

Laying-Open No. 2017-123692 and Japanese Patent Laying-Open No. 2017-091149 has been proposed as a method for managing data in a distributed manner.

The present disclosure has been made to solve the above-described problem, and an object of the present disclosure is to provide a vehicle information communication system configured to perform communication between a plurality of vehicles and a server, in which an increase in load on the server is suppressed and appropriate communication is performed.

A vehicle information communication system according to the present disclosure includes: a plurality of vehicles; and a server configured to communicate with the plurality of vehicles. The server communicates with the plurality of vehicles by using either a first communication mode or a second communication mode. In the first communication mode, the server receives and transmits information to and from each of the plurality of vehicles individually. In the second communication mode, the server receives and transmits the information to and from a part of the plurality of vehicles and the information is shared among the plurality of vehicles by using vehicle-to-vehicle communication. The server is configured to switch between the first and second communication modes such that the server performs communication in the first communication mode when a communication load between the server and the plurality of vehicles is lower than a threshold value, and performs communication in the second communication mode when the communication load is higher than the threshold value.

According to the present disclosure, in the system configured to perform communication between the plurality of vehicles and the server, the communication mode can be switched between the first communication mode and the second communication mode. In the first communication mode, communication is performed individually between each vehicle and the server. In the second communication mode, communication is distributed and performed between the server and only a part of the vehicles and the information is shared among the vehicles by using vehicle-to-vehicle communication. In the first communication mode, the information can be obtained in real time. However, a load on the server side increases when the number of vehicles with which the server communicates increases. By appropriately switching between the two communication modes, an increase in communication load on the server can be suppressed and appropriate communication can be performed.

The server performs communication in the first communication mode when a

representative vehicle transmits the information from the server to the other vehicles in the area by vehicle-to-vehicle communication, and transmits the information shared among the vehicles in the area to the server.

The information from the server is transmitted to each vehicle via the representative vehicle and the information shared among the vehicles is also transmitted to the server by the representative vehicle. Since the representative vehicle provides comprehensive control of the group of vehicles as described above, an increase in communication load between the vehicles and the server can be suppressed and appropriate communication can be performed.

A server according to still another aspect of the present disclosure is configured to communicate with a plurality of vehicles. The server communicates with the plurality of vehicles by using either a first communication mode or a second communication mode. The first communication mode is a communication mode in which the server receives and transmits information to and from each of the plurality of vehicles individually. The second communication mode is a communication mode in which the server receives and transmits the information to and from a part of the plurality of vehicles and the information is shared among the plurality of vehicles by using vehicle-to-vehicle communication. The server is configured to switch between the first and second communication modes such that the server performs communication in the first communication mode when a communication load between the server and the plurality of vehicles is lower than a threshold value, and performs communication in the second communication mode when the communication load is higher than the threshold value.

The foregoing and other objects, features, aspects and advantages of the present disclosure will become more apparent from the following detailed description of the present disclosure when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram of an overall configuration of a vehicle information communication system (environment improvement system) according to the present embodiment.

Fig. 2 is a block diagram for illustrating details of a vehicle and a server in Fig. 1.

Fig. 3 is a diagram for illustrating an overview of communication in a first communication mode.

CLAIMS:

1. A vehicle information communication system comprising:
a plurality of vehicles; and
a server configured to communicate with the plurality of vehicles by using either a first communication mode or a second communication mode,
the first communication mode being a communication mode in which the server receives and transmits information to and from each of the plurality of vehicles individually,
the second communication mode being a communication mode in which the server receives and transmits the information to and from a part of the plurality of vehicles and the information is shared among the plurality of vehicles by using vehicle-to-vehicle communication,
the server being configured to switch between the first and second communication modes such that the server performs communication in the first communication mode when a communication load between the server and the plurality of vehicles is lower than a threshold value, and performs communication in the second communication mode when the communication load is higher than the threshold value.
2. The vehicle information communication system according to claim 1, wherein in the second communication mode, the plurality of vehicles share the information by using blockchain authentication.
3. An environment improvement system comprising:
the vehicle information communication system according to claim 1 or 2; and
a sensor configured to detect a state of pollution by an environmental pollutant, wherein
an environment improvement device configured to remove the environmental pollutant is mounted on each of the plurality of vehicles, and
when a pollution level by the environmental pollutant exceeds a reference value in an area where the sensor is located, the server being configured to cause a vehicle selected from the plurality of vehicles to move to the area, and configured to output a command to execute an environment improvement operation using the environment improvement

device.

4. The environment improvement system according to claim 3, wherein the server is configured to perform communication in the first communication mode when the number of vehicles selected to execute the environment improvement operation is smaller than the reference number, and perform communication in the second communication mode when the number is larger than the reference number.

5. The environment improvement system according to claim 3 or 4, wherein the sensor is provided in each of the plurality of vehicles.

6. The environment improvement system according to claim 5, wherein the server is configured to calculate the pollution level for each predetermined area, using position information of the plurality of vehicles and information about the state of pollution detected by the sensor.

7. The environment improvement system according to claim 6, wherein when the server performs communication in the second communication mode, the server is configured to determine, for each area, a representative vehicle for communicating with the server, and
during communication in the second communication mode, the representative vehicle transmits the information from the server to the other vehicles in the area by vehicle-to-vehicle communication, and transmits the information shared among the vehicles in the area to the server.

8. A server configured to communicate with a plurality of vehicles,
the server being configured to communicate with the plurality of vehicles by using either a first communication mode or a second communication mode,
the first communication mode being a communication mode in which the server receives and transmits information to and from each of the plurality of vehicles individually,
the second communication mode being a communication mode in which the

server receives and transmits the information to and from a part of the plurality of vehicles and the information is shared among the plurality of vehicles by using vehicle-to-vehicle communication,

the server being configured to switch between the first and second communication modes such that the server performs communication in the first communication mode when a communication load between the server and the plurality of vehicles is lower than a threshold value, and performs communication in the second communication mode when the communication load is higher than the threshold value.