In other words, the value of the position counter functions as position identification information D_2 that can identify the position of the information display device 200.

[0094]

The display data switching part 204 switches information displayed on the display part 101, based on the position identified by the control part 205.

[0095]

Fig. 8 is a flowchart showing data transmission and reception control of the information display device 200.

In the flowchart shown in Fig. 8, the same processes as those in the flowchart of the first embodiment shown in Fig. 7 are indicated by the same reference characters.

The processes of the step S10 to the step S13 in Fig. 8 are similar to those of the step S10 to the step S13 in Fig. 7. However, after the step S13, the processing proceeds to the process of the step S20. Description of the steps S10 - S13 is replaced by the description in the first embodiment.

[0096]

In the step S20, the control part 205 checks whether the received data D_0 includes the position counter D_2.

[0097]

In the case where the position counter D_2 is included, the processing proceeds to the step S21. In Fig. 8, "YES" is selected in the step S20. In the case where the position counter D_2 is not included, the processing proceeds to the step S22. In Fig. 8, "NO" is selected in the step S20.

[0098]

information, is also included in the destinations of the connection information 120.

[0267]

Then, after completion of transmission of the data D_0, the installation position estimating part 308 returns to the reception standby state (S40).

[0268]

In this way, the information display devices 300 can acquire a graph from the connection information 120 of the connection in the train 900. By this graph, the information display devices 300 can specify the connection state of the information display devices 300 in the train 900.

[0269]

Based on the specified connection state, it is possible to specify the installation position of each information display device 300 by applying in turn each device to a place in the arrangement of the information display devices 300. Here, the arrangement is specified by the arrangement information stored in the data accumulation part 102. In other words, by applying the graph acquired from the connection information 120 to the arrangement information of the information display devices 300, the installation positions of the information display devices 300 can be specified. The same arrangement information is accumulated in the data accumulation part 102a through the data accumulation part 102l.

[0270]

However, depending on the pattern of the arrangement or the like of the information display devices 300, sometimes it is possible to consider a plurality of combinations of the arranged devices.

as a Global Positioning System (GPS) receiver, a door opening/closing detection sensor, or a camera can be considered, for example.

[0274]

For example, when acceleration in the left direction seen from a viewpoint facing the display part 101 is detected by using an acceleration sensor at the time of departure of the train 900, it is possible to determine that the information display device 300 is installed on the right side of the vehicle 901. Further, when acceleration in the right direction seen from a viewpoint facing the display part 101 is detected, it is found that the information display device 300 is installed on the left side of the vehicle 901.

[0275]

Except at the time of coupling or decoupling, at least during operation of the train 900, the installation positions of the information display devices 300 do not change. Accordingly, it is sufficient that communication for detecting the positions of the information display devices 300 is performed once before the start of the operation of the train 900. Thus, the information display devices 300 can perform communication for detecting the positions in a state that an obstacle such as a passenger or luggage does not exist.

[0276]

Here, "coupling" means increasing of connected vehicles of a train. Thus, more vehicles are connected in a train on the way or incidentally. On the other hand, "decoupling" means decreasing of the number of vehicles in a time zone of a few passengers such as the daytime on weekdays, to decrease transportation capacity

switching part 304; a control part 305; a plurality of optical communication parts 106; an installation position presumption part 508; and a storage part 317. The storage part 317 has a data accumulation part 102; a data storage part 103; and an identifier storage part 307. The installation position presumption part 508 functions as a communication control part. A plurality of information display devices 500 are installed in a vehicle.

[0309]

In the information display device 500 of the fifth embodiment, the display parts 101, the data accumulation part 102, the data storage part 103, the display data switching part 304, the control part 305, the optical communication parts 106, and the identifier storage part 307 are similar to those in the information display device 300 of the third embodiment. Description of the components similar to those in the third embodiment is replaced by the description in the third embodiment. In the following, the installation position presumption part 508, which is different from that in the information display device 300 of the third embodiment, will be described.

[0310]

In the third and the fourth embodiments described above, examples have been shown in which communication between the different vehicles 901a and 901b is not particularly differentiated from communication within the same vehicle 901. Alternatively, description has been given assuming that the information display devices 300, 400 can recognize the optical communication parts 106 used for communication between the different vehicles 901a and 901b.

[0311]

However, it is convenient if the information display device

Claims

1. An information display device included in a plurality of information display devices for transmitting and receiving data to and from one another, the plurality of information display device being installed in a vehicle, comprising:

a display part that displays information;

a plurality of optical communication parts that perform transmission and reception of the data including the information to be displayed on the display part by wireless using light;

a storage part that stores arrangement information indicating arrangement positions of the plurality of information display devices; and

a control part; wherein,

the data include connection information of the plurality of information display devices;

in a case where the optical communication part receives the connection information of another information display device, the optical communication part transmits the connection information of its own information display device and the connection information of the another information display device;

the control part that generates graph information indicating state of connection between the plurality of information display devices and presumes installation position of its own information display device by use of the graph information and the arrangement information, the state of connection being specified based on the connection information.

2. The information display device according to claim 1, wherein the connection information includes an individual identifier for identifying its own information display device, a

direction of an optical communication part that has been used for transmission of the data, a connection destination of the optical communication part that has been used for transmission of the data, or a type identifier for identifying a type of its own information display device.

3. The information display device according to claim 1 or 2, wherein:

the plurality of optical communication parts include a first optical communication part directed in a first direction and a second optical communication part directed in a different direction from the first direction; and

the data received by the first optical communication part is transmitted from the second optical communication part.

4. The information display device according to any one of claims 1 to 3, wherein: the display part displays the information corresponding to the vehicle in which its own information display device being installed or a position in the vehicle in which its own information display device being installed.

5. The information display device according to any one of claim 1 to 4, wherein:

the optical communication part identifies a source of light that includes the data; and

based on an incident direction of the light, whether the source is in the vehicle or in a different vehicle is determined.

6. The information display device according to any one of claims 1 to 5, wherein:

the optical communication part have an effective angle satisfying a following equation (1):

[Equation 1]

$$Optical\ communication\ effective\ angle > 4 \times \tan^{-1} \frac{Vehicle\ length \div 2}{Minimum\ curvature\ radius} \quad (1)$$

.

7. The information display device according to any one of claims 1 to 6, wherein:

the control part acquires, with use of a sensor, information on the installation position on right and left sides of the vehicle or information on a positional relationship with devices in another vehicle, to presume the installation position of its own information display device.