

DESCRIPTION

ON-BOARD UNIT

Technical Field

[0001]

The present invention relates to an on-board unit. The present invention, especially, relates to the on-board unit which receives an information service.

Background Art

[0002]

In a field of ITS (Intelligent Transport Systems), WAVE (Wireless Access in Vehicular Environments) communication standard is known as a standard of communication systems used, in common, for various services including road pricing (see Patent Literature 1). An on-board unit based on the WAVE communication standard performs communications between road and vehicle or between vehicle and vehicle. As an example of the road-vehicle communications, the road pricing is exemplified. As an example of the vehicle-vehicle communications, informing emergency vehicle's approaching is exemplified.

[0003]

Fig. 1 is a conceptual diagram for explaining the WAVE communications. In the WAVE communications, in order to achieve different types of services in accordance with various purposes, communication frequency band used is time-divided into a plurality of communication channels (time slots). The time slots are divided into control channels and service channels. The control channels are shared by all of the communication appliances (terminals). In each of

the control channels, a service provided in a next service channel is designated, and communications are established. In each of the service channels, sending and receiving information correlated with the designated service are performed.

[0004]

In the example shown in Fig. 1, the on-board unit performs wireless communications with a communication device A installed on the road and performs wireless communications with a communication device B installed on the road. The communication device A provides a service A, and the communication device B provides a service B. At first, in the control channel, the on-board unit performs a broadcast to the communication device A and the communication device B, and requests communications for the service A. In the subsequent service channel, the communication device A for providing the service A responds, and transmits data for the service A to the on-board unit. In the next control channel, the on-board unit performs a broadcast to the communication device A and the communication device B, and requests communications for the service B. In the subsequent service channel, the communication device B for providing the service B responds, and transmits data for the service B to the on-board unit. Thus, by repeating the control channel and the service channel alternately, different information services are realized in parallel in a time-divided manner.

[0005]

Patent Literature 2 discloses the on-board unit based on short-range communications (DSRC: Dedicated Short Range Communications). This on-board unit includes a DSRC part, a car navigation part, and an

information processor. The DSRC part communicates with a DSRC base station. The car navigation part notifies a driver, by at least one of "voice" or "display", provided information from the DSRC base station to the car. The information processor is connected with both the DSRC part and the car navigation part. This information processor receives, from the car navigation part, a plurality of data used in execution of the service between the DSRC base station and the car, and stores them.

[0006]

Patent Literature 3 discloses a router device that is capable of transmitting and receiving multimedia data including different types of data such as image and voice without impairing synchrony property and real-time property.

Citation List

[Patent Literature]

[0007]

Patent Literature 1: JP 2010-239607 A

Patent Literature 2: JP 2009-251950 A

Patent Literature 3: JP 2005-033583 A

Summary of the Invention

[0008]

As mentioned above, there is a communication method for providing information services to the on-board unit. However, it is expected that types of information services received by the on-board unit continues to increase in the future.

[0009]

An object of the present invention is to provide a technique with which it is possible to

provide, at low cost, the on-board unit that receives such various information services.

[0010]

In one aspect of the present invention, the on-board unit is provided. The on-board unit includes an information service data communication unit, a control unit, and a forwarding communication unit. The information service data communication unit receives information service data correlated with an information service from outside of a vehicle. The control unit determines, from among information devices in the vehicle, a forwarding target device to which the received information service data is to be forwarded. The forwarding communication unit forwards the received information service data to the forwarding target device.

[0011]

The on-board unit may further include a forwarding target device database indicating forwarding target device candidates, which are candidates for the forwarding target device. In this case, the control unit determines the forwarding target device from among the forwarding target device candidates indicated by the forwarding target device database.

[0012]

The forwarding communication unit may detect a radio wave transmitted from each of the information devices. The control unit may register, in the forwarding target device database, the information device which has transmitted the radio wave to be detected by the on-board unit as one of the forwarding target device candidates.

[0013]

The forwarding target device database may indicate a correspondence between an attribute of the information service and one of the forwarding target device candidates. In this case, the information service data includes attribute information indicating the attribute. The control unit recognizes the attribute indicated by the attribute information that is included in the received information service data. Further, the control unit determines the one of the forwarding target device candidates corresponding to the recognized attribute as the forwarding target device by referring to the forwarding target device database.

[0014]

Alternatively, the control unit may make display the forwarding target device candidates indicated by the forwarding target device database on a display, and determine, from among the displayed forwarding target device candidates, one candidate designated by a user as the forwarding target device.

[0015]

According to the present invention, it is not necessary to mount all functions corresponding to the respective information service data on the on-board unit itself, and a configuration for receiving information services can be simplified. Therefore, it is possible to provide the on-board unit that receives various information services at low cost.

Brief Description of the Drawings

[0016]

Fig. 1 is the conceptual diagram for explaining the WAVE communications.

Fig. 2 is a conceptual diagram for explaining outline of some embodiments of the present invention.

Fig. 3 is a block diagram for indicating a configuration of an on-board unit and information devices according to some embodiments of the present invention.

Fig. 4 is a conceptual diagram for indicating an example of a forwarding target device database according to some embodiments of the present invention.

Fig. 5 is a flowchart for illustrating a process according to some embodiments of the present invention.

Fig. 6 is a flowchart for illustrating a first example of step S40 of the process according to some embodiments of the present invention.

Fig. 7 is a conceptual diagram for indicating another example of the forwarding target device database according to some embodiments of the present invention.

Fig. 8 is a flowchart for illustrating a second example of step S40 of the process according to some embodiments of the present invention.

Description of Embodiments

[0017]

With reference to the accompanying drawings, an on-board unit according to some embodiments of the present invention will be explained.

[0018]

(Overview)

Fig. 2 is the conceptual diagram for explaining the outline of some embodiments of the present

invention. An on-board unit according to the present embodiment receives various information services. For example, the on-board unit according to the present embodiment corresponds to the WAVE communication standard, and receives a variety of data correlated with information services via the WAVE communications (see Fig. 1). Data correlated with such information services are hereinafter referred to as "information service data". As the information service data, advertising information, music distribution information, data for business, etc. are exemplified.

[0019]

Here, a situation in which various information devices in addition to the on-board unit are present in the vehicle is considered. As information devices (Typically, a portable information devices) other than the on-board unit, a mobile phone, a portable music player, a personal computer, etc. are exemplified. In such a situation, the on-board unit according to the present embodiment forwards the information service data received from outside of a vehicle to suitable one of the other information devices in the vehicle. That is, the on-board unit according to the present embodiment functions as "repeater" which relays the information service data.

[0020]

As an example, a case in which the on-board unit receives, as the information service data, the advertising information, the music distribution information, and the data for business is considered. In this case, the on-board unit forwards the received advertising information to the mobile phone, forwards the received music distribution information to the portable music player, and forwards the received data

for business to the personal computer. Thus, a user can refer to the advertising information using the mobile phone. The user can also enjoy the distributed music using the portable music player. Further, the user can process the data for business using the personal computer.

[0021]

Thus, the on-board unit according to the present embodiment has a function of forwarding the received information service data from the outside of the vehicle to the suitable one of the other information devices in the vehicle. Therefore, it is not necessary to mount all functions corresponding to the respective information service data on the on-board unit itself. If each of the advertising information, the music distribution information, and the data for business is to be processed only by the on-board unit, it is necessary to install, in the on-board unit, dedicated functions corresponding to them in a one-by-one manner. As a result, a configuration becomes more complicated, and costs of production are increased. On the other hand, according to the present embodiment, such a problem can be solved. That is, according to the present embodiment, it is possible to provide the on-board unit for receiving the various information services at low cost. The on-board unit according to the present embodiment is useful especially in the future because the types of information services will be increased in the future.

[0022]

(Configuration)

FIG. 3 is the block diagram for indicating the configuration of the on-board unit 1 and the information devices 100 according to the present

embodiment. The on-board unit 1 includes a control unit 10, a storage unit 20, a display unit 30, an input unit 40, an information service data communication unit 50, and a forwarding communication unit 60.

[0023]

As the control unit 10, a CPU or a microcomputer is exemplified. The control unit 10 executes a control program to perform various types of arithmetic processing and control each unit. In addition, as will be described later in detail, the control unit 10 has a function of determining, among the information devices 100 in the vehicle, a forwarding target device to which received information service data DAT is to be forwarded.

[0024]

As the storage unit 20, RAM or HDD is exemplified. The storage unit 20 stores the control program executed by the control unit 10, and various types of data such as map data. In addition, the storage unit 20 stores a forwarding target device database 25 indicating forwarding target device candidates for the information service data DAT.

[0025]

Fig. 4 conceptually indicates an example of the forwarding target device database 25. As shown in Fig. 4, the forwarding target device database 25 indicates the forwarding target device candidates for the information service data DAT in a list format. Note that the forwarding target device candidates are the information devices 100 in the vehicle such as the mobile phone, the portable music player, and the personal computer. These forwarding target device

candidates are automatically detected by communications with the on-board unit 1, or are registered by the user.

[0026]

As the display unit 30, a liquid crystal display unit or a touch panel is exemplified. The display unit 30 displays various types of information such as a map, a position of the vehicle, and a message.

[0027]

As the input unit 40, a touch panel is exemplified. The input unit 40 receives data input by the user.

[0028]

The information service data communication unit 50 performs wireless communications with an information service provider outside the vehicle. As the information service provider, another vehicle or an information service base station is exemplified. The information service data communication unit 50 complies with, for example, the WAVE communication standard, and communicates with each of a plurality of the information service providers via the WAVE communications. More particularly, the information service data communication unit 50 includes a transmitter 51 and a receiver 52. The transmitter 51 receives data (e.g., service request data) from the control unit 10 and transmits the data to the information service provider. On the other hand, the receiver 52 receives the information service data DAT from the information service provider and transmits the received information service data DAT to the control unit 10.

[0029]

The forwarding communication unit 60 performs wireless communications with the information device 100 in the vehicle. More particularly, the forwarding communication unit 60 includes a receiver 61 and a transmitter 62. The receiver 61 receives necessary data from the information device 100, and transmits the received data to the control unit 10. In addition, the receiver 61 has a function of detecting a radio wave and detects the radio wave transmitted from the information device 100 in the vehicle. Further, the receiver 61 receives identification information from the information device 100 from which the radio wave is detected, and transmits the identification information to the control unit 10. On the other hand, the transmitter 62 receives, from the control unit 10, the information service data DAT and forwarding target device information correlated with the forwarding target device for the information service data. Then, the transmitter 62 transmits (forwards) the information service data DAT to the information device 100 as the designated forwarding target device.

[0030]

As the information device 100, the mobile phone, the portable music player, the personal computer, etc. are exemplified. The information device 100 has a function of performing wireless communications with the on-board unit 1. More particularly, the information device 100 includes a transmitter 101 and a receiver 102. The transmitter 101 transmits the necessary data to the on-board unit 1. The transmitter 101 has a function of transmitting the radio wave. On the other hand, the receiver 102 receives the information service data DAT from the on-

board unit 1. The information device 100 performs processing in accordance with the received information service data DAT.

[0031]

(Processing Flow)

Fig. 5 is the flowchart for illustrating the process according to the present embodiment. With reference to Figs. 3 to 5, processing flow according to the present embodiment will be explained.

[0032]

Step S10, S110

The user turns on the on-board unit 1 and the necessary information device 100. For example, N information devices 100-1 to 100-N (N is an integer greater than or equal to 1) are turned on. Each of the information devices 100-1 to 100-N notifies the on-board unit 1 that "the respective information device itself is available as a forwarding target device". The on-board unit 1 recognizes that "the information devices 100-1 to 100-N are available as the forwarding target devices".

[0033]

More particularly, the on-board unit 1 is turned ON, and a radio wave detection function of the receiver 61 of the forwarding communication unit 60 is enabled. The information devices 100-1 to 100-N are turned ON, and a radio wave transmitting function of the transmitter 101 of each of them is enabled. The transmitter 101 of each information device 100 transmits the radio wave using the radio wave transmitting function. It corresponds to notifying the on-board unit 1 from each information device 100 that "the respective information device itself is

available as the forwarding target device". The receiver 61 of the on-board unit 1 detects the radio wave transmitted from each of the information devices 100-1 to 100-N using the radio wave detection function. It corresponds to being recognized by the on-board unit 1 that "the information devices 100-1 to 100-N are available as the forwarding target devices". Thus, the on-board unit 1 automatically detects the information devices 100-1 to 100-N as the forwarding target device candidates using the radio wave detection function.

[0034]

Step S20

The receiver 61 of the on-board unit 1 receives the identification information from each of the information devices 100-1 to 100-N from which the radio waves are detected, and transmits the identification information to the control unit 10. The control unit 10 registers, in the forwarding target device database 25, the detected information devices 100-1 to 100-N as the forwarding target device candidates based on the identification information. Alternatively, the registration of the forwarding target device candidates in the forwarding target device database 25 may be performed manually by the user.

[0035]

Step S30

The receiver 52 of the information service data communication unit 50 of the on-board unit 1 receives the information service data DAT from the information service provider outside the vehicle. The receiver 52 transmits the received information service data DAT to the control unit 10.

[0036]

Step S40

The control unit 10 receives the information service data DAT from the information service data communication unit 50. The control unit 10 determines, from among the information devices 100-1 to 100-N, the forwarding target device for the received information service data DAT. In this case, the control unit 10 determines the forwarding target device from among the forwarding target device candidates indicated by the forwarding target device database 25 based on the forwarding target device database 25. The processing of this step S40 will be described later in detail.

[0037]

Step S50

The control unit 10 transmits, to the forwarding communication unit 60, the information service data DAT and forwarding target device information which designates the forwarding target device determined in step S40. As the forwarding target device information, the identification information about the information device 100 determined as the forwarding target device is exemplified. The transmitter 62 of the forwarding communication unit 60 transmits (forwards) the information service data DAT to the information device 100, which is the forwarding target device designated by the forwarding target device information.

[0038]

Step S120

The receiver 102 of the information device 100 as the forwarding target device receives the information service data DAT from the on-board unit 1.

[0039]

Step S130

The information device 100 as the forwarding target device performs processing in accordance with the received information service data DAT. For example, when the advertising information is forwarded to the mobile phone, the user can refer to the advertising information using the mobile phone. For example, when the music distribution information is forwarded to the portable music player, the user can enjoy the distributed music using the portable music player. For example, when the data for business is forwarded to the personal computer, the user can process the data for business using the personal computer.

[0040]

(Determination Method for Forwarding Target Device
(step S40))

(1) First Example

FIG. 6 is the flowchart for illustrating the first example of step S40.

[0041]

Step S41A

When the control unit 10 receives the information service data DAT, it reads contents of the forwarding target device database 25. Then, the control unit 10 makes display the forwarding target device candidates indicated by the forwarding target device database 25 (see Fig. 4) on the display unit 30.

[0042]

Step S42A

The user designates a desirable forwarding target device from among the forwarding target device candidates displayed on the display unit 30 using the input unit 40.

[0043]

Step S43A

The control unit 10 determines one of the forwarding target device candidates designated by the user as the forwarding target device. Thus, the control unit 10 determines the forwarding target device from among the forwarding target device candidates indicated by the forwarding target device database 25 based on the forwarding target device database 25.

[0044]

(2) Second Example

In the first example mentioned above, every time when the information service data DAT is received, the user must designate the forwarding target device. Therefore, in this case, the operation becomes complicated. In addition, there is a possibility that the user's operation during driving leads to accidents. Therefore, in the second example, a method in which it is possible to determine the forwarding target device without requiring the designation by the user is proposed.

[0045]

Fig. 7 is the conceptual diagram for indicating another example of the forwarding target device database 25 according to the second example. This forwarding target device database 25 indicates a correspondence between the "attribute of information service" and "forwarding target device candidate". As

the attribute of the information service, "advertisement", "music", "video", "traffic", "no attribute (undefined)", etc. are exemplified. The correspondence between this "attribute of information service" and the "forwarding target device candidate" can be registered by, for example, the user using the input unit 40 in step S20.

[0046]

Further, in this example, the information service data DAT includes attribute information indicating the attribute. That is, the information service provider transmits the information service data DAT including the attribute information.

[0047]

Fig. 8 is the flowchart for illustrating the second example of step S40.

[0048]

Step S41B

When the control unit 10 receives the information service data DAT, it extracts the attribute information included in the received information service data DAT. Thereby, the control unit 10 recognizes the attribute of the received information service data DAT.

[0049]

Step S42B

Subsequently, the control unit 10 reads the forwarding target device candidate corresponding to the attribute recognized in step S41B by referring to the forwarding target device database 25. Then, the control unit 10 determines the forwarding target device candidate as the forwarding target device for

the information service data DAT. Thus, the control unit 10 determines, based on the forwarding target device database 25, the forwarding target device from among the forwarding target device candidates indicated by the forwarding target device database 25.

[0050]

In the example shown in Fig. 7, when the on-board unit 1 receives the advertising information (for example, the nearest store information) as the information service data DAT, it automatically forwards the advertising information to the mobile phone. Similarly, when the on-board unit 1 receives the music data as the information service data DAT, it automatically forwards the music data to the portable music player.

[0051]

Thus, according to the second example, the control unit 10 automatically determines the forwarding target device for the information service data DAT. It is not necessary for the user to designate the forwarding target device every time when the information service data DAT is received. Thus, the operation is simplified. Further, since the user's operation during driving is not required, safety is improved.

[0052]

(Effect)

As described above, the on-board unit 1 according to the present embodiment has the function of forwarding the information service data DAT received from the outside of the vehicle to the suitable information device among the other information devices 100 in the vehicle. Therefore, it

is not necessary to install all of the functions corresponding to the respective information service data DAT in the on-board unit 1 itself. If each of the advertising information, the music distribution information, and the data for business is to be processed only by the on-board unit 1, it is necessary to install, in the on-board unit 1, the dedicated functions corresponding to them in a one-by-one manner. As a result, the configuration becomes more complicated, and the costs of production are increased. On the other hand, according to the present embodiment, such a problem can be solved. That is, according to the present embodiment, it is possible to provide the on-board unit 1 for receiving the various information services at low cost. The on-board unit 1 according to the present embodiment is useful especially in the future because the types of information services will be increased in the future.

[0053]

Further, according to the present embodiment, the on-board unit 1 automatically detects the information device 100 in the vehicle as the forwarding target device candidate using the radio wave detection function. Since there are a huge number of products of information devices 100 and the information devices used are deferent depending on the user, it is difficult to install the forwarding target device candidates in the on-board unit 1 in advance. On the other hand, according to the present embodiment, since the on-board unit 1 automatically detects the information device 100 in the vehicle as the forwarding target device candidate, flexible management can be performed depending on the variations of the information devices 100.

[0054]

Furthermore, even if information service based on a new technology is added, it is not necessary to exchange the on-board unit 1 itself by preparing an information device 100 corresponding to the new technology. As an example, a case in which the information service for displaying three-dimensional video is newly started is considered. Even in this case, it is not necessary to wait for sales start of a new on-board unit that corresponds to the three-dimensional video or replace the on-board unit by such a new on-board unit. The user can view the three-dimensional video by forwarding the information service data DAT to a personal computer corresponding to the three-dimensional video.

[0055]

As mentioned above, some embodiments of the present invention have been described with reference to the accompanying drawings. However, the present invention is not limited to the above-mentioned embodiments and can be modified without departing from the spirit or scope of the general inventive concept of the present invention.

[0056]

This application claims a priority based on Japan Patent Application No. JP 2013-013664, the disclosure of which is hereby incorporated by reference herein in its entirety.

CLAIMS

1. An on-board unit comprising:
 - an information service data communication unit configured to receive information service data correlated with an information service from outside of a vehicle;
 - a control unit configured to determine, from among information devices in the vehicle, a forwarding target device to which the received information service data is to be forwarded; and
 - a forwarding communication unit configured to forward the received information service data to the forwarding target device.
2. The on-board unit according to claim 1, further comprising:
 - a forwarding target device database configured to indicate forwarding target device candidates which are candidates for the forwarding target device,
 - wherein the control unit is configured to determine the forwarding target device from among the forwarding target device candidates indicated by the forwarding target device database.
3. The on-board unit according to claim 2, wherein the forwarding communication unit is configured to detect a radio wave transmitted from each of the information devices, and
 - wherein the control unit is configured to register, in the forwarding target device database, an information device which has transmitted the radio wave to be detected as one of the forwarding target device candidates.
4. The on-board unit according to claim 2 or 3,

wherein the forwarding target device database is configured to indicate a correspondence between an attribute of the information service and one of the forwarding target device candidates,

wherein the information service data includes attribute information indicating the attribute, and

wherein the control unit is configured to recognize the attribute indicated by the attribute information that is included in the received information service data, and determine the one of the forwarding target device candidates corresponding to the recognized attribute as the forwarding target device by referring to the forwarding target device database.

5. The on-board unit according to claim 2 or 3, wherein the control unit is configured to make display the forwarding target device candidates indicated by the forwarding target device database on a display, and determine, from among the displayed forwarding target device candidates, one candidate designated by a user as the forwarding target device.

6. A communication method for an on-board unit comprising:

receiving information service data correlated with an information service from outside of a vehicle;

determining, from among information devices in the vehicle, a forwarding target device to which the received information service data is to be forwarded; and

forwarding the received information service data to the determined forwarding target device.