted by each of the measurement data has been measured and a position at which the target vehicle of the one piece of the imaging data has been captured if the identical vehicle type classification search unit has found the measurement data, and the data
10 associating unit may associate one piece of the measurement data targeting a vehicle measured at a position having a high degree of matching evaluated by the position evaluating unit among the measurement data found by the identical vehicle type classification search unit with the one piece of the imaging data.

[0020]

15 The vehicle data processing device may further include: a time determining unit configured to determine whether a measurement start time of a vehicle during measurement by the measuring device is prior to a time at which the target vehicle of the one piece of imaging data has been last captured if a result of measurement data retrieval performed by the identical vehicle type classification search unit or the identical time
20 zone search unit represents that measurement data including the same information as the information of the target vehicle of the one piece of the imaging data has not been found, and the data associating unit may defer association of the measurement data with the one piece of the imaging data if the time determining unit determines that the measurement start time is prior to the time at which the target vehicle of the one piece of imaging data
25 has been last captured.

[0021]

The data associating unit may assume that the measurement data is associated with the one piece of the imaging data without associating the measurement data with the one piece of the imaging data if the time determining unit determines that the measurement start time is not prior to the time at which the target vehicle of the one piece of imaging data has been last captured.

[0022]

According to a second aspect of the present invention, a vehicle data processing method is provided for processing data related to vehicles running on a road, and includes: a data associating step of associating (i) one piece of measurement data including the same information as information of one vehicle captured by an imaging device among a measurement data including information of vehicles measured by a measuring device with (ii) one piece of imaging data including the information of the one vehicle captured by the imaging device, wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road.

20 [0023]

According to a third aspect of the present invention, a vehicle data processing device is provided for processing data related to vehicles running on a road, and includes: a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by an imaging device among a measurement data including information of vehicles measured by a

measuring device with (ii) one piece of imaging data including the information of the one vehicle captured by the imaging device, wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road.

[0024]

According to a fourth aspect of the present invention, a program is provided for causing a computer to function as a vehicle data processing device for processing data related to vehicles running on a road, and causes the computer to function as a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by an imaging device among a measurement data including information of vehicles measured by a measuring device with (ii) one piece of imaging data including the information of the one vehicle captured by the imaging device, wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road.

[0025]

According to a fifth aspect of the present invention, a recording medium recording a program for causing a computer to function as a vehicle data processing device for processing data related to vehicles running on a road is provided, and the

program causes the computer to function as a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by an imaging device among a measurement data including information of vehicles measured by a measuring device with (ii) one piece of
5 imaging data including the information of the one vehicle captured by the imaging device, wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the
10 measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road.

[0026]

The summary of the invention does not necessarily describe all necessary features of the present invention.

15 The present invention may also be a sub-combination of feature groups described above.

Advantageous Effects of Invention

[0027]

20 As is apparent from the above description, according to the present invention, it is possible not only to more reliably specify an illegal vehicle, but also to determine a charging amount of a specific use of a road based on a size of an actually running vehicle.

25 Brief Description of Drawings

[0028]

Fig. 1 illustrates an example of a usage environment of a vehicle data processing system 100 according to an embodiment.

Fig. 2 is a diagram illustrating an example of a block configuration of a vehicle data processing device 110.

Fig. 3 is a diagram illustrating an example of information stored in an imaging data storage unit 122 in the form of a table.

Fig. 4 is a diagram illustrating an example of information stored in the imaging data storage unit 122 in the form of a table.

Fig. 5 is a diagram illustrating an example of information stored in a measurement data storage unit 123 in the form of a table.

Fig. 6 is a diagram illustrating an example of information stored in the measurement data storage unit 123 in the form of a table.

Fig. 7 is a diagram illustrating an example of an operation sequence of a vehicle data processing device 110, a camera 130, and an imaging data generating device 150.

Fig. 8 is a diagram illustrating an example of an operation sequence of the vehicle data processing device 110, a laser scanner 170, and a measurement data generating device 190.

Fig. 9 is a diagram illustrating an example of an operation sequence of the vehicle data processing device 110 and the measurement data generating device 190.

Fig. 10 is a diagram illustrating an example of an operation flow of the vehicle data processing device 110.

Fig. 11 is a diagram illustrating an example of an operation flow of the vehicle data processing device 110.

Fig. 12 is a diagram illustrating an example of an operation flow of the vehicle

data processing device 110.

Fig. 13 is a diagram illustrating an example of a hardware configuration of a computer 800 constituting the vehicle data processing device 110 according to this embodiment.

5 Fig. 14 is a diagram illustrating an example of a usage environment of ERP 900.

Description of Embodiments

[0029]

An aspect of the invention will now be described based on the preferred
10 embodiments, which are not intended to limit the scope of the present invention, but exemplify the invention. All of the features and the combinations thereof described in the embodiment are not necessarily essential to the invention.

[0030]

Fig. 1 illustrates an example of a usage environment of a vehicle data processing
15 system 100 according to an embodiment. The vehicle data processing system 100 is a system which processes data related to vehicles running on a road R including a plurality of lanes Ra to Rc. In addition, the road R including a plurality of lanes Ra to Rc may be an example of a “road” in the present invention.

[0031]

20 The vehicle data processing system 100 includes a vehicle data processing device 110, a plurality of cameras 130a to 130c (hereinafter collectively referred to as a camera 130), a plurality of imaging data generating devices 150a to 150c (hereinafter collectively referred to as an imaging data generating device 150), a laser scanner 170, and a measurement data generating device 190. In addition, the camera 130 may be an
25 example of an “imaging device” in this embodiment. In addition, the laser scanner 170

may be an example of a “measuring device” in this embodiment.

[0032]

The vehicle data processing device 110 is communicably connected to the imaging data generating device 150 and the measurement data generating device 190.

5 Then, the vehicle data processing device 110 processes the data related to the vehicle running on the road R. More specifically, the vehicle data processing device 110 receives imaging data transmitted from the imaging data generating device 150. Here, the imaging data include information of vehicles imaged by the camera 130. In addition, the vehicle data processing device 110 receives measurement data transmitted from the
10 measurement data generating device 190. Here, the measurement data include information of vehicles measured by the laser scanner 170. Then, the vehicle data processing device 110 associates one of measurement data including the same information as the information of the vehicle imaged by the camera 130 among a measurement data with one of imaging data.

15 [0033]

Cameras 130 are placed above the road R so as to be arranged in the width direction of a gate Ga extending. Here, the camera 130a is provided to have an imaging area Aa in which vehicles running on a lane Ra can be imaged. In addition, the camera 130b is provided to have an imaging area Ab in which vehicles running on a lane Rb can
20 be imaged. In addition, the camera 130c is provided to have an imaging area Ac in which vehicles running on a lane Rc can be imaged. In addition, each camera 130 is electrically connected to one imaging data generating device 150. Then, the camera 130 converts a video into an electrical signal using a semiconductor element which reacts to light of a charge coupled device (CCD), a complementary metal oxide semiconductor
25 (CMOS), or the like, and outputs the electrical signal as image data to the imaging data

generating device 150.

[0034]

Each imaging data generating device 150 is electrically connected to one camera 130.

5 Then, upon receiving an input of image data output from the camera 130, the imaging data generating device 150 generates imaging data including information of a vehicle when the vehicle is shown in its image. Then, the imaging data generating device 150 transmits the generated imaging data to the vehicle data processing device 110.

10 [0035]

For example, the imaging data generating device 150 generates imaging data including information of an image identifier (ID), a vehicle number, a number plate type, a vehicle speed, a camera ID, a first imaging time, and a last imaging time as the information of the vehicle.

15 [0036]

The information of the image ID is information for uniquely identifying each of image data. More specifically, the camera 130, for example, continuously performs imaging at a speed of about 20 (images/second). Therefore, the camera 130 images the vehicle a plurality of times while the vehicle passes through the imaging area. The
20 imaging data generating device 150 saves image data from which the number plate of the vehicle is most likely to be visibly recognized among images in which the same vehicle is shown. For example, the image data from which the number plate of the vehicle is most likely to be visibly recognized is image data in which a number plate of the vehicle is shown to be largest. This image data is used as the evidence of illegality thereafter
25 when the shown vehicle is an illegal vehicle. Information of the image ID is

information for uniquely identifying the image data.

[0037]

The information of the vehicle number is information representing the vehicle number displayed on the number plate of the vehicle. More specifically, when the
5 number plate of the vehicle is shown in the image, the imaging data generating device 150 reads the vehicle number displayed on the number plate by performing optical character recognition on the image. The information of the vehicle number is information representing the vehicle number read as described above.

[0038]

10 The information of the number plate type is information representing the type of number plate of the vehicle. More specifically, when the number plate of the vehicle is shown in the image, the imaging data generating device 150 identifies the type of number plate. For example, the imaging data generating device 150 determines whether a
15 physical object is a vehicle based on a feature point of the physical object shown in the image. Then, upon determining that the physical object shown in the image is the vehicle, the imaging data generating device 150 detects a rectangular region at a predetermined position within a region occupied by the vehicle in the image as the number plate. Then, the imaging data generating device 150 identifies the type of number plate based on a size of the region in the image detected as the number plate.
20 The information of the number plate type is information representing the type of number plate identified as described above.

[0039]

The information of the vehicle speed is information representing a speed of the vehicle. More specifically, as described above, the imaging data generating device 150
25 detects the number plate shown in the image. Then, the imaging data generating device

150 calculates the speed of the vehicle based on a time from an imaging time of the image in which the number plate of the vehicle has been first imaged to an imaging time of the image in which the number plate of the vehicle has been last imaged. The information of the vehicle speed is information representing the speed of the vehicle
5 calculated as described above.

[0040]

The information of the camera ID is information for uniquely identifying each camera 130 among a plurality of cameras 130.

[0041]

10 The information of the first imaging time is the imaging time of the image in which the number plate of one vehicle has been first imaged. In addition, the information of the last imaging time is the imaging time of the image in which the number plate of the one vehicle has been last imaged. More specifically, as described above, the imaging data generating device 150 detects the number plate shown in the
15 image. Information of the first detection time is an imaging time of an image in which the number plate of one vehicle detected as described above has been first imaged. In addition, the information of the last imaging time is an imaging time of the image in which the number plate of the one vehicle detected as described above has been last imaged.

20 [0042]

The laser scanner 170 is provided on a gate Gb extending over the road R so as to perform scanning in the width direction of the road R in an imaging area of the imaging areas Aa to Ac of the cameras 130a to 130c. In addition, the laser scanner 170 is electrically connected to the measurement data generating device 190. Then, the laser
25 scanner 170 measures dimensions of the vehicle passing through a scanning area L by

scanning the scanning area L using light rays. Then, the laser scanner 170 outputs data representing the dimensions of the vehicle as a measurement result to the measurement data generating device 190.

[0043]

5 The measurement data generating device 190 is electrically connected to the laser scanner 170. Then, upon receiving the input of the data output from the laser scanner 170, the measurement data generating device 190 generates measurement data including information of the vehicle such as dimensions of the vehicle represented by the data. Then, the measurement data generating device 190 transmits the generated
10 measurement data to the vehicle data processing device 110.

[0044]

For example, the measurement data generating device 190 generates imaging data including information of a measurement position, a vehicle length, a vehicle width, a vehicle height, a vehicle speed, a measurement start time, and a measurement end time as
15 the information of the vehicle.

[0045]

The information of the measurement position is information representing a measurement position of a road width direction of the vehicle measured by the laser scanner 170. More specifically, the laser scanner 170 detects a center position of the
20 vehicle with a distance from an end of the road R in the width direction of the road R.

[0046]

The information of the vehicle length is information representing a dimension from a front end to a rear end of the vehicle measured by the laser scanner 170.

[0047]

25 The information of the vehicle width is information representing the dimension

from a left end to a right end of the vehicle measured by the laser scanner 170.

[0048]

The information of the vehicle height is information representing the height of the vehicle measured by the laser scanner 170.

5 [0049]

The information of the vehicle speed is information representing the speed of the vehicle measured by the laser scanner 170. More specifically, the measurement data generating device 190 calculates the speed of the vehicle based on a time until the laser scanner 170 does not measure the dimensions of the vehicle after beginning to measure the dimensions of the vehicle. Information of the vehicle speed (km/h) is information representing the speed of the vehicle calculated as described above.

[0050]

The information of the measurement start time is information representing a time at which the laser scanner 170 has started the measurement of dimensions of one vehicle. The information of the measurement end time is information representing a time at which the laser scanner 170 has ended the measurement of the dimension of the one vehicle.

[0051]

In addition, the measurement data generating device 190 transmits measurement progress time data representing a measurement start time of the vehicle during measurement by the laser scanner 170 to the vehicle data processing device 110. For example, the measurement data generating device 190 transmits the measurement progress time data at predetermined time intervals.

[0052]

25 In addition, in this embodiment, for the purpose of preventing the description

from being complex, a configuration in which the vehicle data processing system 100 includes one vehicle data processing device 110, one laser scanner 170, and one measurement data generating device 190 will be described. However, the vehicle data processing system 100 may include a plurality of vehicle data processing devices 110, a plurality of laser scanners 170, and a plurality of measurement data generating devices 190.

[0053]

Fig. 2 illustrates an example of a block configuration of the vehicle data processing device 110. The vehicle data processing device 110 includes an imaging data receiving unit 111, a measurement data receiving unit 112, a measurement progress time data receiving unit 113, an identical position search unit 114, an identical time zone search unit 115, an identical vehicle type classification search unit 116, a vehicle speed evaluating unit 117, a time zone evaluating unit 118, a position evaluating unit 119, a time determining unit 120, a data associating unit 121, an imaging data storage unit 122, and a measurement data storage unit 123. In the following description, functions and operations of the components will be described in detail.

[0054]

The imaging data receiving unit 111 receives imaging data transmitted from the imaging data generating device 150.

20 [0055]

The measurement data receiving unit 112 receives measurement data transmitted from the measurement data generating device 190.

[0056]

The measurement progress time data receiving unit 113 receives measurement progress time data transmitted from the measurement data generating device 190.

[0057]

The identical position search unit 114 searches for measurement data including information of a vehicle measured at the same position as an imaged position of a vehicle of a target of one of imaging data from among the measurement data.

5 [0058]

The identical time zone search unit 115 searches for measurement data including information of a vehicle measured in the same time zone as a time zone in which the vehicle of the target of the one of imaging data has been imaged from among the measurement data. More specifically, the identical time zone search unit 115 searches
10 for measurement data including the information of the vehicle measured in the same time zone as the time zone in which the vehicle of the target of the one imaging data has been imaged from among the measured data found by the identical position search unit 114.

[0059]

The identical vehicle type classification search unit 116 searches for
15 measurement data including information of a vehicle of the same vehicle type classification as vehicle type classification of the vehicle of the target of the one of imaging data from among the measurement data. More specifically, the identical vehicle type classification search unit 116 searches for measurement data including the information of the vehicle of the same vehicle type classification as the vehicle type
20 classification of the vehicle of the target of the one of imaging data from among the measurement data found by the identical time zone search unit 115.

[0060]

When the identical vehicle type classification search unit 116 has found a measurement data, the vehicle speed evaluating unit 117 evaluates a degree to which a
25 vehicle speed of a vehicle targeted by each of the measurement data matches a vehicle

speed of the vehicle of the target of the one of imaging data.

[0061]

When the identical vehicle type classification search unit 116 has found the measurement data, the time zone evaluating unit 118 evaluates a degree to which a time zone in which the vehicle targeted by each of the measurement data has been measured matches a time zone in which the vehicle of the target of the one of imaging data has been imaged.

[0062]

When the identical vehicle type classification search unit 116 has found the measurement data, the position evaluating unit 119 evaluates a degree to which a position at which the vehicle targeted by each of the measurement data has been measured matches a position at which the vehicle of the target of the one of imaging data has been imaged.

[0063]

The time determining unit 120 determines whether a measurement start time of a vehicle during measurement by the laser scanner 170 is prior to a time at which the vehicle of the target of the one of imaging data has been last imaged when a result of a measurement data search performed by the identical vehicle type classification search unit 116 or the identical time zone search unit 115 represents that measurement data including the same information as the information of the vehicle of the target of the one of imaging data has not been found.

[0064]

The data associating unit 121 associates one of measurement data including the same information as information of the vehicle imaged by the camera 130 among the measurement data with one of imaging data including the information of the vehicle.

More specifically, the data associating unit 121 associates one of measurement data with one of imaging data when the identical vehicle type classification search unit 116 has found the one of measurement data. In addition, the data associating unit 121 associates one of measurement data targeting a vehicle of a vehicle speed having a high degree of matching evaluated by the vehicle speed evaluating unit 117 among the measurement data found by the identical vehicle type classification search unit 116 with the one of imaging data. In addition, the data associating unit 121 associates one of measurement data targeting a vehicle measured in a time zone having a high degree of matching evaluated by the time zone evaluating unit 118 among the measurement data found by the identical vehicle type classification search unit 116 with the one of imaging data. In addition, the data associating unit 121 associates one of measurement data targeting a vehicle measured at a position having a high degree of matching evaluated by the position evaluating unit 119 among the measurement data found by the identical vehicle type classification search unit 116 with the one of imaging data. In addition, the data associating unit 121 defers association of the measurement data with the one of imaging data when the time determining unit 120 determines that the measurement start time is prior to the time at which the vehicle of the target of the one of imaging data has been last imaged. In addition, when the time determining unit 120 determines that the measurement start time is not prior to the time at which the vehicle of the target of the one of imaging data has been last imaged, the data associating unit 121 assumes that the measurement data is associated with the one of imaging data without associating the measurement data with the one of imaging data.

[0065]

Each of Figs. 3 and 4 illustrates an example of information stored in the imaging data storage unit 122 in the form of a table.

In the imaging data storage unit 122, information of an imaging data ID, an image ID, a vehicle number, a number plate type, a vehicle speed (km/h), a camera ID, a first imaging time (year/month/day/hour:minute:second), a last imaging time (year/month/day/hour:minute:second), and a measurement data ID is associated and
5 stored.

[0066]

The information of the imaging data ID is information for uniquely identifying each of imaging data. When the information included in the imaging data received from the imaging data generating device 150 is stored in the imaging data storage unit
10 122, the information of the imaging data ID is associated with the information included in the imaging data.

[0067]

The information of the image ID, the vehicle number, the number plate type, the vehicle speed (km/h), the camera ID, the first imaging time
15 (year/month/day/hour:minute:second), and the last imaging time (year/month/day/hour:minute:second) is information included in the imaging data received from the imaging data generating device 150. That is, as described above, the information of the image ID is information for uniquely identifying each of image data. In addition, the information of the vehicle number is information representing the vehicle
20 number displayed on the number plate of the vehicle. In addition, the information of the number plate type is information representing the type of number plate of the vehicle. In addition, the information of the vehicle speed (km/h) is information representing the vehicle speed of the vehicle. In addition, the information of the camera ID is information for uniquely identifying each camera 130 among a plurality of cameras 130.
25 In addition, the information of the first imaging time

(year/month/day/hour:minute:second) is an imaging time of an image in which a number plate of one vehicle has been first imaged. In addition, the information of the last imaging time is an imaging time of an image in which the number plate of the one vehicle has been last imaged.

5 [0068]

The information of the measurement data ID is information for identifying the measurement data associated with imaging data identified by the imaging data ID.

[0069]

Each of Figs. 5 and 6 illustrates an example of information stored in the
10 measurement data storage unit 123 in the form of a table.

In the measurement data storage unit 123, information of a measurement data ID, a measurement position, a vehicle length (mm), a vehicle width (mm), a vehicle height (mm), a vehicle speed (km/h), a measurement start time (year/month/day/hour:minute:second), a measurement end time
15 (year/month/day/hour:minute:second), and an imaging data ID is associated and stored.

[0070]

The information of the measurement data ID is information for uniquely identifying each of measurement data. When the information included in the measurement data received from the measurement data generating device 190 is stored in
20 the measurement data storage unit 123, the information of the measurement data ID is associated with the information included in the measurement data.

[0071]

The information of the measurement position, the vehicle length (mm), the vehicle width (mm), the vehicle height (mm), the vehicle speed (km/h), the measurement
25 start time (year/month/day/hour:minute:second), and the measurement end time

(year/month/day/hour:minute:second) is information included in the measurement data received from the measurement data generating device 190. That is, as described above, the information of the measurement position is information representing the measurement position of the vehicle measured by the laser scanner 170. In addition, the information of the vehicle length (mm) is information representing a dimension from a front end to a rear end of the vehicle measured by the laser scanner 170. In addition, the information of the vehicle width (mm) is information representing a dimension from a left end to a right end of the vehicle measured by the laser scanner 170. In addition, the information of the vehicle height (mm) is information representing the height of the vehicle measured by the laser scanner 170. In addition, the information of the vehicle speed (km/h) is information representing a speed of the vehicle measured by the laser scanner 170. In addition, the information of the measurement start time (year/month/day/hour:minute:second) is information representing a time at which the laser scanner 170 has started the measurement of the dimensions of one vehicle. In addition, the information of the measurement end time (year/month/day/hour:minute:second) is information representing a time at which the laser scanner 170 has ended the measurement of the dimensions of one vehicle.

[0072]

The information of the imaging data ID is information for identifying the imaging data associated with the measurement data identified by the measurement data ID.

[0073]

Fig. 7 illustrates an example of an operation sequence of the vehicle data processing device 110, the camera 130, and the imaging data generating device 150. In the description of this operation sequence, a process related to imaging data will be

described in detail. In addition, the operation sequence will be described with reference to Figs. 1 to 6 together.

[0074]

The camera 130 captures a video of an imaging area (S101) and outputs the
5 captured video as image data (S102). More specifically, the camera 130, for example, sequentially outputs the image data captured at a speed of about 20 (images/second).

[0075]

Upon receiving the input of the image data output from the camera 130, the
imaging data generating device 150 generates imaging data by performing optical
10 character recognition on the image data (103). More specifically, when the vehicle is not shown in the image, the imaging data generating device 150 discards the image data. On the other hand, when the vehicle is shown in the image, the imaging data generating device 150 saves the image data. Here, as described above, the camera 130 performs imaging at a speed of about 20 (images/second). Therefore, the camera 130
15 continuously outputs the image data in which the same vehicle is shown. Then, the imaging data generating device 150 extracts the vehicle number of the number plate of the vehicle by performing optical character recognition on a series of image data. As a result, when the same vehicle number has been extracted, the imaging data generating device 150 treats the vehicle number as that of the same vehicle. Then, the imaging
20 data generating device 150 generates imaging data including information of an image ID, a vehicle number, a number plate type, a vehicle speed, a camera ID, a first imaging time, and a last imaging time as information of the vehicle shown in the image on which the optical character recognition has been performed. Then, the imaging data generating device 150 transmits the generated imaging data to the vehicle data processing device
25 110 (S104).

[0076]

Upon receiving imaging data transmitted from the imaging data generating device 150, the imaging data receiving unit 111 of the vehicle data processing device 110 associates the information included in the imaging data with the information of the imaging data ID and stores an association result in the imaging data storage unit 122 (S105).

[0077]

Thus, the information as illustrated in Figs. 3 and 4 is stored in the imaging data storage unit 122 of the vehicle data processing device 110.

10 [0078]

Fig. 8 illustrates an example of an operation sequence of the vehicle data processing device 110, the laser scanner 170, and the measurement data generating device 190. In the description of this operation sequence, a process related to measurement data will be described in detail. In addition, the operation sequence will be described with reference to Figs. 1 to 7 together.

[0079]

The laser scanner 170 measures dimensions of a vehicle passing through the scanning area L by scanning the scanning area L using light rays (S201). Then, the laser scanner 170 outputs data representing dimensions of the vehicle as a measurement result (S202).

[0080]

Upon receiving an input of the data output from the laser scanner 170, the measurement data generating device 190 generates measurement data including information of a measurement position, a measurement start time, and a measurement end time in addition to information of a vehicle length, a vehicle width, and a vehicle

height which are dimensions of the vehicle represented by the data (S203). Then, the measurement data generating device 190 transmits the generated measurement data to the vehicle data processing device 110 (S204).

[0081]

5 Upon receiving the measurement data transmitted from the measurement data generating device 190, the measurement data receiving unit 112 of the vehicle data processing device 110 associates the information included in the measurement data with the information of the measurement data ID, and stores an association result in the measurement data storage unit 123 (S205).

10 [0082]

Thus, information as illustrated in Figs. 5 and 6 is stored in the measurement data storage unit 123 of the vehicle data processing device 110.

[0083]

Fig. 9 illustrates an example of an operation sequence of the vehicle data processing device 110 and the measurement data generating device 190. In the description of this operation sequence, a process related to measurement progress time data will be described in detail. In addition, the operation sequence will be described with reference to Figs. 1 to 8 together.

[0084]

20 The measurement data generating device 190 transmits the measurement progress time data representing the measurement start time of the vehicle during measurement by the laser scanner 170 to the vehicle data processing device 110, for example, at predetermined time intervals (S301).

[0085]

25 Upon receiving the measurement progress time data transmitted from the

measurement data generating device 190, the measurement progress time data receiving unit 113 of the vehicle data processing device 110 sends the measurement progress time data to the time determining unit 120.

[0086]

5 Thus, the time determining unit 120 of the vehicle data processing device 110 can perform a process using a measurement start time of the vehicle during measurement by the laser scanner 170 represented by the measurement progress time data.

[0087]

Each of Figs. 10 to 12 illustrates an example of an operation flow of the vehicle
10 data processing device 110. In the description of this operation flow, a process of associating measurement data with imaging data will be described in detail. In addition, the operation flow will be described with reference to Figs. 1 to 9 together.

[0088]

First, the identical position search unit 114 of the vehicle data processing device
15 110 selects one of imaging data with which measurement data is not yet associated from among the imaging data in which information is stored in the imaging data storage unit 122 as target imaging data to be associated with the measurement data. More specifically, the identical position search unit 114 selects one of imaging data in which a value is not yet stored in the information of the measurement data ID associated with the
20 information stored in the imaging data storage unit 122.

[0089]

Then, the identical position search unit 114 searches for measurement data including information of the vehicle measured at the same position as an imaged position of the vehicle of the target of the above-described one of imaging data from among the
25 measurement data in which information is stored in the measurement data storage unit

123 (S401). More specifically, the identical position search unit 114 reads the information of the camera ID of the above-described one of imaging data stored in the imaging data storage unit 122. Then, the identical position search unit 114 searches for measurement data including information of a measurement position of a value

5 corresponding to an imaging area of the camera 130 identified by information of the above-described camera ID as a value of information of a measurement position from among the measurement data in which information is stored in the measurement data storage unit 123. As a result, when at least one of measurement data including information of the vehicle measured at the same position have been found (S402: Yes),

10 the identical position search unit 114 sends measurement data IDs of at least one of measurement data and an imaging data ID of the above-described one of imaging data to the identical time zone search unit 115.

[0090]

Upon receiving data sent from the identical position search unit 114, the

15 identical time zone search unit 115 of the vehicle data processing device 110 searches for measurement data including information of a vehicle measured in the same time zone as a time zone in which a vehicle of a target of one of imaging data has been imaged from among the measurement data found by the identical position search unit 114 (S403).

More specifically, the identical time zone search unit 115 reads information of a first

20 imaging time (year/month/day/hour:minute:second) and information of a last imaging time (year/month/day/hour:minute:second) associated with the imaging data ID sent from the identical position search unit 114 from among the information stored in the imaging data storage unit 122. Then, the identical time zone search unit 115 sets a time zone from a time represented by the information of the first imaging time

25 (year/month/day/hour:minute:second) to a time represented by the information of the last

imaging time (year/month/day/hour:minute:second) as a time zone in which a vehicle targeted by the above-described one of imaging data has been imaged. Then, the identical time zone search unit 115 searches for measurement data targeting a vehicle measured in a time zone in which at least a part of the time zone from the time

5 represented by the information of the measurement start time

(year/month/day/hour:minute:second) to the time represented by the information of the measurement end time (year/month/day/hour:minute:second) overlaps the time zone in which the vehicle targeted by the above-described one of imaging data has been imaged from at least one of measurement data identified by the measurement data ID sent from
10 the identical position search unit 114 by referring to the information of the measurement start time (year/month/day/hour:minute:second) and the measurement end time (year/month/day/hour:minute:second) stored in the measurement data storage unit 123.

As a result, when the measurement data including the information of the vehicle measured in the same time zone has been found (S404: Yes), the identical time zone

15 search unit 115 sends the measurement data IDs of at least one of measurement data and the imaging data ID of the above-described one of imaging data to the identical vehicle type classification search unit 116.

[0091]

Upon receiving data sent from the identical time zone search unit 115, the
20 identical vehicle type classification search unit 116 of the vehicle data processing device 110 searches for measurement data including information of a vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data from among the measurement data found by the identical time zone search unit 115 (S405). More specifically, the identical vehicle type classification
25 search unit 116 reads information of the vehicle number associated with the imaging data

ID sent from the identical time zone search unit 115 from among the information stored in the imaging data storage unit 122. Here, when the information of the vehicle number is empty, the identical vehicle type classification search unit 116 reads information of a number plate type in place of the information of the vehicle number. Then, the identical

5 vehicle type classification search unit 116 specifies vehicle type classification of a vehicle targeted by one of imaging data based on a character string of the vehicle number represented by the information of the vehicle number or a type of number plate represented by the information of the number plate type. For example, when an initial letter of the character string of the vehicle number is "S," the identical vehicle type

10 classification search unit 116 specifies that the vehicle type classification of the vehicle targeted by one of imaging data is a standard vehicle. In addition, for example, when the type of number plate is the standard vehicle, the identical vehicle type classification search unit 116 specifies that the vehicle type classification of the vehicle targeted by the one of imaging data is the standard vehicle. Then, the identical vehicle type

15 classification search unit 116 searches for measurement data targeting a vehicle of the same vehicle type classification as the vehicle type classification of the vehicle targeted by the above-described one of imaging data based on dimensions represented by the information of the vehicle length (mm), the vehicle width (mm), and the vehicle height (mm) from among at least one of measurement data identified by the measurement data

20 IDs sent from the identical time zone search unit 115 by referring to the information of the vehicle length (mm), the vehicle width (mm), and the vehicle height (mm) stored in the measurement data storage unit 123. As a result, when one of measurement data including information of the vehicle of the same vehicle type classification has been found (S406: Yes → S407: Yes), the identical vehicle type classification search unit 116

25 sends the measurement data ID of the one of measurement data and the imaging data ID

of the above-described one of imaging data to the data associating unit 121.

[0092]

Upon receiving data sent from the identical vehicle type classification search unit 116, the data associating unit 121 of the vehicle data processing device 110
5 associates one of measurement data found by the identical vehicle type classification search unit 116 with one of imaging data (S408). More specifically, the data associating unit 121 stores the measurement data ID sent from the identical vehicle type classification search unit 116 in the imaging data storage unit 122 in association with the imaging data ID sent from the identical vehicle type classification search unit 116.

10 Likewise, the data associating unit 121 stores the imaging data ID sent from the identical vehicle type classification search unit 116 in the measurement data storage unit 123 in association with the measurement data ID sent from the identical vehicle type classification search unit 116.

[0093]

15 Thus, the vehicle data processing device 110 associates one of imaging data including information related to a vehicle in which a position of imaging performed by the camera 130 matches a position of measurement by the laser scanner 170, a time zone of the imaging performed by the camera 130 matches a time zone of the measurement performed by the laser scanner 170, and vehicle type classifications match with one of
20 measurement data.

[0094]

On the other hand, when a measurement data including information of a vehicle of the same vehicle type classification have been found in the above-described step S405 (S406: Yes → S407: No), the identical vehicle type classification search unit 116 sends
25 measurement data IDs of the measurement data and an imaging data ID of the

above-described one of imaging data to the vehicle speed evaluating unit 117, the time zone evaluating unit 118, and the position evaluating unit 119.

[0095]

Upon receiving data sent from the identical vehicle type classification search
5 unit 116, the vehicle speed evaluating unit 117 of the vehicle data processing device 110 evaluates a degree to which a vehicle speed of the vehicle targeted by each of the measurement data found by the identical vehicle type classification search unit 116 matches a vehicle speed of the vehicle of the target of the one of imaging data (S409). More specifically, the vehicle speed evaluating unit 117 reads information of a vehicle
10 speed (km/h) of the one of imaging data associated with the imaging data ID sent from the identical vehicle type classification search unit 116 from among the information stored in the imaging data storage unit 122. In addition, the vehicle speed evaluating unit 117 reads information of a vehicle speed (km/h) of each of measurement data associated with each measurement data ID sent from the identical vehicle type
15 classification search unit 116 from among the information stored in the measurement data storage unit 123. Then, the vehicle speed evaluating unit 117 evaluates a degree to which a value of the information of the vehicle speed (km/h) of the above-described one of imaging data matches a value of the information of the vehicle speed (km/h) of each of measurement data. For example, when a normal distribution for a measurement value
20 of the vehicle speed is assumed using a value of the information of the vehicle speed (km/h) as a median value, the vehicle speed evaluating unit 117 evaluates an overlapping amount of two normal distributions as a degree of matching in the vehicle speed. Then, the vehicle speed evaluating unit 117 sends the imaging data ID of the above-described one of imaging data, the measurement data IDs of the measurement data found by the
25 identical vehicle type classification search unit 116, and a result of evaluating the degree

of matching in the vehicle speed to the data associating unit 121.

[0096]

Upon receiving the data sent from the identical vehicle type classification search unit 116, the time zone evaluating unit 118 of the vehicle data processing device 110

5 evaluates a degree to which a time zone in which a vehicle targeted by each of the measurement data found by the identical vehicle type classification search unit 116 has been measured matches a time zone in which the vehicle of the target of the one of imaging data has been imaged (S410). More specifically, the time zone evaluating unit 118 reads information of a first imaging time (year/month/day/hour:minute:second) and a

10 last imaging time (year/month/day/hour:minute:second) of one of imaging data associated with an imaging data ID sent from the identical vehicle type classification search unit 116 from among the information stored in the imaging data storage unit 122. In addition, the time zone evaluating unit 118 reads information of a measurement start time (year/month/day/hour:minute:second) and a measurement end time

15 (year/month/day/hour:minute:second) of each of measurement data associated with each measurement data ID sent from the identical vehicle type classification search unit 116 from among the information stored in the measurement data storage unit 123. Then, the time zone evaluating unit 118 evaluates a degree to which a time zone from a time represented by the information of the first imaging time

20 (year/month/day/hour:minute:second) of the above-described one of imaging data to a time represented by the information of the last imaging time (year/month/day/hour:minute:second) matches a time zone from a time represented by the information of the measurement start time (year/month/day/hour:minute:second) of each of measurement data to a time represented by the information of the measurement

25 end time (year/month/day/hour:minute:second). Then, the time zone evaluating unit

118 sends the imaging data ID of the above-described one of imaging data, the measurement data IDs of the measurement data found by the identical vehicle type classification search unit 116, and a result of evaluating the degree of matching in the time zone to the data associating unit 121.

5 [0097]

Upon receiving data sent from the identical vehicle type classification search unit 116, the position evaluating unit 119 of the vehicle data processing device 110 evaluates a degree to which a position at which a vehicle targeted by each of the measurement data found by the identical vehicle type classification search unit 116 has
10 been measured matches a position at which the vehicle of the target of the one of imaging data has been imaged (S411). More specifically, the position evaluating unit 119 reads information of a camera ID of the one of imaging data associated with the imaging data ID sent from the identical vehicle type classification search unit 116 from among the information stored in the imaging data storage unit 122. In addition, the position
15 evaluating unit 119 reads information of a detection position of measurement data associated with each measurement data ID sent from the identical vehicle type classification search unit 116 from among the information stored in the measurement data storage unit 123. Then, the position evaluating unit 119 evaluates a degree to which an imaging area of the camera 130 identified by the information of the camera ID of the
20 above-described one of imaging data matches a position represented by the information of the detection position of each of measurement data. Then, the position evaluating unit 119 sends the imaging data ID of the above-described one of imaging data, the measurement data IDs of the measurement data found by the identical vehicle type classification search unit 116, and a result of evaluating the degree of matching in the
25 position to the data associating unit 121.

[0098]

Upon receiving data sent from the vehicle speed evaluating unit 117, the time zone evaluating unit 118, and the position evaluating unit 119, the data associating unit 121 associates one of measurement data targeting a vehicle of a vehicle speed, a time zone, and a position having a high degree of matching evaluated by the vehicle speed evaluating unit 117, the time zone evaluating unit 118, and the position evaluating unit 119 among a measurement data found by the identical vehicle type classification search unit 116 with one of imaging data (S408).

[0099]

Thus, even when it is difficult to narrow a measurement data including information related to a vehicle in which a position of imaging performed by the camera 130 matches a position of measurement performed by the laser scanner 170 and a time zone of imaging performed by the camera 130 matches a time zone of measurement performed by the laser scanner 170 down to one of measurement data including information related to a vehicle consistent with vehicle type classification of the vehicle imaged by the camera 130, the vehicle data processing device 110 specifies one of measurement data to be associated with one of imaging data based on degrees of matching in the speed of the vehicle, the time zone in which the vehicle has been detected, and the position at which the vehicle has been detected.

[0100]

On the other hand, when no measurement data including information of the vehicle measured at the same position has been found in the above-described step S402 (S402: No), the identical position search unit 114 sends the imaging data ID of the above-described one of imaging data to the time determining unit 120. In addition, when no measurement data including the information of the vehicle measured in the

same time zone has been found in the above-described step S403 (S404: No), the identical time zone search unit 115 sends an imaging data ID of the above-described one of imaging data to the time determining unit 120. In addition, when no measurement data including the information of the vehicle of the same vehicle type classification has
5 been found in the above-described step S405 (S406: No), the identical vehicle type classification search unit 116 sends an imaging data ID of the above-described one of imaging data to the time determining unit 120.

[0101]

Upon receiving the imaging data ID sent from the identical time zone search
10 unit 115 or the identical vehicle type classification search unit 116, the time determining unit 120 of the vehicle data processing device 110 determines whether the measurement start time of the vehicle during measurement by the laser scanner 170 is prior to a time at which the vehicle of the target of the above-described one of imaging data has been last imaged (S412). More specifically, the time determining unit 120, for example, receives
15 measurement progress time data sent from the measurement progress data receiving unit at predetermined time intervals as described above. Then, upon receiving the imaging data ID sent from the identical time zone search unit 115 or the identical vehicle type classification search unit 116, the time determining unit 120 reads information of a last imaging time (year/month/day/hour:minute:second) associated with the imaging data ID
20 from among the information stored in the imaging data storage unit 122. Then, the time determining unit 120 determines whether a time represented by the measurement progress time data last received is prior to a time represented by the information of the last imaging time (year/month/day/hour:minute:second). Then, the time determining unit 120 sends a determination result to the data associating unit 121.

25 [0102]

Upon receiving a result of determining that the measurement start time of the vehicle during measurement by the laser scanner 170 is prior to the time at which the vehicle of the target of the above-described one of imaging data has been last imaged from the time determining unit 120 (S412: Yes), the data associating unit 121 defers
5 association of the measurement data with the one of imaging data. On the other hand, upon receiving a result of determining that the measurement start time of the vehicle during the measurement by the laser scanner 170 is not prior to the time at which the vehicle of the target of the above-described one of imaging data has been last imaged from the time determining unit 120 (S412: No), the data associating unit assumes that the
10 measurement data is associated with the one of imaging data without associating the measurement data with the one of imaging data (S408).

[0103]

Thus, when no measurement data associated with the one of imaging data has been found, the vehicle data processing device 110 defers the association of the
15 measurement data with the one of imaging data because the measurement data including the information related to the vehicle is likely to be associated with the one imaging data if there is a vehicle which is still being measured after the laser scanner 170 has started measurement at a time prior to the time at which the vehicle targeted by the one of imaging data was last imaged. In addition, when no measurement data to be associated
20 with the one of imaging data has been found, the vehicle data processing device 110 assumes that the measurement data is associated with the one of imaging data without associating the measurement data with the one of imaging data because there is a possibility that measurement of the vehicle targeted by the one of imaging data will fail if there is no vehicle which is still being measured after the laser scanner 170 has started
25 measurement at the time prior to the time at which the vehicle targeted by the one of

imaging data was last imaged.

[0104]

As described above, the plurality of cameras 130 are placed above the road R so as to be arranged in the width direction of the road and configured to continuously image an obliquely downward area. In addition, the laser scanner 170 is provided to perform scanning in the width direction of the road R in the imaging areas Aa to Ac of the camera 130 and measures dimensions of the vehicle passing through the scanning area L. Then, the vehicle data processing device 110 associates one of measurement data including the same information as the information of the vehicle imaged by the camera 130 among a measurement data with one of imaging data including the information of the vehicle.

[0105]

Thus, the vehicle data processing system 100 can not only specify an illegal vehicle more reliably, but can also determine a charging amount of a specific use of a road based on a size of an actually running vehicle.

[0106]

In addition, as described above, the vehicle data processing device 110 searches for measurement data including information of a vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data from among the measurement data. Then, the vehicle data processing device 110 associates one of measurement data with one of imaging data when the one of measurement data has been found.

[0107]

Thus, the vehicle data processing system 100 can associate one of imaging data targeting a vehicle of the same vehicle type classification with one of measurement data.

[0108]

In addition, as described above, the vehicle data processing device 110 searches for measurement data including the information of the vehicle measured in the same time zone as a time zone in which the vehicle of the target of the one of imaging data has been imaged from among the measurement data. Then, the vehicle data processing device

5 110 searches for measurement data including the information of the vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data from among the measurement data which has been found.

[0109]

Thus, the vehicle data processing system 100 can associate the one of imaging

10 data targeting the vehicle of the same vehicle type classification detected in the same time zone with one of measurement data.

[0110]

In addition, as described above, the vehicle data processing device 110 searches for measurement data including the information of the vehicle measured at the same

15 position as an imaged position of the vehicle of the target of the one of imaging data from among the measurement data. Then, the vehicle data processing device 110 searches for measurement data including the information of the vehicle measured in the same time zone as the time zone in which the vehicle of the target of the one of imaging data has been imaged from among the measurement data which has been found.

20 [0111]

Thus, the vehicle data processing system 100 can associate the one of imaging data targeting the vehicle of the same vehicle type classification detected in the same time zone at the same position with one of measurement data.

[0112]

25 In addition, as described above, the vehicle data processing device 110 evaluates

a degree to which the vehicle speed of the vehicle targeted by each of the measurement data matches the vehicle speed of the vehicle of the target of the one of imaging data when the measurement data including the information of the vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data have been found. Then, the vehicle data processing device 110 associates one of measurement data targeting the vehicle of the vehicle speed having a high degree of matching evaluated among the measurement data with one of imaging data.

[0113]

10 Thus, the vehicle data processing system 100 can associate one of imaging data including the information of the vehicle having a high degree of matching in the vehicle speed with one of measurement data when it is difficult to specify the one of measurement data targeting the vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data.

15 [0114]

 In addition, as described above, the vehicle data processing device 110 evaluates a degree to which a time zone in which the vehicle targeted by each of the measurement data has been measured matches a time zone in which the vehicle of the target of the one of imaging data has been imaged when a measurement data including the information of the vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data have been found. Then, the vehicle data processing device 110 associates the one of measurement data targeting the vehicle measured in the time zone having a high degree of matching evaluated among the measurement data with one of imaging data.

25 [0115]

Thus, the vehicle data processing system 100 can associate one of imaging data including the information of the vehicle having a high degree of matching in the detected time zone with one of measurement data when it is difficult to specify the one of measurement data targeting the vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data.

[0116]

In addition, as described above, the vehicle data processing device 110 evaluates a degree to which a position at which the vehicle targeted by each of the measurement data has been measured matches a position at which the vehicle of the target of the one of imaging data has been imaged when a measurement data including the information of the vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data have been found. Then, the vehicle data processing device 110 associates one of measurement data targeting the vehicle measured at a position having a high degree of matching evaluated among the measurement data with one of imaging data.

[0117]

Thus, the vehicle data processing system 100 can associate one of imaging data including the information of the vehicle having a high degree of matching in the detected position with one of measurement data when it is difficult to specify the one of measurement data targeting the vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data.

[0118]

In addition, as described above, the vehicle data processing device 110 determines whether a measurement start time of a vehicle during measurement by the laser scanner 170 is prior to a time at which the vehicle of the target of the one of

imaging data has been last imaged when no measurement data including the same information as the information of the vehicle of the target of the one of imaging data has been found. Then, when the measurement start time is prior to the time at which the vehicle of the target of the one of imaging data has been last imaged, the vehicle data processing device 110 defers the association of the measurement data with the one of imaging data.

[0119]

Thus, the vehicle data processing system 100 can defer the association of the measurement data with one of imaging data when there is no measurement data to be associated with one of imaging data when the vehicle of the target of the one of imaging data is still being measured.

[0120]

In addition, as described above, it is determined whether the measurement start time of the vehicle during the measurement by the laser scanner 170 is prior to the time at which the vehicle of the target of the one of imaging data has been last imaged when no measurement data including the same information as the information of the vehicle of the target of the one of imaging data has been found. Then, the vehicle data processing device 110 assumes that the measurement data is associated with the one of imaging data without associating the measurement data with the one of imaging data when the measurement start time is not prior to the time at which the vehicle of the target of the one of imaging data has been last imaged.

[0121]

Thus, the vehicle data processing device 110 can treat the measurement data as having been associated without actually associating the measurement data with the one of imaging data when the measurement of the vehicle of the target of the one of imaging

data has failed.

[0122]

Fig. 13 illustrates an example of a hardware configuration of a computer 800 constituting the vehicle data processing device 110 according to this embodiment. The computer 800 according to this embodiment includes a central processing unit (CPU) peripheral unit which includes a CPU 802, a random access memory (RAM) 803, a graphic controller 804, and a display 805 mutually connected via a host controller 801, an input/output (I/O) unit which includes a communication interface 807, a hard disk drive (HDD) 808, and a compact disc read only memory (CD-ROM) drive 809 mutually connected via an I/O controller 806, and a legacy I/O unit which includes a read only memory (ROM) 810, a flexible disk drive 811, and an I/O chip 812 connected to the I/O controller 806.

[0123]

The host controller 801 connects the RAM 803 to the CPU 802 and the graphic controller 804 which access the RAM 803 at high transfer rates. The CPU 802 operates based on programs stored in the ROM 810 and the RAM 803 to control each part. The graphic controller 804 acquires image data generated by the CPU 802 or the like in a frame buffer provided in the RAM 803 and displays the image data on the display 805. In place of this, the graphic controller 804 may internally include a frame buffer which stores image data generated by the CPU 802 or the like.

[0124]

The I/O controller 806 connects the host controller 801 to the communication interface 807, the HDD 808, and the CD-ROM drive 809 which are relatively high-speed I/O devices. The HDD 808 stores programs and data used by the CPU 802 within the computer 800. The CD-ROM drive 809 reads programs or data from a CD-ROM 892

and provides the programs or the data to the HDD 808 via the RAM 803.

[0125]

In addition, the I/O controller 806 is connected to the ROM 810, the flexible disk drive 811, and the I/O chip 812 which are relatively low-speed I/O devices. The ROM 810 stores a boot program to be executed when the computer 800 is activated and/or programs, etc. depending on hardware of the computer 800. The flexible disk drive 811 reads programs or data from a flexible disk 893 and provides the programs or the data to the HDD 808 via the RAM 803. The I/O chip 812 connects the flexible disk drive 811 to the I/O controller 806 and also connects various I/O devices to the I/O controller 806 via, for example, a parallel port, a serial port, a keyboard port, a mouse port, etc.

[0126]

The programs provided to the HDD 808 via the RAM 803 are stored on a recording medium, such as the flexible disk 893, the CD-ROM 892, or an integrated circuit (IC) card, and are provided by a user. The programs are read from the recording medium, installed on the HDD 808 within the computer 800 via the RAM 803, and executed in the CPU 802.

[0127]

A program, which is installed in the computer 800 and causes the computer 800 to function as the vehicle data processing device 110, causes the computer 800 to function as the data associating unit 121 configured to associate one of measurement data including the same information as information of the vehicle imaged by the camera 130 among a measurement data with one of imaging data including the information of the vehicle in step S408.

25 [0128]

Further, the program may cause the computer 800 to function as the identical vehicle type classification search unit 116 configured to search for measurement data including information of a vehicle of the same vehicle type classification as vehicle type classification of a vehicle of a target of the one of imaging data from among the measurement data in step S405, and function as the data associating unit 121 configured to associate one of measurement data with the one of imaging data in step S408 when the identical vehicle type classification search unit 116 has found the one of measurement data.

[0129]

Further, the program may cause the computer 800 to function as the identical time zone search unit 115 configured to search for measurement data including information of a vehicle measured in the same time zone as the time zone in which the vehicle of the target of the one of imaging data has been imaged from among the measurement data in step S403, and function as the identical vehicle type classification search unit 116 configured to search for measurement data including information of a vehicle of the same vehicle type classification as the vehicle type classification of the vehicle of the target of the one of imaging data from among the measurement data found by the identical time zone search unit 115 in step S405.

[0130]

Further, the program may cause the computer 800 to function as the identical position search unit 114 configured to search for measurement data including information of a vehicle measured at the same position as an imaged position of the vehicle of the target of the one of imaging data from among the measurement data in step S401, and function as the identical time zone search unit 115 configured to search for measurement data including information of a vehicle measured in the same time zone as the time zone

in which the vehicle of the target of the one of imaging data has been imaged from among the measurement data found by the identical position search unit 114 in step S403.

[0131]

5 Further, the program may cause the computer 800 to function as the vehicle speed evaluating unit 117 configured to evaluate a degree to which a vehicle speed of a vehicle targeted by each of the measurement data matches a vehicle speed of the vehicle of the target of the one of imaging data in step S409 when the identical vehicle type classification search unit 116 has found the measurement data, and function as the data associating unit 121 configured to associate one of measurement data targeting a vehicle of a vehicle speed having a high degree of matching evaluated by the vehicle speed evaluating unit 117 among the measurement data found by the identical vehicle type classification search unit 116 with the one of imaging data in step S408.

[0132]

15 Further, the program may cause the computer 800 to function as the time zone evaluating unit 118 configured to evaluate a degree to which a time zone in which a vehicle targeted by each of the measurement data has been measured matches a time zone in which the vehicle of the target of the one of imaging data has been imaged in step S410 when the identical vehicle type classification search unit 116 has found the measurement data, and function as the data associating unit 121 configured to associate one of measurement data targeting a vehicle measured in a time zone having a high degree of matching evaluated by the time zone evaluating unit 118 among the measurement data found by the identical vehicle type classification search unit 116 with the one of imaging data in step S408.

25 [0133]

Further, the program may cause the computer 800 to function as the position evaluating unit 119 configured to evaluate a degree to which a position at which a vehicle targeted by each of the measurement data has been measured matches a position at which the vehicle of the target of the one of imaging data has been imaged in step S411 when
5 the identical vehicle type classification search unit 116 has found the measurement data, and function as the data associating unit 121 configured to associate one of measurement data targeting a vehicle measured at a position having a high degree of matching evaluated by the position evaluating unit 119 among the measurement data found by the identical vehicle type classification search unit 116 with the one of imaging data in step
10 S408.

[0134]

Further, the program may cause the computer 800 to function as the time determining unit 120 configured to determine whether a measurement start time of a vehicle during measurement by the laser scanner 170 is prior to a time at which the
15 vehicle of the target of the one of imaging data has been last imaged in step S412 when a result of a measurement data search performed by the identical vehicle type classification search unit 116 or the identical time zone search unit 115 represents that measurement data including the same information as the information of the vehicle of the target of the one of imaging data has not been found, and function as the data associating unit 121
20 configured to defer association of the measurement data with the one of imaging data when the time determining unit 120 determines that the measurement start time is prior to the time at which the vehicle of the target of the one of imaging data has been last imaged.

[0135]

25 Further, the program may cause the computer 800 to function as the data

associating unit 121 configured to assume that the measurement data is associated with the one of imaging data without associating the measurement data with the one of imaging data in step S408 when the time determining unit 120 determines that the measurement start time is not prior to the time at which the vehicle of the target of the one of imaging data has been last imaged.

[0136]

Information processing described in the program is loaded to the computer 800, thereby functioning as the imaging data receiving unit 111, the measurement data receiving unit 112, the measurement progress time data receiving unit 113, the identical position search unit 114, the identical time zone search unit 115, the identical vehicle type classification search unit 116, the vehicle speed evaluating unit 117, the time zone evaluating unit 118, the position evaluating unit 119, the time determining unit 120, the data associating unit 121, the imaging data storage unit 122, and the measurement data storage unit 123 which are concrete means resulting from cooperation of software and various hardware resources described above. These concrete means implement calculation or processing of information according to the usage of the computer 800 in this embodiment, whereby the specific vehicle data processing device 110 according to the usage is constructed.

[0137]

For example, when the computer 800 performs communication with an external device or the like, the CPU 802 executes a communication program loaded to the RAM 803 and instructs the communication interface 807 to perform communication processing based on processing content written in the communication program. Under control of the CPU 802, the communication interface 807 reads transmission data stored in a transmission buffer region or the like provided on a storage device, such as the RAM 803,

the HDD 808, the flexible disk 893, or the CD-ROM 892 to transmit the transmission data to the network, or the communication interface 807 writes reception data received from the network to a reception buffer region or the like provided on the storage device.

In this manner, the communication interface 807 may transfer transmission/reception

5 data from and to the storage device using a direct memory access method. In place of this, the CPU 802 reads data from a storage device or the communication interface 807 at a transfer source, and writes the data to the communication interface 807 or a storage device at a transfer destination, whereby transmission/reception data may be transferred.

[0138]

10 Moreover, the CPU 802 loads all or a necessary part of a file or a database stored in an external storage device such as the HDD 808, the CD-ROM 892, or the flexible disk 893 to the RAM 803 using the direct memory access transfer or the like. Then, the CPU 802 performs various types of processing on the data in the RAM 803. Then, the CPU 802 writes the processed data back to the external storage device using
15 the direct memory access transfer or the like.

[0139]

In such processing, because the RAM 803 is considered to provisionally store the content of the external storage device, the RAM 803, the external storage device, and the like are collectively referred to as a memory, a storage unit, or a storage device in the
20 embodiment. Various types of information such as various programs, data, tables, and databases in the embodiment are stored in such a storage device and serve as information processing targets. In addition, the CPU 802 can also hold part of the RAM 803 in a cache memory and perform read and write operations on the cache memory. Even in such a form, because the cache memory undertakes some of the functions of the RAM
25 803, it is assumed in the embodiment that the cache memory is included in the RAM 803,

a memory, and/or a storage device, unless otherwise noted.

[0140]

Moreover, the CPU 802 performs various types of processing specified by an instruction sequence in a program on data read from the RAM 803. The various types
5 of processing include various types of calculation, processing of information, condition determination, and search and replacement of information described in the embodiment. Then, the CPU 802 writes the processed data back to the RAM 803. For example, when the CPU 802 performs condition determination, the CPU 802 compares each of the various variables shown in the embodiment with another variable or a constant and
10 determines whether a condition is satisfied. The condition includes, for example, whether the variable is greater than the other variable or the constant, whether the variable is less than the other variable or the constant, whether the variable is equal to or greater than the other variable or the constant, whether the variable is equal to or less than the other variable or the constant, and whether the variable is equal to the other
15 variable or the constant. When the condition is satisfied or is not satisfied, the process branches to a different instruction sequence, or a subroutine is called.

[0141]

Additionally, the CPU 802 can search for information stored in files or databases stored in storage devices. For example, when a plurality of entries, in each of which an
20 attribute value of a second attribute is associated with an attribute value of a first attribute, are stored in a storage device, the CPU 802 searches for an entry whose attribute value of the first attribute satisfies a specified condition from the plurality of entries stored in the storage device and reads the attribute value of the second attribute stored in the entry, thereby obtaining the attribute value of the second attribute associated with the first
25 attribute satisfying the predetermined condition.

[0142]

The above-described programs or modules may be stored on an external storage medium. In addition to the flexible disk 893 and the CD-ROM 892, for example, an optical recording medium such as a digital versatile disk (DVD) or a compact disk (CD),
5 a magneto-optical recording medium such as a magneto-optical disk (MO), a tape medium, or a semiconductor memory such as an IC card can be used as the storage medium. Moreover, a storage device such as a hard disk or a RAM provided in a server system connected to a dedicated communication network or the Internet may be used as the recording medium, and the programs may be provided to the computer 800 via the
10 network.

[0143]

While the present invention has been described above using the embodiment, the technical scope of the present invention is not limited to the scope of the description of the aforementioned embodiment. It is obvious to persons skilled in the art that various
15 changes or improvements can be made in the aforementioned embodiment. It is obvious from the description of the claims that such changes or improvements may also be included in the technical scope of the present invention.

[0144]

It should be noted that the execution order of processes such as operations,
20 procedures, steps, and stages in the system, the method, the device, the program, and the recording medium described in the claims, the specification, and the drawings can be implemented in any order unless expressions such as “before” and “prior to” are explicitly given or the output of a preceding process is used by a following process. Even when operation flows in the claims, the specification, and the drawings are
25 described using expressions such as “first” and “next” for convenience, this does not

mean that such order is required.

Industrial Applicability

[0145]

- 5 It is possible to provide a vehicle data processing system capable of specifying an illegal vehicle and determining a charging amount of a specific use of a road based on a size of an actually running vehicle.

Reference Signs List

10 [0146]

- | | | |
|----|-----|---|
| | 100 | Vehicle data processing system |
| | 110 | Vehicle data processing device |
| | 111 | Imaging data receiving unit |
| | 112 | Measurement data receiving unit |
| 15 | 113 | Measurement progress time data receiving unit |
| | 114 | Identical position search unit |
| | 115 | Identical time zone search unit |
| | 116 | Identical vehicle type classification search unit |
| | 117 | Vehicle speed evaluating unit |
| 20 | 118 | Time zone evaluating unit |
| | 119 | Position evaluating unit |
| | 120 | Time determining unit |
| | 121 | Data associating unit |
| | 122 | Imaging data storage unit |
| 25 | 123 | Measurement data storage unit |

	130	Camera
	150	Imaging data generating device
	170	Laser scanner
	190	Measurement data generating device
5	800	Computer
	801	Host controller
	802	CPU
	803	RAM
	804	Graphic controller
10	805	Display
	806	I/O controllers
	807	Communication interface
	808	HDD
	809	CD-ROM drive
15	810	ROM
	811	Flexible disk drive
	812	I/O chip
	891	Network communication device
	892	CD-ROM
20	893	Flexible disk
	Aa	Imaging area of camera 130a
	Ab	Imaging area of camera 130b
	Ac	Imaging area of camera 130c
	Ga	Gate
25	Gb	Gate

R	Road
Ra	Lane
Rb	Lane
Rc	Lane

Claims

1. A vehicle data processing system for processing data related to vehicles running on a road, the vehicle data processing system comprising:

5 a plurality of imaging devices placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof;

a measuring device configured to measure dimensions of vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road; and

10 a vehicle data processing device configured to process data related to the vehicles running on the road,

wherein the vehicle data processing device includes a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by the imaging device among the measurement data including information of the vehicles measured by the measuring device with (ii) one piece of imaging data including the information of the one vehicle captured by the imaging device.

20 2. The vehicle data processing system according to claim 1,

wherein the vehicle data processing device further includes:

an identical vehicle type classification search unit configured to retrieve measurement data including information of a vehicle of the same vehicle type classification as vehicle type classification of a target vehicle of the one piece of the

25 imaging data including the information of the one vehicle captured by the imaging device

among the measurement data including the information of the vehicles measured by the measuring device, and

wherein, if the identical vehicle type classification search unit has found one piece of the measurement data, the data associating unit associates the one piece of the measurement data with the one piece of the imaging data.

3. The vehicle data processing system according to claim 2,

wherein the vehicle data processing device further includes:

an identical time zone search unit configured to retrieve measurement data including information of a vehicle measured in the same period of time as a period of time in which the target vehicle of the one piece of the imaging data including the information of the one vehicle captured by the imaging device has been captured among the measurement data including the information of the vehicles measured by the measuring device, and

wherein the identical vehicle type classification search unit retrieves measurement data including information of a vehicle of the same vehicle type classification as the vehicle type classification of the target vehicle of the one piece of the imaging data among the measurement data found by the identical time zone search unit.

20 4. The vehicle data processing system according to claim 3,

wherein the vehicle data processing device further includes:

an identical position search unit configured to retrieve measurement data including information of a vehicle measured at the same position as a captured position of the target vehicle of the one piece of the imaging data including the information of the one vehicle captured by the imaging device among the measurement data including the

information of the vehicles measured by the measuring device, and

wherein the identical time zone search unit retrieves measurement data including information of a vehicle measured in the same period of time as the period of time in which the target vehicle of the one piece of the imaging data has been captured among
5 the measurement data found by the identical position search unit.

5. The vehicle data processing system according to any one of claims 2 to 4,
wherein the vehicle data processing device further includes:

a vehicle speed evaluating unit configured to evaluate a degree of matching
10 between a vehicle speed of a vehicle targeted by each of the measurement data and a vehicle speed of the target vehicle of the one piece of the imaging data if the identical vehicle type classification search unit has found the measurement data, and

wherein the data associating unit associates one piece of the measurement data targeting a vehicle of a vehicle speed having a high degree of matching evaluated by the
15 vehicle speed evaluating unit among the measurement data found by the identical vehicle type classification search unit with the one piece of the imaging data.

6. The vehicle data processing system according to any one of claims 2 to 5,
wherein the vehicle data processing device further includes:

20 a time zone evaluating unit configured to evaluate a degree of matching between a period of time in which a vehicle targeted by each of the measurement data has been measured and a period of time in which the target vehicle of the one piece of the imaging data has been captured if the identical vehicle type classification search unit has found the measurement data, and

25 wherein the data associating unit associates one piece of the measurement data

targeting a vehicle measured in a period of time having a high degree of matching evaluated by the time zone evaluating unit among the measurement data found by the identical vehicle type classification search unit with the one piece of the imaging data.

- 5 7. The vehicle data processing system according to any one of claims 2 to 6,
 wherein the vehicle data processing device further includes:

 a position evaluating unit configured to evaluate a degree of matching between a
position at which a vehicle targeted by each of the measurement data has been measured
and a position at which the target vehicle of the one piece of the imaging data has been
10 captured if the identical vehicle type classification search unit has found the
measurement data, and

 wherein the data associating unit associates one piece of the measurement data
targeting a vehicle measured at a position having a high degree of matching evaluated by
the position evaluating unit among the measurement data found by the identical vehicle
15 type classification search unit with the one piece of the imaging data.

8. The vehicle data processing system according to claim 3 or 4,
 wherein the vehicle data processing device further includes:

 a time determining unit configured to determine whether a measurement start
20 time of a vehicle during measurement by the measuring device is prior to a time at which
the target vehicle of the one piece of the imaging data has been last captured if a result of
measurement data retrieval performed by the identical vehicle type classification search
unit or the identical time zone search unit represents that measurement data including the
same information as the information of the target vehicle of the one piece of the imaging
25 data has not been found, and

wherein the data associating unit defers association of the measurement data with the one piece of the imaging data if the time determining unit determines that the measurement start time is prior to the time at which the target vehicle of the one piece of the imaging data has been last captured.

5

9. The vehicle data processing system according to claim 8, wherein the data associating unit assumes that the measurement data is associated with the one piece of the imaging data without associating the measurement data with the one piece of the imaging data if the time determining unit determines that the measurement start time is not prior to the time at which the target vehicle of the one piece of the imaging data has been last captured.

10

10. A vehicle data processing method of processing data related to vehicles running on a road, the vehicle data processing method comprising:

15

a data associating step of associating (i) one piece of measurement data including the same information as information of one vehicle captured by the imaging device among a measurement data including information of vehicles measured by the measuring device with (ii) one piece of imaging data including the information of the one vehicle captured by the imaging device, wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road.

20

25

11. A vehicle data processing device for processing data related to vehicles running on a road, the vehicle data processing device comprising:

a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by an imaging
5 device among a measurement data including information of vehicles measured by a measuring device with (ii) one piece of imaging data including the information of the one vehicle captured by the imaging device, wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area
10 thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging devices in the width direction of the road.

12. A program for causing a computer to function as a vehicle data processing
15 device for processing data related to vehicles running on a road,

wherein the program causes the computer to function as a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by an imaging device among a measurement data including information of vehicles measured by a measuring device with (ii) one piece of
20 imaging data including the information of the one vehicle captured by the imaging device, wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the
25 measuring device by scanning the road in imaging areas of the plurality of imaging

devices in the width direction of the road.

13. A recording medium recording a program for causing a computer to function as a vehicle data processing device for processing data related to vehicles running on a road,

5 wherein the program causes the computer to function as a data associating unit configured to associate (i) one piece of measurement data including the same information as information of one vehicle captured by an imaging device among a measurement data including information of vehicles measured by a measuring device with (ii) one piece of imaging data including the information of the one vehicle captured by the imaging device,
10 wherein a plurality of the imaging devices are placed above the road so as to be arranged in a width direction of the road and configured to continuously capture an image with being directed to an obliquely downward area thereof, and the measuring device is configured to measure dimensions of the vehicles passing through a scanning area of the measuring device by scanning the road in imaging areas of the plurality of imaging
15 devices in the width direction of the road.