DESCRIPTION

TITLE OF THE INVENTION:
INFORMATION PROCESSING DEVICE, INFORMATION PROCESSING METHOD, AND INFORMATION PROCESSING PROGRAM

Field

[0001] The present invention relates to an information processing apparatus, an information processing method, and an information processing program.

Background

[0002] Conventionally, there is a technology for displaying an image captured by a dashboard camera on a map (for example, see Non Patent Literature 1).

Citation List

Non Patent Literature

[0003] Non Patent Literature 1: "Google map", [online], [searched on February 17, 2024], Internet (URL:https://www.google.co.jp/maps)

Summary

Technical Problem

[0004] However, with the conventional technology, there is a problem in that it is not possible for a user to appropriately grasp information on a road and a surrounding environment of the road. For example, in some cases, several days has elapsed from the date and time on which the image has been captured by the dashboard camera. Therefore, in a case where the user desires to know the information on the road and the surrounding environment of the road from almost a real-time image, such as an image on the same day or within a week, the user is not sometimes able to appropriately grasp the information.

Solution to Problem

[0005] The information processing apparatus according to the present invention comprising a metadata retaining unit that acquires metadata that includes location information that is related to a location of an image that has been captured by a moving vehicle and time information that is related to time at which the image has been captured, and that retains the acquired metadata in a first storage unit, a reception unit that receives an assignment of a predetermined area on a map, a specifying unit that specifies the image that satisfies a predetermined condition from among the images captured at the location that is included in the area received by the reception unit by using the metadata stored in the first storage unit, and an image retaining unit that acquires the image specified by the specifying unit from the moving vehicle, and that retains the acquired image in a second storage unit.

[0006] The information processing method according to the present invention performed by an information processing apparatus, the information processing method comprising, metadata retaining step of acquiring metadata that includes location information that is related to a location of an image that has been captured by a moving vehicle and time information that is related to time at which the image has been captured, and retaining the acquired metadata in a first storage unit, a receiving step of receiving an assignment of a predetermined area on a map, a specifying step of specifying the image that satisfies a predetermined condition from among the images captured at the location that is included in the area received at the receiving step by using the metadata stored in the first storage unit, and an image retaining step of acquiring the image specified at the specifying step from the moving vehicle, and retaining the acquired image in a

second storage unit.

[0007] The information processing program according to the present invention that causes a computer to execute a process comprising, metadata retaining step of acquiring metadata that includes location information that is related to a location of an image that has been captured by a moving vehicle and time information that is related to time at which the image has been captured, and retaining the acquired metadata in a first storage unit, a receiving step of receiving an assignment of a predetermined area on a map, a specifying step of specifying the image that satisfies a predetermined condition from among the images captured at the location that is included in the area received at the receiving step by using the metadata stored in the first storage unit, and an image retaining step of acquiring the image specified at the specifying step from the moving vehicle, and retaining the acquired image in a second storage unit.

Advantageous Effects of Invention

[0008] According to the present invention, an advantage is provided in that a user is able to appropriately grasp information on a road and a surrounding environment of the road.

Brief Description of Drawings

[0009] FIG. 1 is a diagram for explaining an outline of an information processing system according to a first embodiment.

FIG. 2 is a block diagram illustrating an example of a configuration of an information processing apparatus according to the first embodiment.

FIG. 3 is a diagram illustrating one example of metadata.

FIG. 4 is a diagram illustrating one example of a

metadata retaining process for retaining the metadata in a first storage unit that stores therein the metadata.

FIG. 5 is a diagram illustrating one example in which a predetermined area on a map is assigned.

FIG. 6 is a diagram illustrating one example of a process for specifying an image that satisfies a predetermined condition from among images captured in the predetermined area.

FIG. 7 is a diagram illustrating one example of an image retaining process for retaining the image in a second storage unit.

FIG. 8 is a diagram illustrating one example of a screen of an image that is displayed on a terminal device owned by a user.

FIG. 9 is a flowchart illustrating one example of a process performed in the information processing apparatus according to the first embodiment.

FIG. 10 is a diagram illustrating a computer that executes an information processing program.

Description of Embodiments

[0010] Hereinafter, modes (hereinafter, referred to as an "embodiments") for carrying out an information processing apparatus, an information processing method, and an information processing program according to the present application will be described in detail below with reference to the accompanying drawings. Moreover, the information processing apparatus, the information processing method, and the information processing program according to the present application are not limited by the embodiments. Furthermore, in the embodiments below, the same components are denoted by the same reference numerals and an overlapping description will be omitted.

[0011] (First Embodiment)

[1. Configuration of information processing system]

First, one example of information processing according to an embodiment will be described by use of FIG. 1. FIG. 1 is a diagram for explaining an outline of an information processing system according to a first embodiment, and is implemented by an information processing apparatus 100. Moreover, a terminal device 10, a moving vehicle 50, and the information processing apparatus 100 are communicably connected each other via a network N regardless of a wired or wireless manner. Furthermore, the number of the terminal devices 10 is not limited to the number illustrated in FIG. 1. Furthermore, FIG. 1 illustrates a case in which the terminal device 10 and the information processing apparatus 100 are different devices, but the terminal device 10 and the information processing apparatus 100 may be integrated. Moreover, in the description below, a case in which an assignment of a predetermined area is received from a user will be described as an example.

[0012] The terminal device 10 is a computer that is used by the user in order for the user to input the predetermined area on a map. For example, as a result of an input of the predetermined area on the map performed by the user, the terminal device 10 is able to allow the user to appropriately grasp the information on a road and a surrounding environment of the road from the image of the area that has been selected by the user. Moreover, the terminal device 10 may be a device, such as a smartphone, a tablet terminal, a notebook Personal Computer (PC), a desktop PC, a mobile phone, a Personal Digital Assistant (PDA), or the like.

[0013] The moving vehicle 50 is a moving vehicle provided with a device or a function for capturing an image. Moreover, examples of the moving vehicle 50

illustrated in FIG. 1 include a bus 50A, a vehicle 50B, a truck 50C, a motorcycle 50D, and a drone 50E, but any moving vehicle may be adopted as long as the moving vehicle is provided with the device or the function for capturing an image.

[0014] The information processing apparatus 100 is a computer that is used in order for the user to appropriately grasp the information on the road and the surrounding environment of the road, and any device may be used as long as the device is able to perform the process according to the embodiment. For example, the information processing apparatus 100 acquires metadata that includes "location information" on the image captured from the moving vehicle 50 and "time information" on the time at which the image has been captured, specifies the image that satisfies a predetermined condition and that is included in the predetermined area displayed on the map, and acquires the specified image from the moving vehicle 50.

[0015] Here, the information processing apparatus 100 receives the metadata that includes the "location information" and the "time information" that are related to the image that has been captured from the moving vehicle 50, and receives the image that has been specified by the information processing apparatus 100. Furthermore, the information processing apparatus 100 receives an assignment of the predetermined area on the map from the terminal device 10. Then, the information processing apparatus 100 transmits the specified image to the terminal device 10.

[0016] [2. Configuration of information processing apparatus]

In the following, a configuration of the information processing apparatus 100 will be described by use of FIG. 2. FIG. 2 is a block diagram illustrating an example of a

configuration of the information processing apparatus 100 according to the first embodiment. As illustrated in FIG. 2, the information processing apparatus 100 includes a communication unit 110, a storage unit 120, and a control unit 130. A process performed by each of the units included in the information processing apparatus 100 will be described below.

[0017] The communication unit 110 is connected to the network N in a wired or wireless manner, and transmits and receives information to and from the terminal device 10 or the like via the network N. For example, the communication unit 110 receives the predetermined area on the map from the terminal device 10, and transmits the image corresponding to the selected area to the terminal device 10. Furthermore, the communication unit 110 receives the metadata that includes "location information" that is related to the location of the image that has been captured by the moving vehicle 50 and "time information" that is related to the time at which the image has been captured, and acquires the image that satisfies the predetermined condition from the moving vehicle 50. For example, the communication unit 110 is implemented by a Network Interface Card (NIC), or the like.

[0018] The storage unit 120 stores therein data and programs needed for various kinds of processes performed by the control unit 130. The storage unit 120 includes a first storage unit 121 and a second storage unit 122. For example, the storage unit 120 stores therein map data or the like. Furthermore, the storage unit 120 is implemented by a semiconductor memory device, such as a Random Access Memory (RAM) or a flash memory, or a storage device, such as a hard disk or an optical disk.

[0019] The first storage unit 121 stores therein

metadata that includes the "location information" that is related to the location of the image that has been captured by the moving vehicle 50 and the "time information" that is related to the time at which the image has been captured. Here, an example of the metadata will be described by use of the example illustrated in FIG. 3. FIG. 3 is a diagram illustrating one example of the metadata. For example, the first storage unit 121 stores therein, in an associated manner, as illustrated in FIG. 3, a moving vehicle identification number of "ID: XXXXXXX" for identifying the moving vehicle 50, location information of "latitude XX and longitude XX" that indicates longitude and latitude of the moving vehicle 50 at the time at which the image has been captured, and time information of "XX mm/XX dd/20XX (mm: month, and dd: date) at time XX HH:XX MM:XX SS (HH: hours, MM: minutes, and SS: seconds)" that indicates the date and time on which the image has been captured.

[0020] The data stored in the first storage unit 121 is data that is able to be added, updated, and deleted as appropriate. For example, the first storage unit 121 may delete the data that has passed a certain period of time, such as two weeks. Moreover, the data stored in the first storage unit 121 may also be stored in a database that is provided outside the information processing apparatus 100.

[0021] The second storage unit 122 stores therein the image acquired from the moving vehicle 50. For example, the second storage unit 122 stores therein the image acquired from the moving vehicle 50 in an associated manner with the "moving vehicle identification number" for identifying the moving vehicle 50, the "location information" that is related to the location of the image that has been captured by the moving vehicle 50, and the "time information" that is related to the time at which the

image has been captured.

[0022] Moreover, the data stored in the second storage unit 122 is data that is able to be added, updated, and deleted as appropriate. For example, the second storage unit 122 may add or update the data in accordance with a request received from the user. Moreover, the data stored in the second storage unit 122 may also be stored in a database that is provided outside the information processing apparatus 100.

[0023] The control unit 130 is a controller, and is implemented by causing, for example, a Central Processing Unit (CPU), a Micro Processing Unit (MPU), or the like to execute various kinds of programs stored in the storage device included in the information processing apparatus 100 by using a RAM as a work area. Furthermore, the control unit 130 is implemented by an integrated circuit, such as an application specific integrated circuit (ASIC) or a field programmable gate array (FPGA).

[0024] As illustrated in FIG. 2, the control unit 130 includes a metadata retaining unit 131, a reception unit 132, a specifying unit 133, an image retaining unit 134, and a display control unit 135, and implements or performs an operation of the information processing apparatus 100 that will be described below. Moreover, an internal configuration of the control unit 130 is not limited to the configuration illustrated in FIG. 2, another configuration may be used as long as the information processing apparatus 100 is configured to perform the information processing described later.

[0025] The metadata retaining unit 131 acquires the metadata that includes the location information that is related to the location on the image that has been captured by the moving vehicle 50 and the time information that is

related to the time at which the image has been captured, and stores the acquired metadata in the first storage unit 121. For example, the metadata retaining unit 131 periodically acquires the metadata from the moving vehicle 50, and stores, in an associated manner, the "moving vehicle identification number" for identifying the moving vehicle 50, the "location information", and the "time information" as the metadata. Moreover, the metadata retaining unit 131 may acquire the metadata in a case where a predetermined request is received or in a case where a predetermined condition is satisfied as an acquisition timing of the metadata.

[0026] In the following, an example in which the metadata retaining unit 131 acquires the metadata and retains the metadata in the first storage unit 121 will be described by use of an example illustrated in FIG. 4. FIG. 4 is a diagram illustrating one example of a metadata retaining process for retaining the metadata in the first storage unit 121 that stores therein the metadata. The metadata retaining unit 131 retains, for example, as illustrated in FIG. 4, the "moving vehicle identification number", the "location information", and the "time information" that are included in the metadata that has been acquired via Long Term Evolution (LTE) or the like and that is related to the image captured by a camera installed in the moving vehicle 50.

[0027] The reception unit 132 receives an assignment of the predetermined area on the map. For example, the reception unit 132 divides the map displayed on the terminal owned by the user into meshes, and receives an assignment of a section that the user desires to acquire from among the divided sections. Furthermore, the reception unit 132 may display a flag in the section

assigned by the user.

[0028] In the following, an example in which the reception unit 132 receives an assignment of the predetermined area on the map will be described by use of an example illustrated in FIG. 5. FIG. 5 is a diagram illustrating one example in which the predetermined area on the map is assigned. For example, the reception unit 132 divides, as illustrated in FIG. 5, a map 25 into 15 m sections by using meshes, causes the terminal device 10 to display the sections, and receives, from the user, an assignment of the section that includes the image and that the user desires to acquire by a click operation or the like performed by using a mouse. Moreover, when the reception unit 132 receives an assignment of the location of the image desired by the user from the user, as illustrated in FIG. 5, the reception unit 132 may receive the section from the user by dividing the map 25 into meshes, or may cause the terminal device 10 to display a travelling route of the moving vehicle 50 on the map by using map matching and may receive the section by assigning the location and the direction of the image that the user desires to acquire.

[0029] The specifying unit 133 uses the metadata retained in the first storage unit 121, and specifies the image that satisfies the predetermined condition from among the images that have been captured at the location included in the area received by the reception unit 132. Here, for example, the specifying unit 133 specifies the image, in which the area that has been selected by the reception unit 132 has been captured, from at least one of weather information that is indicated when the image has been captured and date and time information that is related to the date and time on which the image has been captured as

the predetermined condition. Specifically, the specifying unit 133 specifies an image by using the weather information indicating sunny, cloudy, rainy, snowy, or the like as the predetermined condition when the image has been captured. Furthermore, the specifying unit 133 specifies the image by using the date and time information that is related to the date on which the image has been captured indicated by a captured time zone of "from ○ HH to ○ HH (HH: hours)", a captured time of the year of "from ○ mm/○ dd to △ mm/△ dd (mm: month, dd: date)", or the like as the predetermined condition.

[0030] For example, the specifying unit 133 specifies, from among the images that has been captured at the location included in the area assigned from the user, the image that satisfies the condition of the weather information indicated by a "sunny day", the time zone indicated by "9 hours to 16 hours", and the captured time of the year indicated by "one week from the current date and time". Furthermore, in a case where a plurality of images have been specified under the above described condition, the specifying unit 133 may take into account the date and time from among the plurality of specified images. For example, the specifying unit 133 may specify the images in the order closer to the current date and time from among the plurality of images. Furthermore, the predetermined condition is able to be appropriately changed in accordance with a request received from the user, and may be set such that, for example, the weather information is a "rainy day ", and the time zone is "from 20 hours to 4 hours". Moreover, the specifying unit 133 may use one of the weather information, the time information, and the captured time of the year or may use only the plurality thereof as the predetermined condition.

[0031] In the following, an example in which the specifying unit 133 uses the metadata retained in the first storage unit 121 and specifies the image that satisfies the predetermined condition from among the images that has been captured at the location included in the area received by the reception unit 132 will be described by use of an example illustrated in FIG. 6. FIG. 6 is a diagram illustrating one example of a process for specifying the image that satisfies the predetermined condition from among the images captured in the predetermined area. For example, in the example illustrated in FIG. 6, the specifying unit 133 specifies the route in which the moving vehicle 50 travels from the "location information" that is included in the metadata, and acquires the image that satisfies the condition corresponding to the captured date and time from the location that has been assigned by the user and that is included in the travelling route of the moving vehicle 50, the weather assigned by the user from the weather forecast included in the "weather information", and the "time information". Furthermore, in a case where the location assigned by the user is captured by the plurality of the moving vehicles 50, the specifying unit 133 may take into account the date and time on which the plurality of specified images have been captured. In this case, the specifying unit 133 specifies the most recent image by taking into account the date and time from among, for example, the plurality of specified images. Moreover, in the example illustrated in FIG. 6, the route traveled by the moving vehicle 50 is highlighted on the map 25 as a display X.

[0032] Furthermore, for example, the specifying unit 133 may specify the image, in which the area that has been selected by the reception unit 132 when the moving vehicle

50 is stopped in a predetermined period of time or is travelling at a speed equal to or less than a predetermined speed has been captured, from at least one of the location information on the moving vehicle 50 and the sensor information on the acceleration sensor as the predetermined condition. For example, in a case where it is determined that the moving vehicle 50 is stopped in the predetermined period of time or is travelling at the speed equal to or less than the predetermined speed caused by a traffic jam, an accident, road construction, or the like on the basis of the location information or the sensor information obtained from the acceleration sensor, the specifying unit 133 specifies the image in which the area that has been selected by the reception unit 132 has been captured.

[0033] Specifically, the specifying unit 133 specifies an image obtained at the time at which the moving vehicle 50 has been stopped for ○ seconds or longer as a predetermined period of time or at the time at which the moving vehicle 50 is travelling at a speed of Δ km or less as a predetermined speed. For example, the specifying unit 133 specifies the image obtained at the time at which the moving vehicle 50 has been stopped for 100 seconds or longer as the predetermined period of time or at the time at which the moving vehicle 50 is travelling at a speed of 10 km or less as the predetermined speed. Furthermore, the above described predetermined period of time and the predetermined speed are able to be changed in accordance with a request received from the user. Moreover, for example, in a case where the plurality of the moving vehicles 50 are stopped at the same location in a predetermined period of time or in a case where the moving vehicle 50 has been parked for a long time, for example, for one hour or the like, the specifying unit 133 may

change a time interval for specifying the image to an arbitrary time interval determined by the user, such as one day or three hours.

[0034] The image retaining unit 134 acquires the image specified by the specifying unit 133 from the moving vehicle 50, and retains the acquired image in the second storage unit 122. For example, the image retaining unit 134 acquires the image that has been captured at the location that is included in the area selected by the reception unit 132 in the past and that satisfies the predetermined condition from the moving vehicle 50, and retains the acquired image in the second storage unit 122. Furthermore, the image retaining unit 134 acquires the image that has been captured when the moving vehicle 50 is stopped in a predetermined period of time or is travelling at a speed equal to or less than a predetermined speed from the moving vehicle 50, and retains the acquired image in the second storage unit 122. For example, the image retaining unit 134 retains the image acquired from the moving vehicle 50 in an associated manner with the "moving vehicle identification number" for identifying the moving vehicle 50, the "location information" that is related to the location of the image that has been captured by the moving vehicle 50, and the "time information" that is related to the time at which the image has been captured.

[0035] In the following, an example in which the image retaining unit 134 acquires the image that has been captured at the location that is included in the area selected by the reception unit 132 in that past and that satisfies the predetermined condition from the moving vehicle 50 and retains the acquired image in the second storage unit 122 will be describe by use of an example illustrated in FIG. 7. FIG. 7 is a diagram illustrating

one example of an image retaining process for retaining the image in the second storage unit 122. For example, the image retaining unit 134 acquires, as illustrated in FIG. 7, the image that has been captured at the location that is included in the area that has been selected by the reception unit 132 in the past and that satisfies the weather information indicated by "sunny" and the time zone indicated by "from 9 hours to 16 hours" that are the predetermined conditions from the moving vehicle 50, and retains the acquired image in the second storage unit 122. Here, the image retaining unit 134 may acquire, as the above described predetermined condition, the image that satisfies the same condition for the image that has been captured at the location included in the selected area in the past, or may acquire the image by changing the condition as appropriate in accordance with a request received from the user. Furthermore, the image retaining unit 134 may determine a period of time, such as one month, as the period of time over which the above described images are acquired, or may change as appropriate a period of time over which the above described images are acquired in accordance with a request received from the user.

[0036] The display control unit 135 acquires the image that corresponding to the area selected by the reception unit 132 from the second storage unit 122, and displays the acquired image. For example, the display control unit 135 displays the image by associating the image with the flag that has been displayed on the above described map.

[0037] In the following, an example in which the display control unit 135 acquires the image corresponding to the area selected by the reception unit 132 from the second storage unit 122 and displays the acquired image will be described by use of an example illustrated in FIG. 8. FIG.

8 is a diagram illustrating one example of a screen of the image displayed on the terminal device 10 owned by the user. For example, the display control unit 135 receives the flag that represents the section that is indicated on the map 25 and that has been selected by the reception unit 132 by a click operation or the like performed by the user by using the mouse, displays the date and time on which the image that has been captured in the above described area, receives the date and time on which the image has been captured by a click operation or the like performed by the user by using the mouse, and displays the image.

[0038] [3. Processing procedure for information processing apparatus]

In the following, an example of a procedure of processing performed by the information processing apparatus 100 according to the first embodiment will be described by use of FIG. 9. FIG. 9 is a flowchart illustrating one example of a process performed in the information processing apparatus 100 according to the first embodiment.

[0039] As illustrated in FIG. 9 as an example, the reception unit 132 included in the information processing apparatus 100 determines whether or not an assignment of the predetermined area is received from the user (Step S101). As a result of this, in a case where the reception unit 132 has received an assignment of the predetermined area from the user (Yes at Step S101), the specifying unit 133 specifies the image that satisfies the predetermined condition (Step S102). For example, the specifying unit 133 specifies the image that satisfies the condition that the weather information is "sunny" and the time zone is "from 9:00 to 16:00".

[0040] Then, the image retaining unit 134 acquires the

image specified by the user from the moving vehicle 50, and retains the acquired image in the second storage unit 122 (Step S103). Then, the display control unit 135 acquires the specified image in the second storage unit 122, and causes the terminal device 10 to display the specified image (Step S104).

[0041] [4. Effects]

The information processing apparatus 100 according to the first embodiment includes the metadata retaining unit 131 that acquires metadata that includes the location information that is related to the location of the image that has been captured by the moving vehicle 50 and the time information that is related to the time at which the image has been captured and retains the acquired metadata in the first storage unit 121, the reception unit 132 that receives an assignment of the predetermined area on the map, the specifying unit 133 that uses the metadata retained in the first storage unit 121 and that specifies an image that satisfies the predetermined condition from among the images that have been captured at the location included in the area received by the reception unit 132, and the image retaining unit 134 that acquires the image specified by the specifying unit 133 from the moving vehicle 50 and that retains the acquired image in the second storage unit 122.

[0042] As a result of this, the information processing apparatus 100 is able to specify the images in near real time that is information on the road and the surrounding environment of the road in the predetermined area on the map received from the user. Furthermore, by acquiring only the image that satisfies the predetermined condition from the moving vehicle 50 and retaining the acquired image in the image retaining unit 134, it is possible to store only

the needed image and implement the efficiency of the capacity of the storage unit 120, and the user is able to appropriately grasp the information on the road and the surrounding environment of the road.

[0043] The information processing apparatus 100 according to the first embodiment further includes the display control unit 135 that acquires the image corresponding to the area selected by the reception unit 132 from the second storage unit 122 and that displays the acquired image.

[0044] As a result of this, the information processing apparatus 100 is able to cause the terminal device 10 to display the image that is in near real time and that has been specified by the specifying unit 133 described above, so that the user is able to appropriately grasp the information on the road and the surrounding environment of the road.

[0045] In the information processing apparatus 100 according to the first embodiment, the specifying unit 133 specifies the image, in which the area that has been selected by the reception unit 132 has been captured, from at least one of the weather information that is indicated when the image has been captured and the date and time information that is related to the date and time on which the image has been captured as the predetermined condition.

[0046] As a result of this, the information processing apparatus 100 is able to specify the information on the road and the surrounding environment of the road in the situation desired by the user by using the weather information, the time at which the image has been captured, and the number of days elapsed from the date on which the image has been captured as the condition, so that the user is able to appropriately grasp the information on the road

and the surrounding environment of the road.

[0047] In the information processing apparatus 100 according to the first embodiment, the image retaining unit 134 acquires the image that has been captured at the location included in the area selected by the reception unit 132 in the past and that satisfies the predetermined condition from the moving vehicle 50, and stores the acquired image in the second storage unit 122.

[0048] As a result of this, the information processing apparatus 100 stores the plurality of images that have been captured in the same area as the area selected by the reception unit 132 and that have been captured under the same conditions as the conditions corresponding to the weather information and the time at which the image has been captured on each date and time, so that the information processing apparatus 100 is able to cause the terminal device 10 to display each of the captured images in time series, so that the user is able to appropriately grasp the information on the road and the surrounding environment of the road.

[0049] In the information processing apparatus 100 according to the first embodiment, the specifying unit 133 specifies the image, in which the area selected by the reception unit 132 when the moving vehicle 50 is stopped in a predetermined period of time or is travelling at a speed equal to or less than a predetermined speed has been captured, from at least one of the location information on the moving vehicle 50 and the sensor information on the acceleration sensor as the predetermined condition, and the image retaining unit 134 acquires the image that has been captured when the moving vehicle 50 is stopped in the predetermined period of time or is travelling at the speed equal to or less than the predetermined speed from the

moving vehicle 50, and retains the specified image in the second storage unit 122.

[0050] As a result of this, the information processing apparatus 100 specifies the image captured when the moving vehicle 50 is stopped in a predetermined period of time or is travelling at a speed equal to or less than a predetermined speed due to a traffic jam, an accident, road construction, or the like, so that the user is able to grasp a place of the traffic jam or the like and a situation of the traffic jam from the image, and is able to appropriately grasp the information on the road and the surrounding environment of the road.

[0051] (Second Embodiment)

In the first embodiment, the example in which the user specifies the image that satisfies the area that the user desires to acquire and the condition has been mainly described, but in a second embodiment that will be described below, an example in which, at the time of a disaster or the like, an image captured at a predetermined time in an area assigned by the user in order to specify the image of the road and the surrounding environment of the road will be described. Moreover, descriptions of the content that is common to the content described in the first embodiment will be omitted as appropriate, and the specifying unit 133 that performs a process that is different from the process performed in the first embodiment will be described. Furthermore, in the second embodiment, a case in which the user desires to grasp an image of the road and the surrounding environment of the road at the time of a disaster, for example, snowfall, is cited as one example.

[0052] The specifying unit 133 specifies, as an image that satisfies the predetermined condition, images that are

included in an area assigned by the user and that are captured in a period of time from a point at which the date and time have been assigned by the user to a current point. For example, it is assumed that it started snowing at time ○ HH:○ MM (HH: hours, MM: minutes) on ○ mm/○ dd (mm: month, and dd: date), the specifying unit 133 specifies the image in the area assigned by the user in a period of time from a point at time ○ HH:○ MM (HH: hours, and MM: minutes) on ○ mm/○ dd (mm: month, dd: date) to the current point.

[0053] In other words, in the second embodiment, the user is able to acquire the images in near real time in the area assigned by the user, and is able to appropriately grasp the information on the road and the surrounding environment of the road at the time of snowfall, at the time of an occurrence of a disaster, or the like.

[0054] (System configuration, etc.)

Furthermore, the components of each unit illustrated in the drawings are only for conceptually illustrating the functions thereof and are not always physically configured as illustrated in the drawings. In other words, the specific shape of a separate or integrated device is not limited to the drawings. Specifically, all or part of the device can be configured by functionally or physically separating or integrating any of the units depending on various loads or use conditions. In addition, all or any part of each of the processing functions performed by the each of the devices can be implemented by a CPU and by programs analyzed and executed by the CPU or implemented as hardware by wired logic.

[0055] Furthermore, of the processes described in the embodiment, the whole or a part of the processes that are mentioned as being automatically performed can also be manually performed, or the whole or a part of the processes

that are mentioned as being manually performed can also be automatically performed using known methods. Furthermore, the flow of the processes, the control procedures, the specific names, and the information containing various kinds of data or parameters indicated in the above specification and drawings can be arbitrarily changed unless otherwise stated.

[0056] (Program)

Furthermore, it is possible to generate a program in which a process to be executed by the information processing apparatus 100 described above in the embodiments is described in a computer executable language. For example, it is possible to generate an information processing program in which the processes performed by the information processing apparatus 100 according to the embodiments are described in a computer executable language. In this case, it is possible to obtain the same effects as those described above in the embodiments by the computer executing the information processing program. In addition, it may be possible to implement the same processes as those described above in the embodiments by recording the information processing program into a computer readable recording medium and allow the computer to read the information processing program recorded in the recording medium.

[0057] FIG. 10 is a diagram illustrating a computer that executes the information processing program. As illustrated in FIG. 10, a computer 1000 includes, for example, a memory 1010, a CPU 1020, a hard disk drive interface 1030, a disk drive interface 1040, a serial port interface 1050, a video adapter 1060, and a network interface 1070, and each of the units is connected by a bus 1080.

[0058] The memory 1010 includes, as illustrated as an example in FIG. 10, a Read Only Memory (ROM) 1011 and a RAM 1012. The ROM 1011 stores therein, for example, a boot program, such as a basic input output system (BIOS). The hard disk drive interface 1030 is connected to a hard disk drive 1090 as illustrated as an example in FIG. 10. The disk drive interface 1040 is connected to a disk drive 1100 as illustrated as an example in FIG. 10. For example, a detachable storage medium, such as a magnetic disk or an optical disk, is inserted into the disk drive 1100. The serial port interface 1050 is connected to, as illustrated as an example in FIG. 10, for example, a mouse 1110 and a keyboard 1120. The video adapter 1060 is connected to, as illustrated as an example in FIG. 10, for example, a display 1130.

[0059] Here, as illustrated as an example in FIG. 10, the hard disk drive 1090 stores therein, for example, an Operating System (OS) 1091, an application program 1092, a program module 1093, and program data 1094. In other words, the above described information processing program is stored, as a program module in which commands executed by the computer 1000 are described, in, for example, the hard disk drive 1090.

[0060] Furthermore, the various kinds of data described above in the embodiments are stored in, as the program data, for example, the memory 1010 or the hard disk drive 1090. Then, the CPU 1020 reads the program module 1093 or the program data 1094 stored in the memory 1010 or the hard disk drive 1090 as needed into the RAM 1012 and executes various kinds of processing procedures.

[0061] Moreover, the program module 1093 or the program data 1094 according to the information processing program may be stored in, for example, a detachable storage medium

as well as being stored in the hard disk drive 1090, and then may be read out by the CPU 1020 via the disk drive or the like. Alternatively, the program module 1093 or the program data 1094 according to the information processing program may be stored in another computer that is connected via a network (a Local Area Network (LAN), a Wide Area Network (WAN), etc.), and then may be read out by the CPU 1020 via the network interface 1070.

[0062] The above described embodiments and modifications of each of the embodiments are included in the technology disclosed in the present invention and are also included in the invention described in the accompanying claims and their equivalents.

Reference Signs List

[0063] 10 terminal device
25 map
50 moving vehicle
50A bus
50B vehicle
50C truck
50D motorcycle
50E drone
100 information processing apparatus
110 communication unit
120 storage unit
121 first storage unit
122 second storage unit
130 control unit
131 metadata retaining unit
132 reception unit
133 specifying unit
134 image retaining unit
135 display control unit

N network

X display

CLAIMS

Claim 1. An information processing apparatus comprising:

a metadata retaining unit that acquires metadata that includes location information that is related to a location of an image that has been captured by a moving vehicle and time information that is related to time at which the image has been captured, and that retains the acquired metadata in a first storage unit;

a reception unit that receives an assignment of a predetermined area on a map;

a specifying unit that specifies the image that satisfies a predetermined condition from among the images captured at the location that is included in the area received by the reception unit by using the metadata stored in the first storage unit; and

an image retaining unit that acquires the image specified by the specifying unit from the moving vehicle, and that retains the acquired image in a second storage unit.

Claim 2. The information processing apparatus according to claim 1, further comprising a display control unit that acquires the image corresponding to the area selected by the reception unit from the second storage unit, and that displays the acquired image.

Claim 3. The information processing apparatus according to claim 1, wherein the specifying unit specifies the image, in which the area selected by the reception unit has been captured, from at least one of weather information that is indicated when the image has been captured and date and time information that is related to date and time on which the image has been captured as the predetermined condition.

Claim 4. The information processing apparatus according to claim 1, wherein the image retaining unit acquires the image that has been captured at the location included in the area selected by the reception unit in the past and that satisfies the predetermined condition from the moving vehicle, and retains the acquired image in the second storage unit.

Claim 5. The information processing apparatus according to claim 1, wherein

the specifying unit specifies the image, in which the area selected by the reception unit when the moving vehicle is stopped in a predetermined period of time or is travelling at a speed equal to or less than a predetermined speed has been captured, from at least one of the location information on the moving vehicle and sensor information on an acceleration sensor as the predetermined condition, and

the image retaining unit acquires the image that has been captured when the moving vehicle is stopped in the predetermined period of time or is travelling at the speed equal to or less than the predetermined speed from the moving vehicle, and retains the acquired image in the second storage unit.

Claim 6. An information processing method performed by an information processing apparatus, the information processing method comprising:

metadata retaining step of acquiring metadata that includes location information that is related to a location of an image that has been captured by a moving vehicle and time information that is related to time at which the image has been captured, and retaining the acquired metadata in a

first storage unit;

a receiving step of receiving an assignment of a predetermined area on a map;

a specifying step of specifying the image that satisfies a predetermined condition from among the images captured at the location that is included in the area received at the receiving step by using the metadata stored in the first storage unit; and

an image retaining step of acquiring the image specified at the specifying step from the moving vehicle, and retaining the acquired image in a second storage unit.

Claim 7. An information processing program that causes a computer to execute a process comprising:

metadata retaining step of acquiring metadata that includes location information that is related to a location of an image that has been captured by a moving vehicle and time information that is related to time at which the image has been captured, and retaining the acquired metadata in a first storage unit;

a receiving step of receiving an assignment of a predetermined area on a map;

a specifying step of specifying the image that satisfies a predetermined condition from among the images captured at the location that is included in the area received at the receiving step by using the metadata stored in the first storage unit; and

an image retaining step of acquiring the image specified at the specifying step from the moving vehicle, and retaining the acquired image in a second storage unit.