

DESCRIPTION

PARK AND RIDE DETECTION SYSTEM

5

TECHNICAL FIELD

[0001]

The present invention relates to a park-and-ride detection system, a park-and-ride detection device, a control method, and a program. In particular, the present invention relates to a park-and-ride detection system for detecting use of
10 park-and-ride, a park-and-ride detection device, a control method of controlling the park-and-ride detection device, and a program for use in the park-and-ride detection device.

Priority is claimed on Japanese Patent Application No. 2011-288686, filed December 28, 2011, the content of which is incorporated herein by reference.

15

BACKGROUND ART

[0002]

In recent years, a movement method called park-and-ride has been recommended in order to mitigate traffic congestion in urban areas, tourist areas, etc.
20 Park-and-ride is a movement method of going to a destination by parking a means of personal transportation such as an automobile, a motorized two-wheeled vehicle, a light vehicle or the like in a parking lot installed in a place to get in or out of a suburban public transportation facility and then riding in the public transportation facility such as a railway or a fixed route bus.

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[0003]

A provider of a parking lot, a public transportation facility, or the like provides various services so as to promote the use of the park-and-ride (for example, see Non-Patent Literature 1 and Patent Literature 1). According to the service disclosed in Non-Patent Literature 1, the user parks in a parking lot of a service target of the
5 park-and-ride when receiving a service. Then, the user moves by train using an integrated circuit (IC) card. Then, after returning by train, the user pays a fee of the parking lot using the IC card used while riding the train. In this case, according to the service disclosed in Non-Patent Literature 1, a deboarding history of the train is checked and preferential treatment for a parking fee is given.

10 [0004]

On the other hand, in Patent Literature 1, a suitable service processing system when an information recording medium is used is disclosed. According to the system disclosed in Patent Literature 1, it is determined whether a use date and time is within a predetermined period from a date of use of a shuttle bus because the use date and time is
15 also stored in a parking lot use history storage unit of a memory in a stored fare (SF) card owned by the user when the SF card is processed in a parking lot processing machine installed at a doorway of the parking lot. Then, if the use of the parking lot is within the predetermined period, the shuttle bus is determined to have been used in spite of the fact that the user could have gone to an urban area using an automobile, and predetermined
20 point information is stored in a point storage unit to assign points. Also, this point assignment is disclosed as being performed when a ride date of the shuttle bus is the same as a use date of the parking lot. Then, the assigned points can be used equivalently to money in payment of a parking fee of a parking lot P or a shop or the like of an urban area or can be used as a ride fee of the shuttle bus or the like, thereby
25 promoting the use of the parking lot or the use of the shuttle bus.

PRIOR ART LITERATURE

[Non-Patent Literature]

[0005]

5 [Non-Patent Literature 1]

“Method of receiving park & ride service | Parking Information,” [online],
Times24 Co. Ltd, [accessed September 28, 2011], Internet,
<<http://www.times-info.net/map/pandr/service.html>>

[Patent Literature]

10 [0006]

[Patent Literature 1]

Japanese Unexamined Patent Application, First Publication No. 2007-183752

DISCLOSURE OF INVENTION

15 PROBLEMS TO BE SOLVED BY THE INVENTION

[0007]

However, in the service disclosed in Non-Patent Literature 1 or the technology
disclosed in Patent Literature 1, preferential treatment is given to a user of the parking lot
and the public transportation facility even when the user is not a true user of the

20 park-and-ride.

[0008]

For example, person A is assumed to have parked in a parking lot in the vicinity
of the home of person B so as to travel to the home of person B. Then, person A and
person B are assumed to have moved to a neighboring town using a public transportation
25 facility to eat dinner after a long time has elapsed. In this case, according to the service

disclosed in Non-Patent Literature 1 or the technology disclosed in Patent Literature 1, preferential treatment is also provided for the park-and-ride that is considered to have been performed if person A uses the same IC card for use in the parking lot and the public transportation facility.

5 [0009]

In addition, for example, person C and person D are assumed to have parked in the vicinity of a company of a client for business negotiation at the company. Then, after the business negotiation with the client has ended, person D is assumed have taken person C by automobile to a place to get in or out of a public transportation facility
10 convenient for returning home. Then, person C is assumed to have used the public transportation facility using the IC card used in the parking lot. In this case, according to the technology disclosed in Patent Literature 1, person C is considered to have performed the park-and-ride and preferential treatment is provided even though the parking lot and the place to get in or out of the public transportation facility are separated
15 inappropriately to perform the park-and-ride.

[0010]

In this manner, in the service disclosed in Non-Patent Literature 1 or the technology disclosed in Patent Literature 1, the park-and-ride may be misused by a person who is not a true user of the park-and-ride. If such users become prevalent, true
20 users of the park-and-ride may not be able to use the parking lot.

MEANS FOR SOLVING THE PROBLEMS

[0011]

In order to solve the above-described problems, according to a first form of the
25 present invention, there is provided a park-and-ride detection system for detecting use of

park-and-ride, the park-and-ride detection system including: a park-and-ride detection device configured to detect the use of the park-and-ride, wherein the park-and-ride detection device includes: a park-and-ride start determination unit configured to determine that the use of the park-and-ride has started if a time from a use start time of a parking lot to a use start time of a public transportation facility for the same user is within an allowed time preset in anticipation of a movement time from the parking lot to a place to get in or out of the public transportation facility.

[0012]

The park-and-ride detection system further includes: a public transportation facility device configured to process information about use of the public transportation facility, the public transportation facility device includes: a public transportation facility data transmission unit configured to transmit public transportation facility data representing at least the place to get in or out of the public transportation facility the use of which has started, the user of the public transmission facility, and the use start time of the public transportation facility to the park-and-ride detection device if the use of the public transportation facility has started, the park-and-ride detection device further includes: a public transportation facility data reception unit configured to receive the public transportation facility data transmitted from the public transportation facility device, and the park-and-ride start determination unit of the park-and-ride detection device determines that the use of the park-and-ride has started if the time from the use start time of the parking lot to the use start time of the public transportation facility represented by the public transportation facility data for the user represented by the public transportation facility data received by the public transportation facility data reception unit is within the allowed time preset in anticipation of the movement time from the parking lot to the place to get in or out of the public transportation facility

represented by the public transportation facility data.

[0013]

The park-and-ride detection system further includes: a parking lot device configured to process information about use of the parking lot, the parking lot device includes: a parking lot use start data transmission unit configured to transmit parking lot use start data representing at least the parking lot the use of which has started, the user of the parking lot, and the use start time of the parking lot to the park-and-ride detection device if the use of the parking lot has started, the park-and-ride detection device further includes: a parking lot use start data reception unit configured to receive the parking lot use start data transmitted from the parking lot device, and the park-and-ride start determination unit of the park-and-ride detection device determines that the use of the park-and-ride has started if the time from the use start time of the parking lot represented by the parking lot use start data to the use start time of the public transportation facility for the user represented by the parking lot use start data received by the parking lot use start data reception unit is within the allowed time preset in anticipation of the movement time from the parking lot represented by the parking lot use start data to the place to get in or out of the public transportation facility.

[0014]

The park-and-ride detection device further includes: a park-and-ride end determination unit configured to determine that the use of the park-and-ride has ended if the use of the parking lot by the user of the park-and-ride has ended.

[0015]

The parking lot device further includes: a parking lot use end data transmission unit configured to transmit parking lot use end data representing at least the user of the parking lot to the park-and-ride detection device if the use of the parking lot has ended,

the park-and-ride detection device further includes: a parking lot use end data reception unit configured to receive the parking lot use end data transmitted from the parking lot device, and the park-and-ride end determination unit of the park-and-ride detection device determines that the use of the park-and-ride by the user of the parking lot represented by the parking lot use end data received by the parking lot use end data reception unit has ended.

[0016]

According to a second form of the present invention, there is provided a park-and-ride detection device for detecting use of park-and-ride, the park-and-ride detection device including: a park-and-ride start determination unit configured to determine that the use of the park-and-ride has started if a time from a use start time of a parking lot to a use start time of a public transportation facility for the same user is within an allowed time preset in anticipation of a movement time from the parking lot to a place to get in or out of the public transportation facility.

[0017]

According to a third form of the present invention, there is provided a control method of controlling a park-and-ride detection device for detecting use of park-and-ride, the control method including: a park-and-ride start determination step of determining that the use of the park-and-ride has started if a time from a use start time of a parking lot to a use start time of a public transportation facility for the same user is within an allowed time preset in anticipation of a movement time from the parking lot to a place to get in or out of the public transportation facility.

[0018]

According to a fourth form of the present invention, there is provided a program for use in a park-and-ride detection device for detecting use of park-and-ride for causing

the park-and-ride detection device to function as: a park-and-ride start determination unit configured to determine that the use of the park-and-ride has started if a time from a use start time of a parking lot to a use start time of a public transportation facility for the same user is within an allowed time preset in anticipation of a movement time from the parking lot to a place to get in or out of the public transportation facility.

[0019]

The above outlines of the embodiments according to the present invention do not include all the necessary characteristics of the present invention, and sub-combinations of groups of the characteristics can also be the invention.

EFFECTS OF THE INVENTION

[0020]

As apparent from the above description, according to the present invention, it is possible to detect the true use of park-and-ride.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

Fig. 1 is a diagram illustrating an example of a usage environment of a park-and-ride detection system 100.

Fig. 2 is a diagram illustrating an example of a block configuration of a park-and-ride detection device 110.

Fig. 3 is a diagram illustrating an example of information stored in an allowed time information storage unit 116 in the form of a table.

Fig. 4 is a diagram illustrating an example of information stored in a park-and-ride information storage unit 117 in the form of a table.

Fig. 5 is a diagram illustrating an example of a block configuration of a parking lot device 130a.

Fig. 6 is a diagram illustrating an example of a block configuration of a public transportation facility device 150a.

5 Fig. 7 is a diagram illustrating an example of an operation sequence of the park-and-ride detection device 110, a parking lot device 130, and a public transportation facility device 150.

Fig. 8 is a diagram illustrating an example of an operation sequence of the park-and-ride detection device 110 and the parking lot device 130.

10 Fig. 9 is a diagram illustrating an example of a hardware configuration when the park-and-ride detection device 110, the parking lot device 130, and the public transportation facility device 150 include an electronic information processing device such as a computer.

15 PREFERRED EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0022]

Hereinafter, the present invention will be described through embodiments of the invention. However, the following embodiments are not intended to limit the present invention defined by the claims, and all the combinations of characteristics described in
20 the embodiments are not necessarily required for a solution means of the invention.

[0023]

Fig. 1 is a diagram illustrating an example of a usage environment of a park-and-ride detection system 100. The park-and-ride detection system 100 is a system for detecting the use of park-and-ride.

25 [0024]

The park-and-ride detection system 100 includes a park-and-ride detection device 110, a plurality of parking lot devices 130a, 130b, 130c, ... (hereinafter collectively referred to as a parking lot device 130), and a plurality of public transportation facility devices 150a, 150b, 150c, ... (hereinafter collectively referred to as a public transportation facility device 150).

[0025]

The park-and-ride detection device 110 is a device for detecting the use of park-and-ride. More specifically, the park-and-ride detection device 110 is connected to each parking lot device 130 and each public transportation facility device 150 via a communication circuit N. Here, the communication circuit N includes a computer network such as the Internet, a core network of a communication carrier, and various local networks.

[0026]

The parking lot device 130 is a device for processing information related to the use of the parking lot. More specifically, the parking lot device 130 is provided in a plurality of parking lots Pa, Pb, Pc, ... (hereinafter collectively referred to as a parking lot P). In addition, automatic fare adjustment machines Ea, Eb, Ec, ... (hereinafter collectively referred to as an automatic fare adjustment machine E) are provided in the parking lots Pa, Pb, Pc, ..., respectively. Then, the parking lot device 130 is electrically connected to the automatic fare adjustment machine E provided together in the same parking lot P. Here, the automatic fare adjustment machine E is a machine installed to collect a fee of the parking lot P.

[0027]

The public transportation facility device 150 is a device for processing

information of the use of a railway. More specifically, the public transportation facility device 150 is provided in each of a plurality of railway stations Sa, Sb, Sc, ...

(hereinafter collectively referred to as a railway station S). In addition, automatic ticket machines Ga, Gb, Gc, ... (hereinafter referred to as an automatic ticket machine G) are

5 provided in the railway stations Sa, Sb, Sc, ..., respectively. Then, the public

transportation facility device 150 is electrically connected to the automatic ticket

machine G provided together in the same railway station S. Here, the automatic ticket

machine G is a machine installed in a ticket gate of the railway station S and performs

ticket-related work in place of a human. Also, the railway may be an example of the

10 “public transportation facility” in the present invention. In addition, the railway station

S may be an example of the “place to get in or out” in the present invention.

[0028]

Also, although a configuration in which the park-and-ride detection system 100 includes one park-and-ride detection device 110 will be described to prevent description

15 from being complex in this embodiment, the park-and-ride detection system 100 may

include a plurality of park-and-ride detection devices 110.

[0029]

Fig. 2 illustrates an example of a block configuration of the park-and-ride detection device 110. The park-and-ride detection device 110 includes a parking lot use

20 start data reception unit 111, a public transportation facility data reception unit 112, a

park-and-ride start determination unit 113, a parking lot use end data reception unit 114,

a park-and-ride end determination unit 115, an allowed time information storage unit 116,

and a park-and-ride information storage unit 117. Hereinafter, functions and operations

of the components will be described.

25 [0030]

The parking lot use start data reception unit 111 receives parking lot use start data transmitted from the parking lot device 130. Here, the parking lot use start data is data representing at least a parking lot identifier (ID), a user ID, and a use start time of the parking lot P. The parking lot ID of the parking lot use start data may be an example
5 of information representing “the parking lot the use of which has started” in the present invention. In addition, the user ID of the parking lot use start data may be an example of information representing a “user of the parking lot” in the present invention.

[0031]

The public transportation facility data reception unit 112 receives public
10 transportation facility data transmitted from the public transportation facility device 150. Here, the public transportation facility data is data representing at least a railway station ID, a user ID, and a railway use start time. The railway station ID of the public transportation facility data may be an example of information representing “a place to get in or out of the public transportation facility the use of which has started” in the present
15 invention.

[0032]

The park-and-ride start determination unit 113 determines that the use of the park-and-ride has started when a time from a use start time of the parking lot P to a use start time of a railway for the same user is within an allowed time preset in anticipation
20 of a movement time from the parking lot P to the railway station S. More specifically, the park-and-ride start determination unit 113 determines that the use of the park-and-ride has started when the time from the use start time of the parking lot P to the use start time of the railway represented by public transportation facility data for the user represented by a user ID of the public transportation facility data received by the public
25 transportation facility data reception unit 112 is within the allowed time preset in

anticipation of the movement time from the parking lot P to the railway station S represented by a railway station ID of the public transportation facility data. In addition, the park-and-ride start determination unit 113 determines that the use of the park-and-ride has started when a time from the use start time of the parking lot P represented by parking lot use start data to the use start time of the railway for the user represented by the user ID of the parking lot use start data received by the parking lot use start data reception unit 111 is within the allowed time preset in anticipation of the movement time from the parking lot P represented by the parking lot ID of the parking lot use start data to the railway station S.

10 [0033]

The parking lot use end data reception unit 114 receives parking lot use end data transmitted from the parking lot device 130. Here, the parking lot use end data is data representing at least the user ID. The user ID of the parking lot use end data may be an example of information representing a “user of the parking lot” in the present invention.

15 [0034]

When the use of the parking lot P by the user of the park-and-ride has ended, the park-and-ride end determination unit 115 determines that the use of the park-and-ride has ended. More specifically, the park-and-ride end determination unit 115 determines that the use of the park-and-ride by the user of the parking lot P represented by the user ID of the parking lot use end data received by the parking lot use end data reception unit 114 has ended.

[0035]

Fig. 3 is a diagram illustrating an example of information stored in the allowed time information storage unit 116 in the form of a table. In the allowed time information storage unit 116, information of a parking lot ID, a railway station ID, and an

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allowed time (minutes) are associated and stored.

[0036]

The parking lot ID is an identification code for uniquely identifying each parking lot P among a plurality of parking lots Pa, Pb, Pc, ... The railway station ID is an identification code for uniquely identifying each railway station S among a plurality of railway stations Sa, Sb, Sc, ... The allowed time (minutes) is a time allowed for a time from the use start time of the parking lot P identified by the parking lot ID to the use start time of the railway station S identified by the railway station ID so as to determine that the use of the park-and-ride has started.

10 [0037]

Fig. 4 is a diagram illustrating an example of information stored in the park-and-ride information storage unit 117 in the form of a table. In the park-and-ride information storage unit 117, information of a user ID, a start date and time (year/month/day/hour:minute), and an end date and time (year/month/day/hour:minute) is associated and stored.

15

[0038]

The user ID is an identification code for uniquely identifying each user among a plurality of users of the park-and-ride detection system 100. The start date and time (year/month/day/hour:minute) is a date and time at which the user identified by the user ID started the use of the park-and-ride. The end date and time (year/month/day/hour:minute) is a date and time at which the user identified by the user ID ended the use of the park-and-ride.

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[0039]

Fig. 5 is a diagram illustrating an example of a block configuration of the parking lot device 130a. The parking lot device 130a includes a parking lot use start

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data input reception unit 131a, a parking lot use start data transmission unit 132a, a parking lot use end data input reception unit 133a, and a parking lot use end data transmission unit 134a. Hereinafter, functions and operations of the components will be described.

5 [0040]

In addition, the parking lot devices 130b, 130c, ... other than the parking lot device 130a also include the same components as the parking lot device 130a. In the following description, when a component provided in the parking lot device 130 is distinguished, the component provided in the parking lot device 130 is distinguished by
 10 attaching the same suffix (a, b, c, ...) as in the parking lot device 130 having the component to the reference sign of the component. For example, parking lot use start data input reception units 131a, 131b, and 131c represent the components of the parking lots 130a, 130b, and 130c, respectively.

[0041]

15 In addition, in the following description, a function and operation of a component to which no suffix is attached represent a function and operation of any component to which the same reference sign is attached. For example, the function and operation described in the parking lot use start data input reception unit 131 represent those of the parking lot use start data input reception units 131a, 131b, 131c, ...

20 [0042]

The parking lot use start data input reception unit 131 receives an input of parking lot use start data output from the automatic fare adjustment machine E when the use of the parking lot P has started.

[0043]

25 The parking lot use start data transmission unit 132 transmits the parking lot use

start data to the park-and-ride detection device 110 when the use of the parking lot P has started.

[0044]

The parking lot use end data input reception unit 133 receives an input of
5 parking lot use end data output from the automatic fare adjustment machine E when the use of the parking lot P has ended.

[0045]

The parking lot use end data transmission unit 134 transmits the parking lot use
end data to the park-and-ride detection device 110 when the use of the parking lot P has
10 ended.

[0046]

Fig. 6 is a diagram illustrating an example of a block configuration of a public
transportation facility device 150a. The public transportation facility device 150a
includes a public transportation facility data input reception unit 151a and a public
15 transportation facility data transmission unit 152a. Hereinafter, functions and
operations of the components will be described.

[0047]

In addition, the public transportation facility devices 150b, 150c, ... other than
the public transportation facility device 150a also include the same components as the
20 public transportation facility device 150a. In the following description, when a
component provided in the public transportation facility device 150 is distinguished, the
component provided in the public transportation facility device 150 is distinguished by
attaching the same suffix (a, b, c, ...) as in the public transportation facility device 150
having the component to the reference sign of the component. For example, public
25 transportation facility data input reception units 151a, 151b, and 151c represent the

components of the public transportation facility devices 150a, 150b, and 150c, respectively.

[0048]

In addition, in the following description, a function and operation of a component to which no suffix is attached represent a function and operation of any component to which the same reference sign is attached. For example, the function and operation described in the public transportation facility data input reception unit 151 represent those of the public transportation facility data input reception unit 151a, 151b, 151c, ...

10 [0049]

The public transportation facility data input reception unit 151 receives an input of public transportation facility data output from the automatic ticket machine G when the use of the railway has started.

[0050]

15 The public transportation facility data transmission unit 152 transmits the public transportation facility data to the park-and-ride detection device 110 when the use of the railway has started.

[0051]

Fig. 7 is a diagram illustrating an example of an operation sequence of the park-and-ride detection device 110, the parking lot device 130, and the public transportation facility device 150. This operation sequence represents an operation when the park-and-ride starts. This operation sequence will be described with reference to Figs. 1 to 6 together.

[0052]

25 The user parks in a target parking lot P of the park-and-ride detection system

100 when desiring to receive a service related to the park-and-ride detection system 100 so as to move to a certain destination. In order to use the parking lot P, the user uses an IC card. A user ID is assumed to be recorded on the IC card.

[0053]

5 The user performs an operation indicating that the use of the parking lot P starts using the IC card in the automatic fare adjustment machine E installed in the parking lot P when the use of the parking lot P starts. In this case, the automatic fare adjustment machine E reads the user ID recorded on the IC card. Then, the automatic fare adjustment machine E outputs parking lot use start data representing the read user ID, the
10 parking lot ID of the parking lot P, and the use start time of the parking lot P for the user to the parking lot device 130.

[0054]

 Upon receiving an input of the parking lot use start data output from the automatic fare adjustment machine E (S101), the parking lot use start data input
15 reception unit 131 of the parking lot device 130 sends the parking lot use start data to the parking lot use start data transmission unit 132.

[0055]

 Upon receiving the parking lot use start data sent from the parking lot use start data input reception unit 131, the parking lot device 130 transmits the parking lot use
20 start data to the park-and-ride detection device 110 (S102).

[0056]

 Upon receiving the parking lot use start data transmitted from the parking lot device 130, the parking lot use start data reception unit 111 of the park-and-ride detection device 110 associates information of a user ID, a parking lot ID, and a use start time of
25 the parking lot P represented by the parking lot use start data and stores the associated

information in the park-and-ride information storage unit 117.

[0057]

On the other hand, for example, the user moves on foot from the parking lot P to the railway station S of the railway of a target of the park-and-ride detection system 100.

- 5 Then, the user performs an operation indicating that the use of the railway starts using the IC card in the automatic ticket machine G provided in the railway station S when moving from the railway station S to the destination using the railway. In this case, the automatic ticket machine G reads the user ID recorded on the IC card. Then, the automatic ticket machine G outputs public transportation facility data representing the
- 10 read user ID, the railway station ID of the railway station S, and the use start time of the railway for the user to the public transportation facility device 150.

[0058]

- Upon receiving the input of the public transportation facility data output from the automatic ticket machine G (S103), the public transportation facility data input
- 15 reception unit 151 of the public transportation facility device 150 sends the public transportation facility data to the public transportation facility data transmission unit 152.

[0059]

- Upon receiving the public transportation facility data sent from the public transportation facility data input reception unit 151, the public transportation facility data
- 20 transmission unit 152 of the public transportation facility device 150 transmits the public transportation facility data to the park-and-ride detection device 110 (S104).

[0060]

- Upon receiving the public transportation facility data transmitted from the public transportation facility device 150, the public transportation facility data reception unit
- 25 112 of the park-and-ride detection device 110 sends the public transportation facility data

to the park-and-ride start determination unit 113.

[0061]

Upon receiving the public transportation facility data sent from the public transportation facility data reception unit 112, the park-and-ride start determination unit 113 of the park-and-ride detection device 110 determines whether the use of the park-and-ride has started based on the information represented by the public transportation facility data and the information stored in the allowed time information storage unit 116 and the park-and-ride information storage unit 117 (S105).

[0062]

More specifically, the park-and-ride start determination unit 113 searches for the same user ID as the user ID represented by the public transportation facility data from among the information of the user ID stored in the park-and-ride detection device 110. When there is no corresponding user ID, the park-and-ride start determination unit 113 determines that the use of the park-and-ride has not started.

[0063]

On the other hand, when there is a corresponding user ID, the park-and-ride start determination unit 113 reads information of a parking lot ID and a parking lot use start date and time (year/month/day/hour:minute) stored in association with the corresponding user ID from among the information stored in the park-and-ride information storage unit 117.

[0064]

Then, the park-and-ride start determination unit 113 calculates a time from a parking lot use start date and time (year/month/day/hour:minute) read from the park-and-ride information storage unit 117 to a use start time of the railway represented by the public transportation facility data.

[0065]

Then, the park-and-ride start determination unit 113 reads information of an allowed time (minutes) stored in association with the parking lot ID read from the park-and-ride information storage unit 117 and the railway station ID represented by the public transportation facility data from among information of the allowed time (minutes) stored in the allowed time information storage unit 116.

[0066]

Then, when the above-described calculated time is within the allowed time read from the allowed time information storage unit 116, the park-and-ride start determination unit 113 determines that the use of the park-and-ride has started. On the other hand, when the above-described calculated time is not within the allowed time read from the allowed time information storage unit 116, it is determined that the use of the park-and-ride has not started.

[0067]

Then, the park-and-ride start determination unit 113 associates information of the railway station ID and the railway use start time, which is a start date and time of the park-and-ride, with the user ID of the user starting the use of the park-and-ride, and stores an association result in the park-and-ride information storage unit 117.

[0068]

Fig. 8 illustrates an example of an operation sequence of the park-and-ride detection device 110 and the parking lot device 130. This operation sequence represents an operation when the park-and-ride ends. This operation sequence will be described with reference to Figs. 1 to 7 together.

[0069]

The user performs an operation indicating that the use of the parking lot P ends

using the IC card in the automatic fare adjustment machine E provided in the parking lot P when the use of the parking lot P ends. In this case, the automatic fare adjustment machine E reads the user ID recorded on the IC card. Then, the automatic fare adjustment machine E outputs parking lot use end data representing the read user ID and the use end time of the parking lot P for the user to the parking lot device 130.

[0070]

Upon receiving an input of the parking lot use end data output from the automatic fare adjustment machine E (S201), the parking lot use end data input reception unit 133 of the parking lot device 130 sends the parking lot use end data to the parking lot use end data transmission unit 134.

[0071]

Upon receiving the parking lot use end data sent from the parking lot use end data input reception unit 133, the parking lot use end data transmission unit 134 of the parking lot device 130 transmits the parking lot use end data to the park-and-ride detection device 110 (S202).

[0072]

Upon receiving the parking lot use end data transmitted from the parking lot device 130, the parking lot use end data reception unit 114 of the park-and-ride detection device 110 sends the parking lot use end data to the park-and-ride end determination unit 115.

[0073]

Upon receiving the parking lot use end data sent from the parking lot use end data reception unit 114, the park-and-ride end determination unit 115 of the park-and-ride detection device 110 determines that the use of the park-and-ride by the user represented by the user ID of the parking lot use end data has ended (S203). Then, the

park-and-ride end determination unit 115 associates information of the use end time of the parking lot P represented by the parking lot use end data with the user ID represented by the parking lot use end data, and stores an association result in the park-and-ride information storage unit 117.

5 [0074]

For example, the park-and-ride detection system 100 is executed along with a business model which provides incentives for a user using the park-and-ride, and therefore can be a more attractive system. For example, a provider of the park-and-ride detection system 100 is considered to discount a price of a product purchased by the user or a fee of a service during a period from the start date and time of the park-and-ride to the end date and time using parking lot use start data, public transportation facility data, and parking lot use end data stored in the park-and-ride information storage unit 117, and a user ID and a parking lot ID associated therewith. Alternatively, after the park-and-ride end, an arbitrary service of the provider may be provided based on the use of the park-and-ride.

[0075]

As described above, the park-and-ride detection system 100 can detect the true use of the park-and-ride.

[0076]

20 Fig. 9 illustrates an example of a hardware configuration when the park-and-ride detection device 110, the parking lot device 130, and the public transportation facility device 150 include an electronic information processing device such as a computer. The park-and-ride detection device 110, the parking lot device 130, and the public transportation facility device 150 include a central processing unit (CPU) peripheral unit, an input/output (I/O) unit, and a legacy I/O unit. The CPU peripheral unit includes a

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CPU 802, a random access memory (RAM) 803, a graphic controller 804, and a display device 805 which are connected to each other via a host controller 801. The I/O unit includes a communication interface (I/F) 807, a hard disk drive 808, and a compact disk-read only memory (CD-ROM) drive 809 which are connected to the host controller 801 via an I/O controller 806. The legacy I/O unit includes a ROM 810, a flexible disk (FD) drive 811, and an I/O chip 812 which are connected to the I/O controller 806.

[0077]

The host controller 801 connects the RAM 803, the CPU 802 which accesses the RAM 803 at a high transfer rate, and the graphic controller 804. The CPU 802 operates based on programs stored in the ROM 810 and the RAM 803, and controls all the units. The graphic controller 804 obtains image data generated on a frame buffer provided in the RAM 803 by the CPU 802 and the like, and causes the display device 805 to display the image data. Alternatively, the graphic controller 804 may internally include a frame buffer which stores image data generated by the CPU 802 or the like.

[0078]

The I/O controller 806 connects the host controller 801, the hard disk drive 808 which is a comparatively high-speed I/O device, the communication I/F 807, and the CD-ROM drive 809. The hard disk drive 808 stores programs and data used by the CPU 802. The communication I/F 807 connects to a network communication device 891 to transmit and receive programs and data. The CD-ROM drive 809 reads programs and data from a CD-ROM 892, and provides the programs and data to the hard disk drive 808 and the communication I/F 807 via the RAM 803.

[0079]

The ROM 810 and comparatively low-speed I/O devices, namely the FD drive 811 and the I/O chip 812, are connected to the I/O controller 806. The ROM 810 stores

a boot program to be executed when the park-and-ride detection device 110, the parking lot device 130, and the public transportation facility device 150 are activated or programs and the like depending on the hardware of the park-and-ride detection device 110, the parking lot device 130, and the public transportation facility device 150. The FD drive 811 reads programs and data from an FD 893, and provides the programs and data to the hard disk drive 808 and the communication I/F 807 via the RAM 803. The I/O chip 812 connects various types of I/O devices via the FD drive 811, or via a parallel port, a serial port, a keyboard port, a mouse port, etc.

[0080]

10 The programs to be executed by the CPU 802 are stored in the FD 893, the CD-ROM 892, or a recording medium such as an IC card, and are provided by a user. A program stored in the recording medium can be compressed or uncompressed. The program is installed from the recording medium to the hard disk drive 808, read by the RAM 803, and executed by the CPU 802. The program executed by the CPU 802

15 causes the park-and-ride detection device 110 to function as the parking lot use start data reception unit 111, the public transportation facility data reception unit 112, the park-and-ride start determination unit 113, the parking lot use end data reception unit 114, the park-and-ride end determination unit 115, the allowed time information storage unit 116, and the park-and-ride information storage unit 117 described with reference to Figs.

20 1 to 8, causes the parking lot device 130 to function as the parking lot use start data input reception unit 131, the parking lot use start data transmission unit 132, the parking lot use end data input reception unit 133, and the parking lot use end data transmission unit 134 described with reference to Figs. 1 to 8, and causes the public transportation facility device 150 to function as the public transportation facility data input reception unit 151

25 and the public transportation facility data transmission unit 152.

[0081]

The programs described above can be stored in an external recording medium. As the recording medium, in addition to the FD 893 and the CD-ROM 892, it is possible to use an optical recording medium such as a digital versatile disk (DVD) or a phase disk (PD), a magneto-optical recording medium such as a minidisk (MD), a tape medium, a semiconductor memory such as an IC card, etc. In addition, using a storage medium such as a hard disk or a RAM provided in a server system connected to a dedicated communication network or the Internet as the recording medium, the programs may be provided as programs via the network.

10 [0082]

Although the present invention has been described above with reference to embodiments, the technical scope of the present invention is not limited to the scope of the abovementioned embodiments. It is apparent to those skilled in the art that various alterations and improvements can be made to the abovementioned embodiments. It is apparent from the appended claims that embodiments with the various alterations and improvements will be included in the technical scope of the present invention.

INDUSTRIAL APPLICABILITY

[0083]

20 The present invention is applicable to various services provided by providers of a parking lot, a public transportation facility, etc.

DESCRIPTION OF THE REFERENCE SYMBOLS

[0084]

25 100 Park-and-ride detection system

	110	Park-and-ride detection device
	111	Parking lot use start data reception unit
	112	Public transportation facility data reception unit
	113	Park-and-ride start determination unit
5	114	Parking lot use end data reception unit
	115	Park-and-ride end determination unit
	116	Allowed time information storage unit
	117	Park-and-ride information storage unit
	130	Parking lot device
10	131	Parking lot use start data input reception unit
	132	Parking lot use start data transmission unit
	133	Parking lot use end data input reception unit
	134	Parking lot use end data transmission unit
	150	Public transportation facility device
15	151	Public transportation facility data input reception unit
	152	Public transportation facility data transmission unit
	801	Host controller
	802	CPU
	803	RAM
20	804	Graphic controller
	805	Display device
	806	I/O controller
	807	Communication I/F
	808	Hard disk drive
25	809	CD-ROM drive

	810	ROM
	811	FD drive
	812	I/O chip
	891	Network communication device
5	892	CD-ROM
	893	FD
	E	Automatic fare adjustment machine
	G	Automatic ticket machine
	P	Parking lot
10	S	Railway station

CLAIMS

1. A park-and-ride detection system for detecting use of park-and-ride, the park-and-ride detection system comprising:

a parking lot device configured to process information about use of a plurality of parking lots,

a public transportation facility device configured to process information about use of a plurality of the public transportation facilities, and

a park-and-ride detection device configured to detect the use of the park-and-ride,

wherein the parking lot device is provided in each of a plurality of the parking lots,

wherein the public transportation facility device is provided in each of a plurality of places to get in or out of the public transportation facilities,

wherein the parking lot device includes a parking lot use start data transmission unit,

wherein if the use of one of a plurality of parking lots has started, the parking lot use start data transmission unit transmits parking lot use start data representing at least the one of a plurality of parking lots, the user of the one of a plurality of parking lots, and the use start time of the one of a plurality of parking lots to the park-and-ride detection device,

wherein the public transportation facility device includes a public transportation facility data transmission unit,

wherein if the use of one of a plurality of the public transportation facilities has started, transmits public transportation facility data representing at least the place to get in or out of the one of a plurality of the public transportation facilities, the user of the one of a plurality of the public transportation facilities, and the use start time of the one of a plurality of the public transportation facilities to the park-and-ride detection device,

wherein the park-and-ride detection device includes:

a park-and-ride start determination unit configured to determine the start of the use of the park-and-ride,

a public transportation facility data reception unit configured to receive the public transportation facility data transmitted from the public transportation facility device,

a parking lot use start data reception unit configured to receive the parking lot use start data transmitted from the parking lot device, and

an allowed time information storage unit configured to store a plurality of allowed times preset in anticipation of a movement time from the parking lots to places to get in or out of the public transportation facility associated with each of the parking lots and each of

the places to get in or out of the public transportation facilities, and

wherein the park-and-ride start determination unit of the park-and-ride detection device determines that the use of the park-and-ride has started if a time from a use start time of the one of a plurality of parking lots represented by the parking lot use start data for the user represented by the parking lot use start data received by the parking lot use start data reception unit to the use start time of the one of a plurality of the public transportation facilities represented by the public transportation facility data for the same user received by the public transportation facility data reception unit is within the allowed time read from the allowed time information storage unit associated with the one of a plurality of parking lots represented by the parking lot use start data and the place to get in or out of the one of a plurality of the public transportation facilities represented by the public transportation facility data.

2. The park-and-ride detection system according to claim 1,
 wherein the parking lot use start data represents at least
 a parking lot identifier (ID) for uniquely identifying each used parking lot among a plurality of parking lots,
 a user ID for uniquely identifying each user of parking lots, and
 a use start time of the parking lots,
 wherein the public transportation facility data representing at least
 the place to get in or out ID for uniquely identifying each place to get in or out, and
 a use start time of the places to get in or out,
 wherein the park-and-ride detection device further includes a park-and-ride information storage unit configured to associate and store the user ID, the parking lot ID, the place to get in or out ID, a use start time of the parking lots, and a use start time of the places to get in or out,
 wherein automatic fare adjustment machines are provided in the parking lots respectively which read the user ID recorded on the IC card of the user, and output parking lot use start data representing the read user ID to the parking lot device, and
 wherein automatic ticket machines are provided in the places to get in or out which reads the user ID recorded on the IC card of the user, and outputs the public transportation facility data representing the read user ID to the public transportation facility device.

3. The park-and-ride detection system according to claim 1 or 2, wherein the park-and-

ride detection device further includes:

a park-and-ride end determination unit configured to determine that the use of the park-and-ride has ended if the use of the parking lot by the user of the park-and-ride has ended.

4. The park-and-ride detection system according to claim 3,
wherein the parking lot device further includes:

a parking lot use end data transmission unit configured to transmit parking lot use end data representing at least the user of the parking lot to the park-and-ride detection device if the use of the parking lot has ended,

wherein the park-and-ride detection device further includes:

a parking lot use end data reception unit configured to receive the parking lot use end data transmitted from the parking lot device, and

wherein the park-and-ride end determination unit of the park-and-ride detection device determines that the use of the park-and-ride by the user of the parking lot represented by the parking lot use end data received by the parking lot use end data reception unit has ended.

5. A park-and-ride detection device for detecting use of park-and-ride, the park-and-ride detection device comprising:

a park-and-ride start determination unit configured to determine the start of the use of the park-and-ride,

a public transportation facility data reception unit configured to receive the public transportation facility data representing at least the place to get in or out of one of a plurality of the public transportation facilities the use of which has started, the user of the one of a plurality of the public transportation facilities, and the use start time of the one of a plurality of the public transportation facilities transmitted from a plurality of public transportation facility devices,

a parking lot use start data reception unit configured to receive the parking lot use start data representing at least one of a plurality of parking lots the use of which has started, the user of the one of a plurality of parking lots, and the use start time of the one of a plurality of parking lots transmitted from a plurality of parking lot devices, and

an allowed time information storage unit configured to store a plurality of allowed times preset in anticipation of a movement time from the parking lots to places to get in or

out of the public transportation facility associated with each of the parking lots and each of the places to get in or out of the public transportation facility,

wherein the park-and-ride start determination unit determines that the use of the park-and-ride has started if a time from a use start time of the one of a plurality of parking lots represented by the parking lot use start data for the user represented by the parking lot use start data received by the parking lot use start data reception unit to the use start time of the one of a plurality of the public transportation facilities represented by the public transportation facility data for the same user received by the public transportation facility data reception unit is within the allowed time read from the allowed time information storage unit associated with the one of a plurality of parking lots represented by the parking lot use start data and the place to get in or out of the one of a plurality of the public transportation facilities represented by the public transportation facility data.