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(54) **SERVER APPARATUS**

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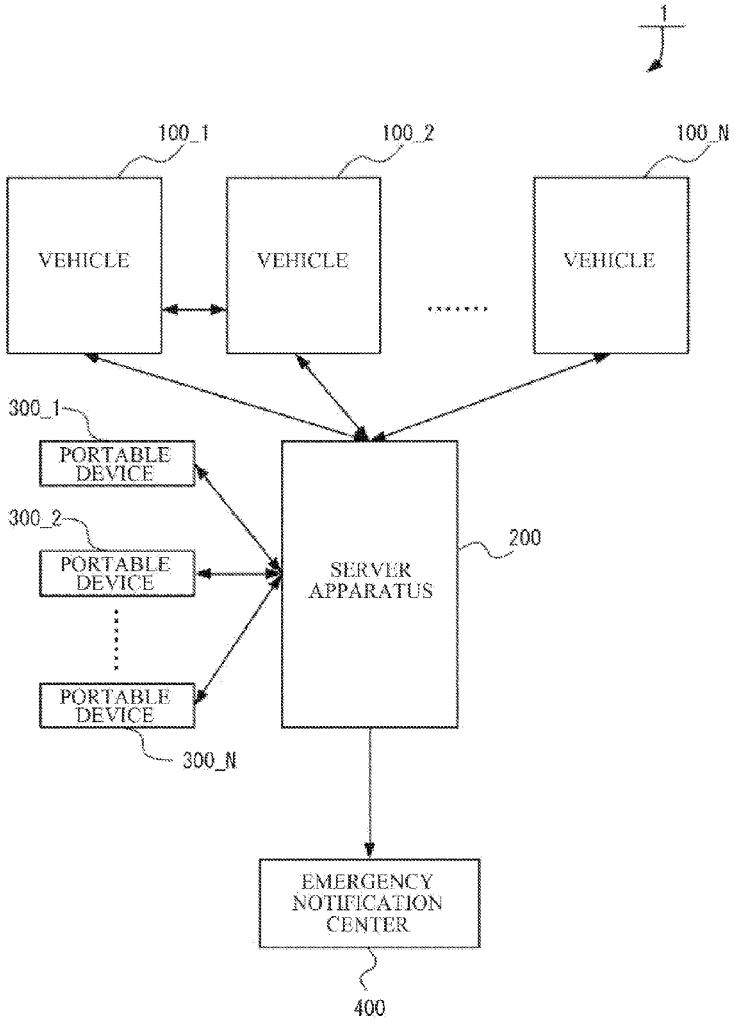
(57) **ABSTRACT**

A server apparatus determines whether a vehicle without an emergency notification system is included in accident vehicles based on image data received from peripheral vehicles or peripheral portable devices. When the vehicle without the emergency notification system is included, the server acquires position data on a vehicle having issued an emergency notification. The server requests a base station covering the acquired position to send an information provision request to vehicles and portable devices present in a set target area. The server collects accident information from the peripheral vehicles and the peripheral portable devices, and collects information from the vehicles and the portable devices present in the set target area. The extractor extracts accident information from the information collected from the vehicles or the portable devices present in the set target area based on the position data. The server notifies an emergency notification center of the accident information collected or extracted.



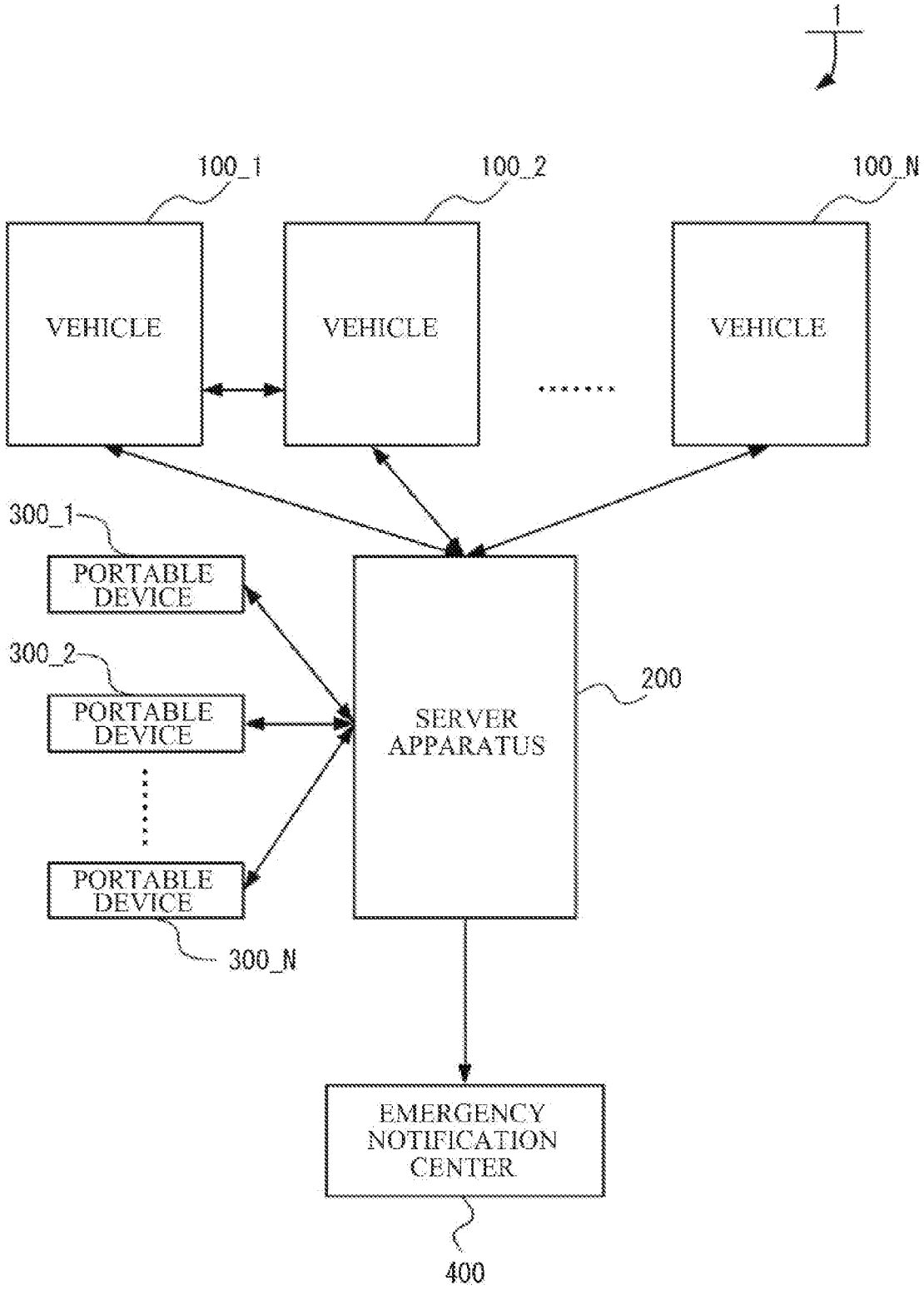

1
100_1
100_2
100_N
VEHICLE
VEHICLE
VEHICLE
300_1
PORTABLE DEVICE
300_2
PORTABLE DEVICE
PORTABLE DEVICE
300_N
SERVER APPARATUS
200
EMERGENCY NOTIFICATION CENTER
400

FIG. 1

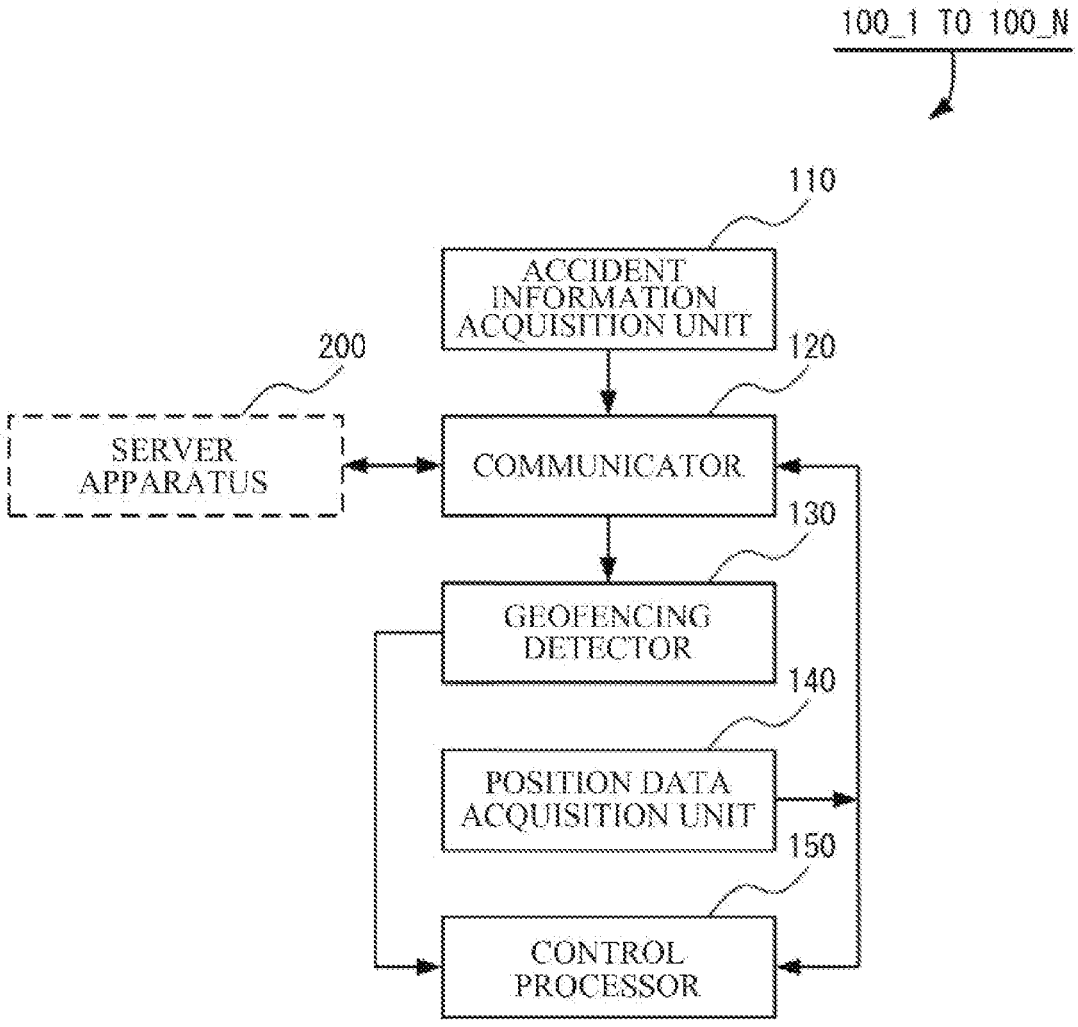

100_1 TO 100_N
110
ACCIDENT INFORMATION ACQUISITION UNIT
200
120
SERVER APPARATUS
COMMUNICATOR
130
GEOFENCING DETECTOR
140
POSITION DATA ACQUISITION UNIT
150
CONTROL PROCESSOR

FIG. 2

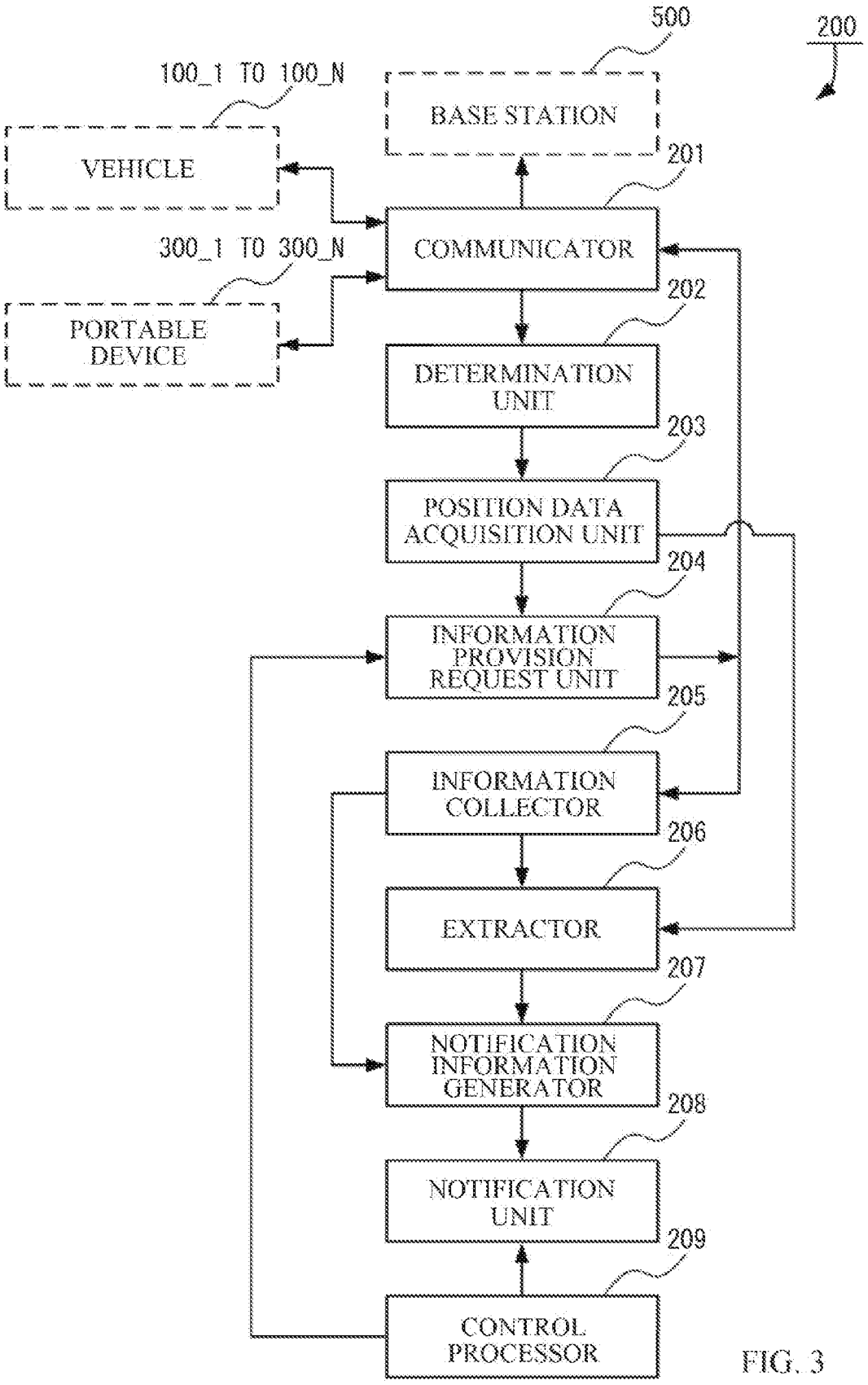

500
200
100_1 TO 100_N
BASE STATION
VEHICLE
201
COMMUNICATOR
300_1 TO 300_N
202
PORTABLE DEVICE
DETERMINATION UNIT
203
POSITION DATA ACQUISITION UNIT
204
INFORMATION PROVISION REQUEST UNIT
205
INFORMATION COLLECTOR
206
EXTRACTOR
207
NOTIFICATION INFORMATION GENERATOR
208
NOTIFICATION UNIT
209
CONTROL PROCESSOR

FIG. 3

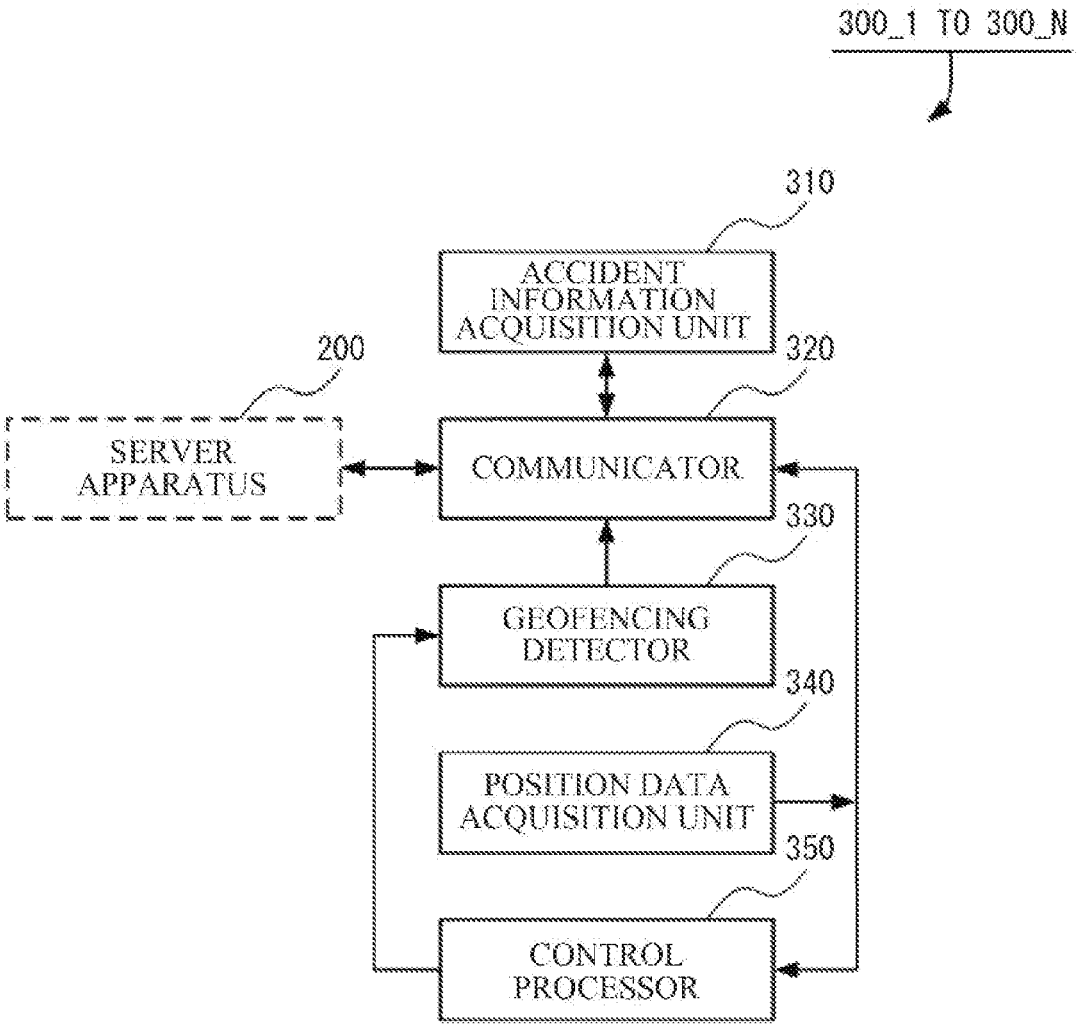

300_1 TO 300_N
310
ACCIDENT INFORMATION ACQUISITION UNIT
200
320
SERVER APPARATUS
COMMUNICATOR
330
GEOFENCING DETECTOR
340
POSITION DATA ACQUISITION UNIT
350
CONTROL PROCESSOR

FIG. 4

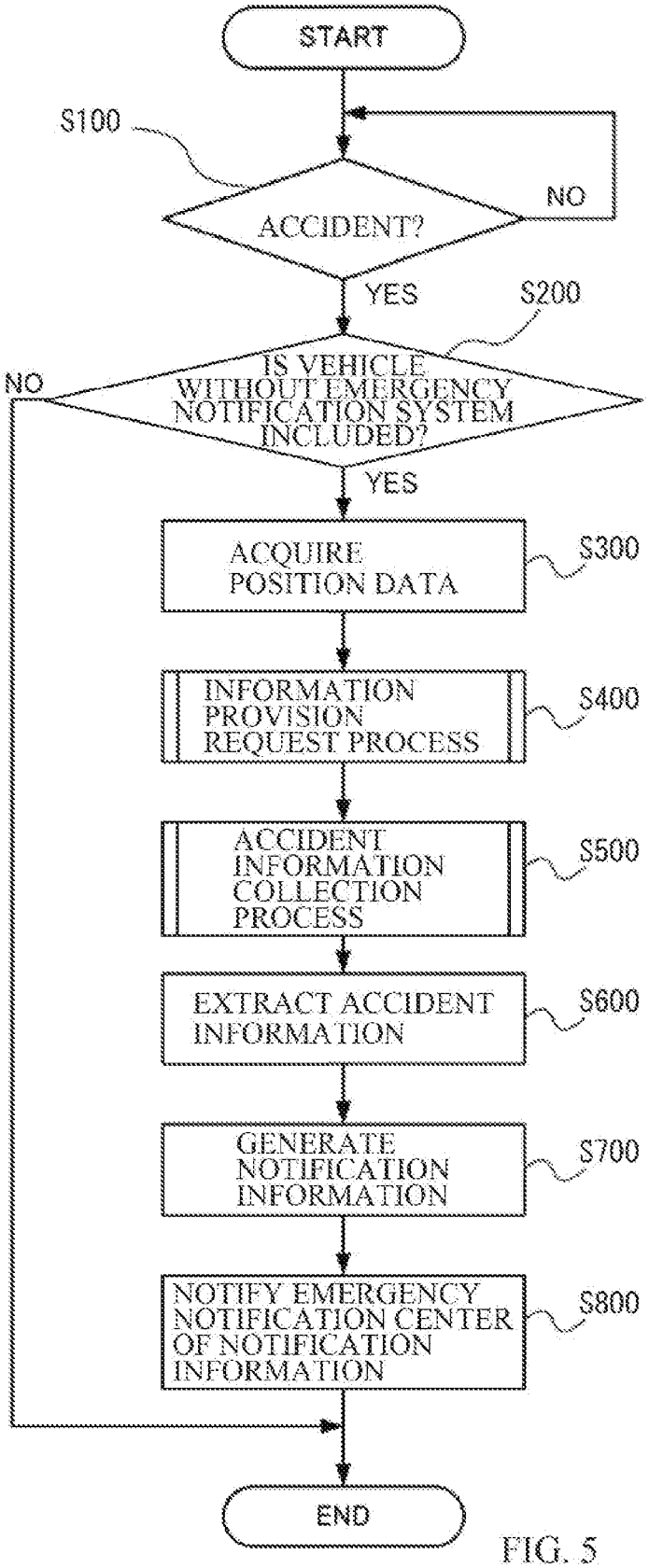

START
S100
ACCIDENT?
NO
YES
S200
IS VEHICLE WITHOUT EMERGENCY NOTIFICATION SYSTEM INCLUDED?
NO
YES
ACQUIRE POSITION DATA
S300
INFORMATION PROVISION REQUEST PROCESS
S400
ACCIDENT INFORMATION COLLECTION PROCESS
S500
EXTRACT ACCIDENT INFORMATION
S600
GENERATE NOTIFICATION INFORMATION
S700
NOTIFY EMERGENCY NOTIFICATION CENTER OF NOTIFICATION INFORMATION
S800
END

FIG. 5

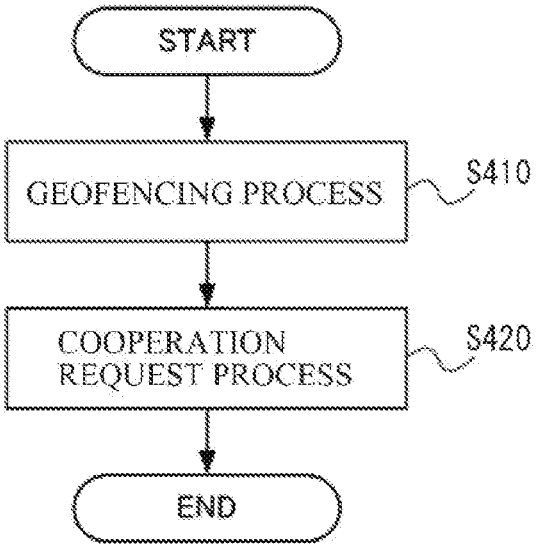

START
GEOFENCING PROCESS
S410
COOPERATION REQUEST PROCESS
S420
END

FIG. 6

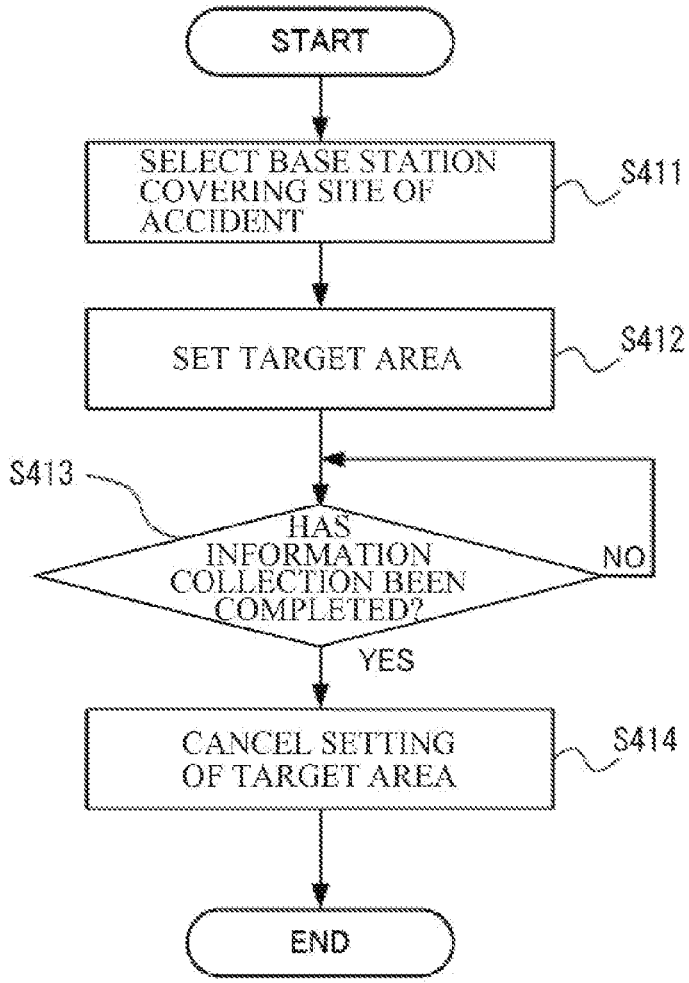

START
SELECT BASE STATION COVERING SITE OF ACCIDENT
S411
SET TARGET AREA
S412
S413
HAS INFORMATION COLLECTION BEEN COMPLETED?
NO
YES
CANCEL SETTING OF TARGET AREA
S414
END

FIG. 7

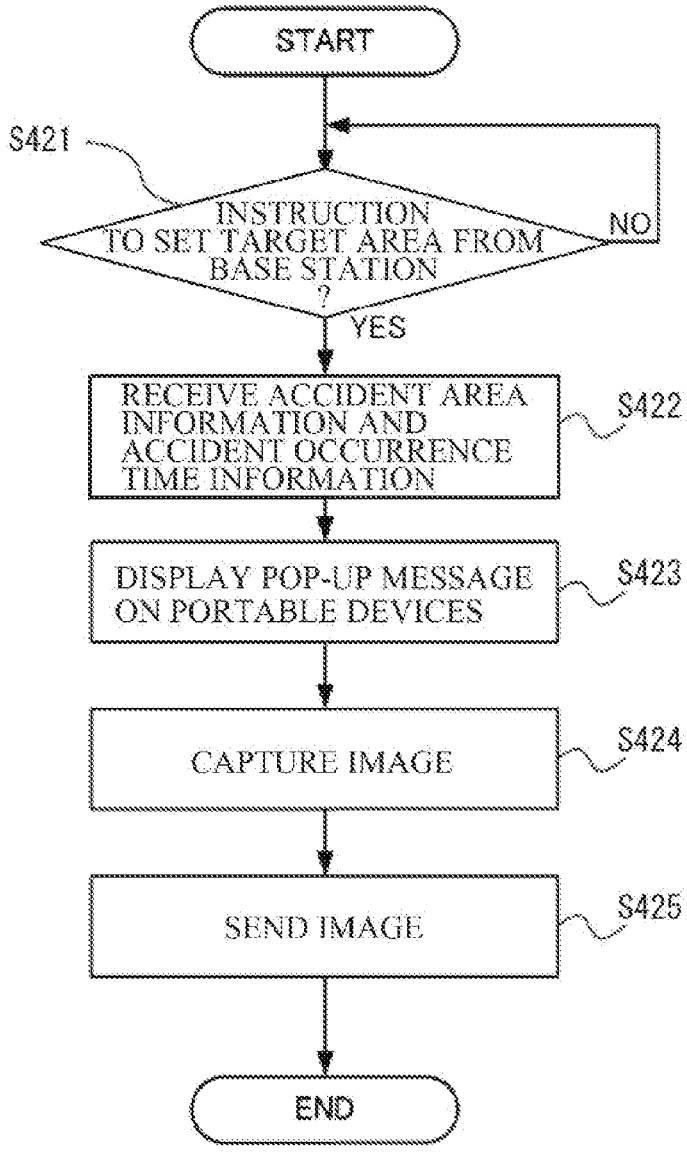

START
S421
INSTRUCTION TO SET TARGET AREA FROM BASE STATION ?
NO
YES
RECEIVE ACCIDENT AREA INFORMATION AND ACCIDENT OCCURRENCE TIME INFORMATION
S422
DISPLAY POP-UP MESSAGE ON PORTABLE DEVICES
S423
CAPTURE IMAGE
S424
SEND IMAGE
S425
END

FIG. 8

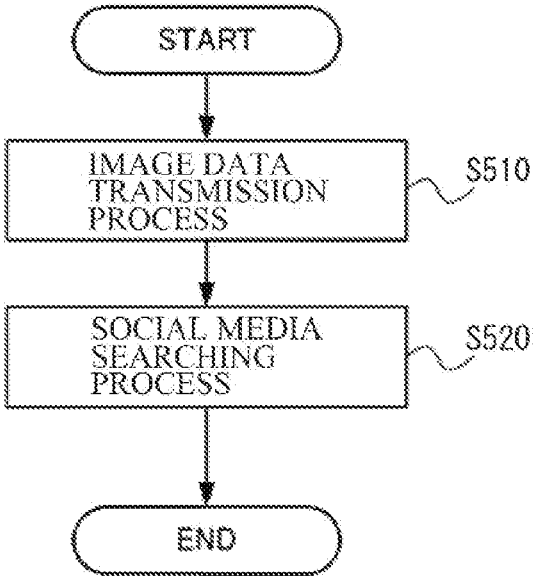

START
IMAGE DATA TRANSMISSION PROCESS
S510
SOCIAL MEDIA SEARCHING PROCESS
S520
END

FIG. 9

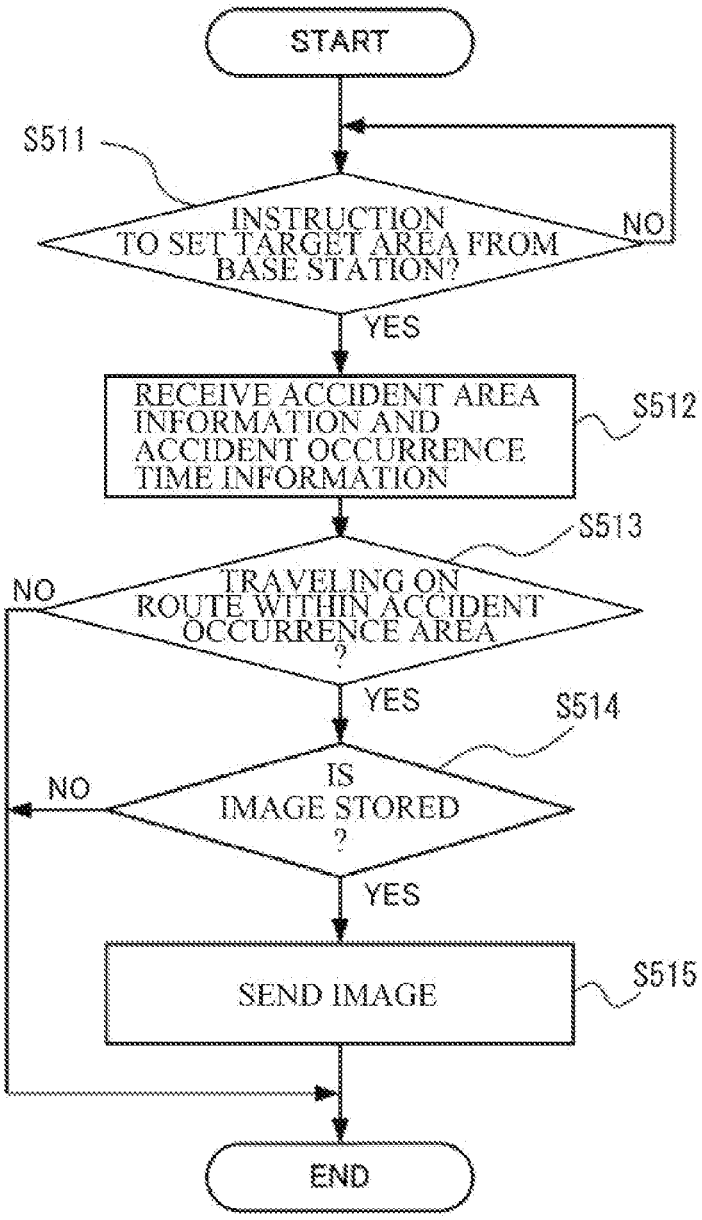

START
S511
INSTRUCTION TO SET TARGET AREA FROM BASE STATION?
NO
YES
RECEIVE ACCIDENT AREA INFORMATION AND ACCIDENT OCCURRENCE TIME INFORMATION
S512
S513
TRAVELING ON ROUTE WITHIN ACCIDENT OCCURRENCE AREA ?
NO
YES
S514
IS IMAGE STORED ?
NO
YES
SEND IMAGE
S515
END

FIG. 10

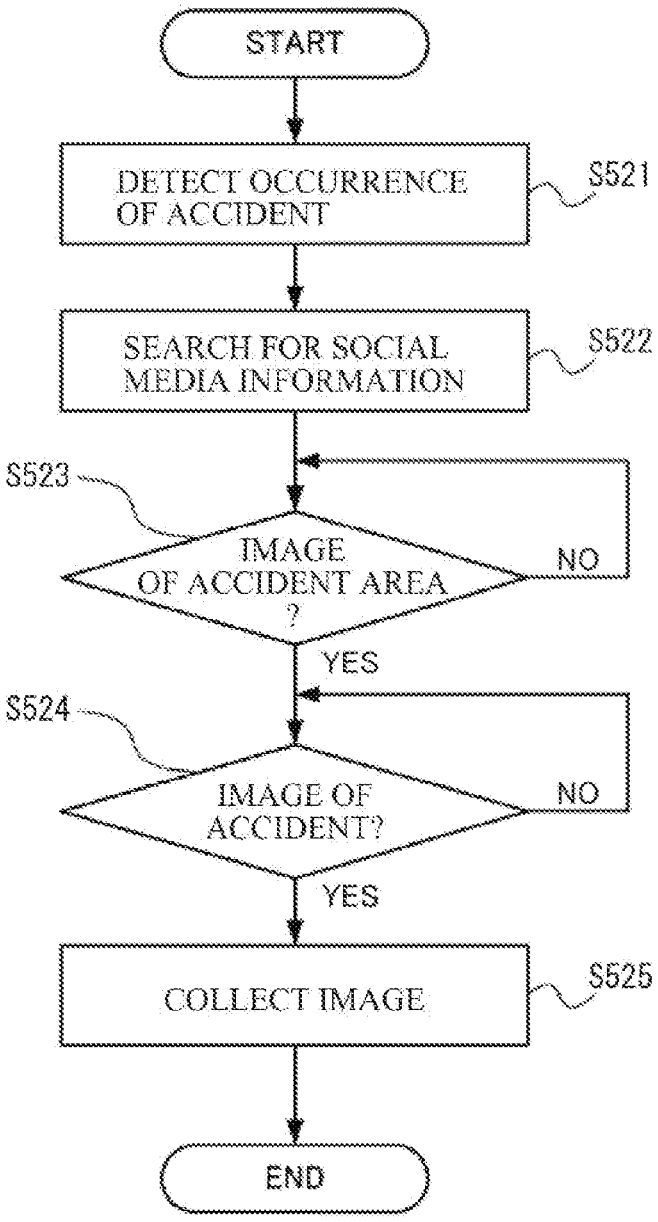

START
DETECT OCCURRENCE OF ACCIDENT
S521
SEARCH FOR SOCIAL MEDIA INFORMATION
S522
S523
IMAGE OF ACCIDENT AREA ?
NO
YES
S524
IMAGE OF ACCIDENT?
NO
YES
COLLECT IMAGE
S525
END

FIG. 11

SERVER APPARATUS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority from Japanese Patent Application No. 2022-143324 filed on Sep. 8, 2022, the entire contents of which are hereby incorporated by reference.

BACKGROUND

[0002] The disclosure relates to a server apparatus.

[0003] Various vehicle notification systems have been put into practical use that causes, when an emergency such as a traffic accident or a vehicle malfunction occurs, a mobile phone, an in-vehicle phone, or another in-vehicle communication device to send an emergency notification indicating the state of the emergency via a mobile communication network.

[0004] An example of the notification systems described above is disclosed in, for example, Japanese Unexamined Patent Application Publication (JP-A) No. 2010-244167. In order to inform an emergency center of details of a contact accident, an emergency notification system disclosed in JP-A 2010-244167 includes a pedestrian accident information sensor, an occupant accident information sensor, and an accident information transmission part. The pedestrian accident information sensor detects pedestrian accident information to determine a circumstance upon contact between a pedestrian and a vehicle. The occupant accident information sensor detects occupant accident information to determine a circumstance upon occurrence of danger to an occupant due to contact of the vehicle. When detecting contact with the pedestrian, the accident information transmission part sends the pedestrian accident information to a communication device of the emergency center. When determining the occurrence of danger to the occupant, the accident information transmission part sends the occupant accident information to the communication device.

[0005] Another example of the notification systems is disclosed in, for example, JP-A No. 2001-93069. According to the notification system disclosed in JP-A No. 2001-93069, when an accident occurs outside a communication area of an in-vehicle mobile phone, emergency notification data is sent from an own vehicle to another vehicle in the communication area via a transceiver unit, and the other vehicle performs emergency notification in place of the own vehicle.

SUMMARY

[0006] An aspect of the disclosure provides a server apparatus including communicator, a determination unit, a position data acquisition unit, an information provision request unit, an information collector, an extractor, and a notification unit. The communicator is configured to, upon occurrence of an accident involving multiple vehicles, communicate with peripheral vehicles or portable devices present in a peripheral area of a site of the accident. The peripheral vehicles include the multiple vehicles. The determination unit is configured to determine whether a vehicle without an emergency notification system is included in the multiple vehicles based on image data received from the peripheral vehicles or the portable devices present in the peripheral area. The position data acquisition unit is configured to acquire position data on a position of a vehicle of the multiple vehicles, which has issued an emergency notification when the vehicle without the emergency notification system is included in the multiple vehicles involved. The information provision request unit is configured to request a base station covering an area including the position acquired by the position data acquisition unit to send an information provision request to vehicles or portable devices present in a set target area. The information collector is configured to collect accident information from the peripheral vehicles or the portable devices present in the peripheral area, and collect information from the vehicles or the portable devices present in the set target area. The extractor is configured to extract accident information from the information collected from the vehicles or the portable devices present in the set target area based on the position data included in the information collected from the vehicles or the portable devices present in the set target area. The notification unit is configured to notify an emergency notification center of the accident information collected by the information collector or the accident information extracted by the extractor as notification information.

[0007] A server apparatus includes a communicator and circuitry. The communicator is configured to, upon occurrence of an accident involving multiple vehicles, communicate with peripheral vehicles or portable devices present in a peripheral area of a site of the accident. The peripheral vehicles include the multiple vehicles. The circuitry is configured to: determine whether a vehicle without an emergency notification system is included in the multiple vehicles based on image data received from the peripheral vehicles or the portable devices present in the peripheral area; acquire position data on a position of a vehicle of the multiple vehicles, which has issued an emergency notification when the vehicle without the emergency notification system is included in the multiple vehicles; request a base station covering an area including the position acquired to send an information provision request to vehicles or portable devices present in a set target area; collect accident information from the peripheral vehicles or the portable devices present in the peripheral area; collect information from the vehicles or the portable devices present in the set target area; extract accident information from the information collected from the vehicles or the portable devices present in the set target area based on the position data included in the information collected from the vehicles or the portable devices present in the set target area; and notify an emergency notification center of the accident information collected or the accident information extracted as notification information.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings are included to provide a further understanding of the disclosure, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments and, together with the specification, serve to explain the principles of the disclosure.

[0009] FIG. **1** is an exemplary configuration of an emergency notification system including a server apparatus according to one example embodiment of the disclosure.

[0010] FIG. **2** is a block diagram illustrating an exemplary configuration of a vehicle according to one example embodiment of the disclosure.

[0011] FIG. **3** is a block diagram illustrating an exemplary configuration of a server apparatus according to one example embodiment of the disclosure.

[0012] FIG. **4** is a block diagram illustrating an exemplary configuration of a portable device according to one example embodiment of the disclosure.

[0013] FIG. **5** is a flowchart of an exemplary process to be performed by the server apparatus according to one example embodiment of the disclosure.

[0014] FIG. **6** is a flowchart of an information provision request process to be performed by the server apparatus according to one example embodiment of the disclosure.

[0015] FIG. **7** is a flowchart of a geofencing process to be performed by the server apparatus according to one example embodiment of the disclosure.

[0016] FIG. **8** is a flowchart of a cooperation request process to be performed by the server apparatus according to one example embodiment of the disclosure.

[0017] FIG. **9** is a flowchart of an accident information collection process to be performed by the server apparatus according to one example embodiment of the disclosure.

[0018] FIG. **10** is a flowchart of an image data transmission process of sending image data to the server apparatus during traveling of the vehicle according to one example embodiment of the disclosure.

[0019] FIG. **11** is a flowchart of a social media searching process to be performed by the server apparatus according to one example embodiment of the disclosure to retrieve and collect image data from the portable device.

DETAILED DESCRIPTION

[0020] As described in JP-A No. 2010-244167, when an accident involving vehicles has occurred, information about details of the accident is to be provided to an emergency notification center.

[0021] Further, in a possible measure against a case where an own vehicle is in an uncommunicable state when an accident involving multiple vehicles and multiple people has occurred, another vehicle is to send an emergency notification in place of the own vehicle, as described in JP-A No. 2001-93069.

[0022] However, although being able to cause the other vehicle to send a rescue request in place of the own vehicle in the uncommunicable state, the technique described in JP-A No. 2001-93069 fails to utilize image data and sound data relevant to the accident owned by the vehicle in the uncommunicable state. There is therefore still room for improvement in providing information on details of the accident to the emergency notification center.

[0023] It is desirable to provide a server apparatus that secures smooth and rapid transmission of accurate information on details of an accident involving multiple vehicles and multiple people upon occurrence of the accident.

Example Embodiment

[0024] In the following, a server apparatus **200** according to an example embodiment of the disclosure is described with reference to FIGS. **1** to **11**.

[0025] The following description of the server apparatus **200** according to the example embodiment is given with reference to an exemplary configuration of an emergency notification system **1**.

[0026] Note that the following description is directed to illustrative examples of the disclosure and not to be construed as limiting to the disclosure. Factors including, without limitation, numerical values, shapes, materials, components, positions of the components, and how the components are coupled to each other are illustrative only and not to be construed as limiting to the disclosure. Further, elements in the following example embodiments which are not recited in a most-generic independent claim of the disclosure are optional and may be provided on an as-needed basis. The drawings are schematic and are not intended to be drawn to scale. Throughout the present specification and the drawings, elements having substantially the same function and configuration are denoted with the same reference numerals to avoid any redundant description. In addition, elements that are not directly related to any embodiment of the disclosure are unillustrated in the drawings.

<Exemplary Configuration of Emergency Notification System **1**>

[0027] As illustrated in FIG. **1**, the emergency notification system **1** according to the example embodiment includes vehicles **100_1** to **100**_N, the server apparatus **200**, portable devices **300_1** to **300**_N, and an emergency notification center **400**.

[0028] The vehicles **100_1** to **100**_N are peripheral vehicles including vehicles involved in the accident, and are communicable with the server apparatus **200** to be described later. Hereinafter, the vehicles **100_1** to **100**_N are each referred to as a peripheral vehicle **100** or collectively referred to as peripheral vehicles **100** when the vehicles **100_1** to **100**_N are not to be distinguished from each other.

[0029] In the example embodiment, the vehicle **100** sends accident information to the server apparatus **200** upon the occurrence of an accident. Examples of the accident information may include data on the state of contact, data on a contact portion, images, and sounds that are stored in a memory of the vehicle **100**.

[0030] The server apparatus **200** collects the accident information from the vehicles **100** and the portable devices **300_1** to **300**_N. In the example embodiment, when a vehicle without an emergency notification system is included in the vehicles involved in the accident, the server apparatus **200** collects the accident information by sending a request for the accident information not only to the other vehicles **100** involved in the accident and the portable devices **300_1** to **300**_N in the peripheral area of the site of the accident but also to the vehicles **100** and the portable devices **300_1** to **300**_N present within a specific area from the site of the accident.

[0031] The portable devices **300_1** to **300**_N may include not only portable devices owned by drivers of the vehicles involved in the accident but also the portable devices present in the peripheral area of the site of the accident, and the portable devices present in the specific area from the site of the accident. Hereinafter, the portable devices **300_1** to **300**_N are each referred to as a portable device **300** or collectively referred to as portable devices **300** when the portable devices **300_1** to **300**_N are not to be distinguished from each other.

[0032] The portable devices **300** may be, for example, smartphones and wearable devices.

[0033] The portable device **300** may provide the accident information, such as static image data, moving image data,

or sound data relevant to the accident, in response to the request from the server apparatus **200**.

[0034] Further, the portable device **300** may permit the server apparatus **200** to search the portable device **300** for social media information, image data, or sound data stored in the portable device **300**.

[0035] The emergency notification center **400** may receive notification information form the server apparatus **200**, and may notify a person in charge of the accident information. When receiving the accident information, the person in charge may send a notification to a fire station, a police station, or a hospital selected based on the details of the accident.

<Exemplary Configuration of Vehicle **100**>

[0036] As illustrated in FIG. **2**, the vehicles **100_1** to **100_N** according to the example embodiment may each include an accident information acquisition unit **110**, a communicator **120**, a geofencing detector **130**, a position data acquisition unit **140**, and a control processor **150**.

[0037] The accident information acquisition unit **110** may acquire, as the accident information, image data acquired by an imaging device of an advanced driver-assistance system (ADAS), image data of a peripheral environment of the vehicle **100** acquired by a dashboard camera of the vehicle **100**, or sound data collected by microphones of the vehicles **100** for example.

[0038] The communicator **120** may be a communication module that communicates with the server apparatus **200**, for example.

[0039] The communication may be established by a communication method such as Wi-Fi (registered trademark), for example.

[0040] The communicator **120** may send the accident information acquired by the accident information acquisition unit **110** in response to the request for the accident information from the server apparatus **200**, for example.

[0041] Further, the communicator **120** may send a control signal, received from a base station **500**, for enabling a geofencing operation to the geofencing detector **130** to be described later, and may send own vehicle position data acquired by the position data acquisition unit **140** to be described later to the server apparatus **200**.

[0042] The geofencing detector **130** may transmit the control signal for enabling the geofencing operation received from the base station **500** via the communicator **120**, and may notify the control processor **150** to be described later of the transmission of the control signal.

[0043] When the geofencing operation is enabled, the position data acquisition unit **140** may acquire the own vehicle position data from a navigation system, for example.

[0044] The position data acquisition unit **140** may send the own vehicle position data acquired from the navigation system to the server apparatus **200**.

[0045] The control processor **150** may control an overall operation of the vehicle **100** in accordance with a control program stored in a non-illustrated read only memory (ROM), for example.

[0046] In the example embodiment, the control processor **150** may perform control to send the accident information acquired by the accident information acquisition unit **110** and the own vehicle position data acquired by the position data acquisition unit **140** to the server apparatus **200** in response to the request for the accident information from the server apparatus **200**, for example.

<Exemplary Configuration of Server Apparatus **200**>

[0047] As illustrated in FIG. **3**, the server apparatus **200** according to the example embodiment may include a communicator **201**, a determination unit **202**, a position data acquisition unit **203**, an information provision request unit **204**, an information collector **205**, an extractor **206**, a notification information generator **207**, a notification unit **208**, and a control processor **209**.

[0048] The communicator **201** may be a communication module that communicates with the peripheral vehicles **100**, including the vehicles involved in the accident, and the portable devices **300** present in the peripheral area of the site of an accident upon the occurrence of the accident, for example.

[0049] The communication may be established by a communication method such as Wi-Fi (registered trademark), for example.

[0050] In one example, the communicator **120** may be activated in response to a control signal from the control processor **209**, and may receive the accident information from the peripheral vehicles **100**, including the vehicles involved in the accident, and the portable devices **300** present in the peripheral area of the site of the accident.

[0051] Note that the communicator **120** may sequentially send the accident information received from the vehicles **100** and the portable devices **300** present in the peripheral area of the site of the accident to the information collector **205** to be described later.

[0052] The determination unit **202** may determine whether a vehicle without the emergency notification system is included in the vehicles involved in the accident, based on image data received from the vehicles **100**, including the vehicles involved in the accident, the portable devices **300** present in the peripheral area of the site of the accident.

[0053] In one example, the determination unit **202** may retrieve information on the license plate of a vehicle involved in the accident from the image data included in the accident information acquired by the communicator **201**. The determination unit **202** may access a server of the District Land Transport Bureau or a server of the Ministry of Land, Infrastructure and Transport to determine whether the vehicle includes the emergency notification system.

[0054] Alternatively, the determination unit **202** may retrieve the information on the license plate of the vehicle involved in the accident from image data acquired by monitoring cameras disposed on roads.

[0055] When the determination unit **202** determines that the vehicle without the emergency notification system is included, the position data acquisition unit **203** may acquire position data on a position of a vehicle having issued an emergency notification out of the vehicles involved in the accident.

[0056] The position data acquired by the position data acquisition unit **203** may be sent to the information provision request unit **204** to be described later.

[0057] The information provision request unit **204** requests, via the communicator **201**, a base station **500** covering an area including the acquired position to send an information provision request to the vehicles **100** or the portable devices **300** present in a set target area.

[0058] The information collector **205** collects the accident information from the peripheral vehicles **100**, including the vehicles involved in the accident, or the portable devices **300** present in the peripheral area of the site of the accident, and collects information from the vehicles **100** or the portable devices **300** present in the set target area.

[0059] Note that the information collected by the information collector **205** from the vehicles **100** and the portable devices **300** present in the set target area may be sent to the extractor **206** to be described later, and the accident information collected by the information collector **205** from the peripheral vehicles **100**, including the vehicles involved in the accident, or the portable devices **300** present in the peripheral area of the site of the accident may be sent to the notification information generator **207**.

[0060] The extractor **206** may extract accident information from the information collected by the information collector **205** based on the position data included in the information received from the vehicles **100** or the portable devices **300** present in the set target area.

[0061] Note that the accident information extracted by the extractor **206** may be sent to the notification information generator **207** to be described later.

[0062] The notification information generator **207** may sort out the accident information received from the peripheral vehicles **100**, including the vehicles involved in the accident, or the portable devices **300_1** to **300**_N present in the peripheral area of the site of the accident, and the accident information extracted by the extractor **206**, to generate notification information.

[0063] Herein, the term "sort out" may encompass excluding the same accident information from the accident information received from the peripheral vehicles, including the vehicles involved in the accident, or the portable devices **300** present in the peripheral area of the site of the accident, and the accident information extracted by the extractor **206**, and combining multiple pieces of accident information to enhance the accuracy of the information on the number of vehicles involved in the accident or the number of injured people, for example.

[0064] The notification information generated by the notification information generator **207** may be sent to the notification unit **208** to be described later.

[0065] The notification unit **208** may notify the emergency notification center **400** of the notification information generated by the notification information generator **207**.

[0066] The control processor **209** may control an overall operation of the server apparatus **200** in accordance with a control program stored in a non-illustrated read only memory (ROM), for example.

[0067] In the example embodiment, the control processor **209** may perform control to cause the information provision request unit **204** to send the information provision request to the base station **500**.

[0068] The control processor **209** may further perform control to cause the notification unit **208** to send the notification information to the emergency notification center **400**.

<Exemplary Configuration of Portable Device **300**>

[0069] As illustrated in FIG. **4**, the portable devices **300_1** to **300**_N according to the example embodiment may each include an accident information acquisition unit **310**, a communicator **320**, a geofencing detector **330**, a position data acquisition unit **340**, and a control processor **350**.

[0070] The accident information acquisition unit **310** may acquire, for example, image data acquired by an imaging device and sound data collected by a microphone as the accident information.

[0071] The communicator **320** may be a communication module to communicate with the server apparatus **200**, for example.

[0072] The communication may be established by a communication method such as Wi-Fi (registered trademark), for example.

[0073] The communicator **320** may send the accident information acquired by the accident information acquisition unit **310** in response to the request for the accident information from the server apparatus **200**, for example.

[0074] Further, the communicator **320** may send a control signal, received from the base station **500**, for enabling the geofencing operation to the geofencing detector **330** to be described later, and may send own vehicle position data acquired by the position data acquisition unit **340** to be described later to the server apparatus **200**.

[0075] The geofencing detector **330** may transmit the control signal for enabling the geofencing operation received from the base station **500** via the communicator **320**, and may notify the control processor **350** to be described later of the transmission of the control signal.

[0076] When the geofencing operation is enabled, the position data acquisition unit **340** may acquire data on a current position from the global positioning system (GPS), for example.

[0077] The position data acquisition unit **340** may send the data on the current position to the server apparatus **200**.

[0078] The control processor **350** may control an overall operation of the portable device **300** in accordance with a control program stored in a non-illustrated read only memory (ROM), for example.

[0079] In the example embodiment, the control processor **350** may send the accident information acquired by the accident information acquisition unit **310** and the data on the current position acquired by the position data acquisition unit **340** to the server apparatus **200** in response to a request from the server apparatus **200** to send the accident information, for example.

<Process in Serve Apparatus **200**>

[0080] With reference to FIG. **5**, a description is given of a process to be performed by the server apparatus **200** according to the example embodiment.

[0081] As illustrated in FIG. **5**, the control processor **209** may determine whether an accident has occurred (Step S**100**).

[0082] When the control processor **209** determines that no accident has occurred (Step S**100**: NO), the process may return to a stand-by mode.

[0083] In contrast, when the control processor **209** determines that an accident has occurred (Step S**100**: YES), the determination unit **202** may determine whether the vehicle without the emergency notification system is included in the vehicles involved in the accident, based on the image data received from the peripheral vehicles **100**, including the vehicle involved in the accident, or devices including the portable devices **300** present in the peripheral area of the site of the accident (Step S**200**).

[0084] If the determination unit **202** determines that the vehicle without the emergency notification system is not included based on the image data received from the peripheral vehicles **100**, including the vehicles involved in the accident, or the devices including the portable devices **300** present in the peripheral area of the site of the accident (Step S**200**: NO), the process may end.

[0085] In contrast, if the determination unit **202** determines that the vehicle without the emergency notification system is included based on the image data received from the peripheral vehicles **100**, including the vehicles involved in the accident, or the devices including the portable devices **300** present in the peripheral area of the site of the accident (Step S**200**: YES), the position data acquisition unit **203** may acquire the position data on the position of the vehicle having issued the emergency notification out of the vehicles **100** involved in the accident (Step S**300**).

[0086] Thereafter, the information provision request unit **204** may request, via the communicator **201**, the base station **500** covering the area including the acquired position to send the information provision request to the vehicles **100** or the portable devices **300** present in the set target area (i.e., an information provision request process) (Step S**400**).

[0087] Note that the information provision request process will be described in detail later.

[0088] The information collector **205** may acquire the accident information from the peripheral vehicles **100**, including the vehicles involved in the accident, or the portable devices **300** present in the peripheral area of the site of the accident, and may collect the information from the vehicles **100** and the portable devices **300** present in the set target area (i.e., an accident information collection process) (Step S**500**).

[0089] Note that the accident information collection process will be described in detail later.

[0090] The extractor **206** may extract accident information from the information collected by the information collector **205** from the vehicles **100** or the portable devices **300** present in the set target area, based on the position data included in the information received from the vehicles **100** or and the portable devices **300** present in the set target area (Step S**600**).

[0091] The notification information generator **207** may sort out the accident information collected by the information collector **205** from the peripheral vehicles **100**, including the vehicles involved in the accident, or the portable devices **300** present in the peripheral area of the site of the accident and the accident information extracted by the extractor **206**, to thereby generate the notification information (Step S**700**).

[0092] The notification unit **208** may notify the emergency notification center **400** of the notification information generated by the notification information generator **207**, following which the process may end (Step S**800**).

<Information Provision Request Process>

[0093] The information provision request process will now be described with reference to FIGS. **6** to **8**. As illustrated in FIG. **6**, the information provision request process may include a geofencing process (Step S**410**) and a cooperation request process (Step S**420**).

[0094] As illustrated in FIG. **7**, the geofencing process may start with Step S**411** in which the server apparatus **200** selects the base station **500** covering the site of the accident based on the position data, acquired by emergency notification position data acquisition unit **203**, on the vehicle having issued the emergency notification out of the vehicles **100** involved in the accident.

[0095] Thereafter, the server apparatus **200** may set the target area, and the information provision request unit **204** may request, via the communicator **120**, the base station **500** covering the area including the acquired position to send the information provision request to the vehicles **100** or the portable devices **300** present in the set target area (Step S**412**).

[0096] The server apparatus **200** may determine whether the information collector **205** has completed the process of collecting the information from the vehicles **100** or the portable devices **300** present in the set target area has been completed (Step S**413**). If the server apparatus **200** determines that the information collector **205** has not completed the process of collecting the information form the vehicles **100** and the portable devices **300** present in the set target area (Step S**413**: NO), the process may return to the stand-by mode.

[0097] In contrast, if it is determined that the information collector **205** has completed the process of collecting the information from the vehicles **100** and the portable devices **300** present in the set target area (Step S**413**: YES), the server apparatus **200** may cancel the setting of the target area, following which the process may end (Step S**413**).

[0098] As illustrated in FIG. **8**, the cooperation request process may start with Step S**421** in which the control processor **350** of the portable device **300** present in the set target area may determine whether an instruction to set the target area (i.e., a geofencing signal) has been received from the base station **500**. If the geofencing detector **330** of the portable device **300** has not detected the geofencing signal sent from the base station **500** (Step S**421**: NO), the control processor **350** of the portable device **300** may return the process to a stand-by mode.

[0099] In contrast, if the geofencing detector **330** of the portable device **300** has detected the geofencing signal sent from the base station **500** (Step S**421**: YES), the communicator **320** of the portable device **300** may receive accident area information and accident occurrence time information from the base station **500**, and may send the information to the control processor **350** of the portable device **300** (Step S**422**).

[0100] The base station **500** may send a pop-up message requesting for cooperation in information provision to the portable devices **300**. The control processor **350** of the portable device **300** may display the pop-up message on a non-illustrated display part thereof (Step S**423**).

[0101] The owner of the portable device **300** may cause a non-illustrated imaging device to capture an image of a peripheral environment, and may send data on the captured image to the communicator **320** (Step S**424**).

[0102] The communicator **320** may send the data on the captured image received from the portable device **300** to the server apparatus **200**, following which the process may end (Step S**425**).

<Accident Information Collection Process>

[0103] The accident information collection process will now be described with reference to FIGS. **9** to **11**.

[0104] As illustrated in FIG. **9**, the accident information collection process may include an image data transmission process (Step S**510**) and a social media searching process (Step S**520**).

[0105] As illustrated in FIG. **10**, the image data transmission process may start with Step S**511** in which the control processor **150** of the vehicle **100** present in the set target area determines whether the instruction to set the target area (i.e., the geofencing signal) has been received from the base station **500**. If the geofencing detector **130** of the vehicle **100** has not detected the geofencing signal sent from the base station **500** (Step S**511**: NO), the control processor **150** of the vehicle **100** may return the process to a stand-by mode.

[0106] In contrast, if the geofencing detector **130** of the vehicle **100** has detected the geofencing signal sent from the base station **500** (Step S**511**: YES), the communicator **120** of the vehicle **100** may receive the accident area information and the accident occurrence time information from the base station **500**, and may send the information to the control processor **150** of the vehicle **100** (Step S**512**).

[0107] The control processor **150** of the vehicle **100** may determine whether the vehicle **100** is traveling on a route within the accident occurrence area based on information received from a non-illustrated navigation system (Step S**513**). If it is determined that the vehicle **100** is not traveling on the route within the accident occurrence area (Step S**513**: NO), the control processor **150** may end the process.

[0108] In contrast, if it is determined that the vehicle **100** is traveling on the route within the accident occurrence area (Step S**513**: YES), the control processor **150** may determine whether an image captured during traveling on the route is stored (Step S**514**). If it is determined that the image captured during traveling on the route is not stored (Step S**514**: NO), the control processor **150** of the vehicle **100** may end the process.

[0109] In contrast, if it is determined that the image captured during traveling on the route is stored (Step S**514**: YES), the control processor **150** of the vehicle **100** may send the stored image to the server apparatus **200** via the communicator **320** (Step S**515**), following which the process may end.

[0110] As illustrated in FIG. **11**, the social media searching process may start with Step S**521** in which the control processor **209** of the server apparatus **200** detects the occurrence of an accident. When detecting the occurrence of the accident, the control processor **209** of the server apparatus **200** may search the portable devices **300** present in the set target area for social media information (Step S**522**).

[0111] Through the search, the control processor **209** of the server apparatus **200** may determine whether the portable devices **300** present in the set target area include social media information including images of the set target area (Step S**523**). If it is determined as a result of the search that the portable devices **300** include no social media information including the images of the set target area (Step S**523**: NO), the control processor **209** of the server apparatus **200** may repeat the search.

[0112] In contrast, if it is determined as a result of the search that the portable devices **300** include the social media information including the images of the set target area (Step S**523**: YES), the control processor **209** of the server apparatus **200** may determine whether an image of the accident is included in the social media information (Step S**524**). If it is determined that the image of the accident is not included (Step S**524**: NO), the control processor **209** may repeat the searching.

[0113] In contrast, if it is determined that the image of the accident is included (Step S**524**: YES), the control processor **209** of the server apparatus **200** may collect the image of the accident (Step S**525**), following which the process may end.

<Workings and Effects>

[0114] As described above, the determination unit **202** of the server apparatus **200** according to the example embodiment determines whether a vehicle without the emergency notification system is included in the vehicles involved in an accident based on the image data received from the peripheral vehicles **100**, including the vehicles involved in the accident, or the portable devices **300** present in the peripheral area of the site of the accident. If the vehicle without the emergency notification system is included, the position data acquisition unit **203** acquires the position data on the position of the vehicle having issued the emergency notification out of the vehicles involved in the accident. Thereafter, the information provision request unit **204** requests the base station **500** covering the area including the acquired position to send the information provision request to the vehicles **100** or the portable devices **300** present in the set target area.

[0115] That is, if the vehicle without the emergency notification system is included in the vehicles involved in the accident, the position data acquisition unit **203** acquires the position data on the position of the vehicle having issued the emergency notification out of the vehicles involved in the accident, and the information provision request unit **204** requests the base station **500** covering the area including the acquired position to send the information provision information to the vehicles **100** or the portable devices **300** present in the set target area.

[0116] If the vehicle without the emergency notification system is included in the vehicles involved in the accident, there may be cases where details of the accident are not recognized only based on the emergency notification information collected from the other vehicles involved in the accident. However, according to the example embodiment, the position data acquisition unit **203** of the server apparatus **200** acquires the position data on the position of the vehicle having issued the emergency notification out of the vehicles involved in the accident, and the information provision request unit **204** requests the base station **500** covering the area including the acquired position to send the information provision request to the vehicles **100** or the portable devices **300** present in the set target area. This enables smooth and rapid transmission of accurate information on details of an accident upon the occurrence of the accident involving multiple vehicles and multiple people.

[0117] In addition, the information collector **205** collects the accident information from the peripheral vehicles **100**, including the vehicles involved in the accident, or the portable devices **300** present in the peripheral area of the site of the accident, and collects the information from the vehicles **100** or the portable devices **300** present in the set target area.

[0118] It is therefore possible to collect the information in a sufficient amount enough to compensate the lack of information on the accident. This enables smooth and rapid

transmission of accurate information on details of an accident upon the occurrence of the accident involving multiple vehicles and multiple people.

[0119] Further, the extractor **206** extracts the accident information from the collected information based on the position data included in the information received from the vehicles **100** or the portable devices **300** present in the set target area.

[0120] It is therefore possible to acquire accurate information on details of the accident. This enables smooth and rapid transmission of accurate information on details of an accident upon the occurrence of the accident involving multiple vehicles and multiple people.

[0121] Further, according to the server apparatus **200** of the example embodiment, the accident information may include the social media information.

[0122] That is, the accident information may include social media information obtained by the server apparatus **200** searching the portable devices **300** and social media information obtained by the server apparatus **200** performing web searching based on a keyword.

[0123] Accordingly, it is possible to acquire information on social media posts posted by people who were in the site of the accident immediately after the occurrence of the accident but left from the site of the accident. This enlarges the area from which information on the accident is obtainable.

[0124] It is therefore possible to collect the information in a sufficient amount enough to compensate the lack of information on the accident. This enables smooth and rapid transmission of accurate information on details of an accident upon the occurrence of the accident involving multiple vehicles and multiple people.

[0125] Further, the notification information generator **207** of the server apparatus **200** according to the example embodiment may sort out the accident information collected from the peripheral vehicles, including the vehicles involved in the accident, or the portable devices present in the peripheral area of the site of the accident and the accident information extracted by the extractor **206**.

[0126] Herein, the sorting out of the collected information by the notification information generator **207** may encompass excluding the same accident information from the accident information received from the peripheral vehicles, including the vehicles involved in the accident, or the portable devices in the peripheral area of the site of the accident, and the accident information extracted by the extractor **206**, and combining multiple pieces of accident information to enhance the accuracy of the information on the number of vehicles involved in the accident or the number of injured people, for example.

[0127] Accordingly, it is possible to secure rapid and accurate information transmission upon the occurrence of an accident involving multiple vehicles and multiple people.

Modification Example 1

[0128] In the example embodiment described above, the determination unit **202** may determine whether a vehicle without the emergency notification system is included in the vehicles involved in the accident based on the image data received from the peripheral vehicles **100_1** to **100_N**, including the vehicles involved in the accident, and the portable devices **300** present in the peripheral area of the site of the accident. Alternatively, the determination unit **202** may determine whether a vehicle without a communication system is included in the vehicles involved in the accident.

[0129] Note that it is possible to implement the server apparatus **200** of the example embodiment of the disclosure by recording the process to be executed by the information provision request unit **204** and the control processor **209** on a non-transitory recording medium readable by a computer system, and causing the computer system to load the program recorded on the non-transitory recording medium onto the information provision request unit **204** and the control processor **209** to execute the program. The computer system as used herein may encompass an operating system (OS) and hardware such as a peripheral device.

[0130] In addition, when the computer system utilizes a World Wide Web (WWW) system, the "computer system" may encompass a website providing environment (or a website displaying environment). The program may be transmitted from a computer system that contains the program in a storage device or the like to another computer system via a transmission medium or by a carrier wave in a transmission medium. The "transmission medium" that transmits the program may refer to a medium having a capability to transmit data, including a network (e.g., a communication network) such as the Internet and a communication link (e.g., a communication line) such as a telephone line.

[0131] Further, the program may be directed to implement a part of the operation described above. The program may be a so-called differential file (differential program) configured to implement the operation by a combination of a program already recorded on the computer system.

[0132] Although some example embodiments of the disclosure have been described in the foregoing by way of example with reference to the accompanying drawings, the disclosure is by no means limited to the embodiments described above. It should be appreciated that modifications and alterations may be made by persons skilled in the art without departing from the scope as defined by the appended claims. The disclosure is intended to include such modifications and alterations in so far as they fall within the scope of the appended claims or the equivalents thereof.

[0133] One or more of the determination unit **202**, the position data acquisition unit **203**, the information provision request unit **204**, the information collector **205**, the extractor **206**, and the notification unit **208** in FIG. **3** are implementable by circuitry including at least one semiconductor integrated circuit such as at least one processor (e.g., a central processing unit (CPU)), at least one application specific integrated circuit (ASIC), and/or at least one field programmable gate array (FPGA). At least one processor is configurable, by reading instructions from at least one machine readable non-transitory tangible medium, to perform all or a part of functions of the determination unit **202**, the position data acquisition unit **203**, the information provision request unit **204**, the information collector **205**, the extractor **206**, and the notification unit **208**. Such a medium may take many forms, including, but not limited to, any type of magnetic medium such as a hard disk, any type of optical medium such as a CD and a DVD, any type of semiconductor memory (i.e., semiconductor circuit) such as a volatile memory and a non-volatile memory. The volatile memory may include a DRAM and a SRAM, and the nonvolatile memory may include a ROM and a NVRAM. The ASIC is an integrated circuit (IC) customized to perform, and the

FPGA is an integrated circuit designed to be configured after manufacturing in order to perform, all or a part of the determination unit **202**, the position data acquisition unit **203**, the information provision request unit **204**, the information collector **205**, the extractor **206**, and the notification unit **208** in FIG. **3**.

1. A server apparatus comprising:

a communicator configured to, upon occurrence of an accident involving multiple vehicles, communicate with peripheral vehicles or portable devices present in a peripheral area of a site of the accident, the peripheral vehicles including the multiple vehicles;

a determination unit configured to determine whether a vehicle without an emergency notification system is included in the multiple vehicles based on image data received from the peripheral vehicles or the portable devices present in the peripheral area;

a position data acquisition unit configured to acquire position data on a position of a vehicle of the multiple vehicles when the vehicle without the emergency notification system is included in the multiple vehicles, the vehicle having issued an emergency notification;

an information provision request unit configured to request a base station covering an area including the position acquired by the position data acquisition unit to send an information provision request to vehicles or portable devices present in a set target area;

an information collector configured to collect accident information from the peripheral vehicles or the portable devices present in the peripheral area, and collect information from the vehicles or the portable devices present in the set target area;

an extractor configured to extract accident information from the information collected from the vehicles or the portable devices present in the set target area based on the position data included in the information collected from the vehicles or the portable devices present in the set target area; and

a notification unit configured to notify an emergency notification center of the accident information collected by the information collector or the accident information extracted by the extractor as notification information.

2. The server apparatus according to claim **1**, wherein the accident information collected by the information collector or the accident information extracted by the extractor includes social media information.

3. The server apparatus according to claim **1**, further comprising a notification information generator configured to sort out the accident information collected form the peripheral vehicles or the portable devices in the peripheral area and the accident information extracted by the extractor to generate the notification information.

4. The server apparatus according to claim **2**, further comprising a notification information generator configured to sort out the accident information collected form the peripheral vehicles or the portable devices in the peripheral area and the accident information extracted by the extractor to generate the notification information.

5. A server apparatus comprising:

a communicator configured to, upon occurrence of an accident involving multiple vehicles, communicate with peripheral vehicles or portable devices present in a peripheral area of a site of the accident, the peripheral vehicles including the multiple vehicles; and

circuitry configured to

determine whether a vehicle without an emergency notification system is included in the multiple vehicles based on image data received from the peripheral vehicles or the portable devices present in the peripheral area,

acquire position data on a position of a vehicle of the multiple vehicles when the vehicle without the emergency notification system is included in the multiple vehicles, the vehicle having issued an emergency notification,

request a base station covering an area including the position acquired to send an information provision request to vehicles or portable devices present in a set target area,

collect accident information from the peripheral vehicles or the portable devices present in the peripheral area,

collect information from the vehicles or the portable devices present in the set target area,

extract accident information from the information collected from the vehicles or the portable devices present in the set target area based on the position data included in the information collected from the vehicles or the portable devices present in the set target area, and

notify an emergency notification center of the accident information collected or the accident information extracted, as notification information.

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