

DESCRIPTION

Title of Invention

ROUTE GUIDANCE DEVICE, ROUTE GUIDANCE METHOD, AND PROGRAM

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Technical Field

[0001]

The present invention relates to a route guidance device, a route guidance method, and a program.

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Priority is claimed on Japanese Patent Application No. 2013-235124, filed November 13, 2013, the content of which is incorporated herein by reference.

Background Art

[0002]

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There is a service that performs route guidance using public transportation such as buses, trains, and airplanes, by specifying a point of departure and a destination. The user is able to specify a movement route search condition for searching for a route through which it takes the shortest time to go to a destination, or searching for a route for which the fee is the cheapest to go to a destination.

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For example, transportation facilities which are available in a route from a point of departure to a destination are searched, and a movement route by using the transportation facilities that are obtained from searching and by walking is provided (for example, see PTL 1).

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In PTL 1, searching for a movement route using transportation facilities and a taxi is described. If a request for a riding spot and a destination from the user is

received, a taxi is extracted that has a remaining charge capacity capable of reaching the charging station that is nearest to the destination, from the current position of the taxi that is moving, through the riding spot and the destination of the user, and a dispatch instruction is given to a taxi that is closest to the riding spot of a user, from among the
 5 extracted taxi vehicles (for example, see PTL 2).

In recent years, a car-sharing system in which a share-car for car-sharing is shared and used by a plurality of people has become popular. The user is able to go to a destination not only by using public transportation and taxis, but also by using the share-car.

10 Citation List

Patent Literature

[0003]

[PTL 1] Japanese Unexamined Patent Application, First Publication No.
 2002-073758

15 [PTL 2] Japanese Unexamined Patent Application, First Publication No.
 2012-073979

Summary of Invention

Technical Problem

20 [0004]

If people or vehicles are crowded in a predetermined location or a facility for movement, there is a possibility that traffic congestion occurs or the efficient use of share-cars is limited. For this reason, it is desired to relieve the traffic congestion or improve the efficiency of use of the facility for movement, by dispersing the movements
 25 of the crowded people and vehicles.

[0005]

The present invention provides a route guidance device, a route guidance method, and a program, which are capable of providing route guidance for a movement route for dispersing the movements of crowded people and vehicles.

5 Solution to Problem

[0006]

According to a first aspect of the present invention, there is provided a route guidance device including an acquisition unit that acquires guiding and restricting information regarding a location or a facility for movement to which a moving object is
10 to be guided, or a location or a facility for movement from which the moving object is to be restricted; a movement route searching unit that searches for a plurality of movement routes to a destination, including a facility for movement to be used, based on information regarding a facility for movement and map information; a priority calculation unit that finds priorities of the plurality of movement routes which are
15 obtained from searching by the movement route searching unit, based on the guiding and restricting information that is acquired by the acquisition unit; an incentive setting unit that gives incentives to the movement routes, based on the priorities that are found by the priority calculation unit; and a route guidance unit that provides route guidance for the movement route, and the incentives that are given by the incentive setting unit.

20 [0007]

According to a second aspect of the present invention, in the route guidance device according to the first aspect, the incentive setting unit obtains an incentive depending on the movement route, based on the guiding and restricting information, or an actual value of a movement demand of the moving object.

25 [0008]

According to a third aspect of the present invention, in the route guidance device according to the first or second aspect, the movement route searching unit searches for a movement route that passes through the location or the facility for movement to which the moving object is to be guided, or a movement route that does not pass through the location or the facility for movement from which the moving object is to be restricted, based on the guiding and restricting information.

[0009]

According to a fourth aspect of the present invention, the route guidance device according to any one of the first to third aspects further includes an guiding and restricting information calculation unit that obtains the guiding and restricting information, based on a movement demand prediction value for the moving object.

[0010]

According to a fifth aspect of the present invention, in the route guidance device according to any one of the first to fourth aspects, the movement route searching unit searches for the movement route, based on a timetable that is provided for public transportation and the movement demand prediction value for the moving object.

[0011]

According to a sixth aspect of the present invention, there is provided a route guidance method including an acquisition step of acquiring guiding and restricting information regarding a location or a facility for movement to which a moving object is to be guided, or a location or a facility for movement from which the moving object is to be restricted; a movement route searching step of searching for a plurality of movement routes to a destination, including a facility for movement to be used, based on information regarding the facility for movement and map information; a priority calculation step that finds priorities of the plurality of movement routes which are

obtained from searching in the movement route searching step, based on the guiding and restricting information which is acquired in the acquisition step; an incentive setting step of giving incentives to the movement routes, based on the priorities that are found in the priority calculation step; and a route guidance step of providing route guidance for the movement route, and the incentives that are given in the incentive setting step.

[0012]

According to a seventh aspect of the present invention, there is provided a program causing a computer to function as: acquisition device for acquiring guiding and restricting information regarding a location or a facility for movement to which a moving object is to be guided, or a location or a facility for movement from which the moving object is to be restricted; movement route searching device for searching for a plurality of movement routes to a destination, including a facility for movement to be used, based on information regarding a facility for movement and map information; priority calculation device for finding priorities of the plurality of movement routes which are obtained from searching by the movement route searching device, based on the guiding and restricting information that is acquired by the acquisition device; incentive setting device for giving incentives to the movement routes, based on the priorities that are found by the priority calculation device; and route guidance device for providing route guidance for the movement route, and the incentives that are given by the incentive setting device.

Advantageous Effects of Invention

[0013]

The route guidance device, route guidance method, and program, which are described above, are capable of providing route guidance for a movement route for dispersing the movements of crowded people and vehicles.

Brief Description of Drawings

[0014]

FIG. 1 is a schematic diagram illustrating an example of a route guidance system including a route guide device according to an embodiment of the present invention.

5 FIG. 2 is a block diagram illustrating a configuration example of the route guidance device according to the embodiment of the present invention.

FIG. 3 is a diagram illustrating an example of a share-car pool dynamic table according to the embodiment of the present invention.

10 FIG. 4 is a diagram illustrating an example of a charging station dynamic table according to the embodiment of the present invention.

FIG. 5 is a diagram illustrating an example of a guiding and restricting information table according to the embodiment of the present invention.

FIG. 6 is a diagram illustrating an example of a movement route table according to the embodiment of the present invention.

15 FIG. 7 is a diagram illustrating an example of a dynamic table for reservation information according to the embodiment of the present invention.

FIG. 8 is a diagram illustrating an example of a movement route obtained from searching by the route guidance device according to the embodiment of the present invention.

20 FIG. 9 is a flowchart illustrating an example of a route guidance method according to the embodiment of the present invention.

FIG. 10 is a flowchart illustrating an example of a route guidance process included in the route guidance method illustrated in FIG. 9.

25 Description of Embodiments

[0015]

Hereinafter, an example of a route guidance system according to an embodiment of the present invention will be described. FIG. 1 is a schematic diagram illustrating the example of the route guidance system according to the embodiment of the present invention.

As illustrated in FIG. 1, the route guidance system includes a plurality of share-car pool management servers 11, 12, ..., a plurality of charging station management servers 21, 22, 23, ..., a plurality of on-board units 31, 32, 33, ..., a route guidance device 40 as a route search device for a rechargeable car, a terminal 50, and an external information providing server 70, which are connected to each other through a network. The plurality of on-board units 31, 32, 33, ... are respectively mounted in a plurality of share-cars 61, 62, 63, Predetermined specific identification information (vehicle ID) is assigned to each of the plurality of on-board units 31, 32, 33, ... or the plurality of share-cars 61, 62, 63,

[0016]

The plurality of share-car pool management servers 11, 12, ... are servers that respectively manage facility information pieces regarding the use states in the share-car pools 101, 102, ... which are respectively associated thereto. The share-car pool is a facility (vehicle supply facility) in which share-cars for car-sharing are parked, and which supplies the share-cars to the users. The share-car pool includes a charger that supplies power to the battery of the share-car which is parked, or the battery that is removable from the share-car.

The plurality of share-car pool management servers 11, 12, ... transmit information regarding the use state of the share-car pool to the route guidance device 40 through a network. For example, each of the plurality of share-car pool management

servers 11, 12, ... transmits information in which information indicating the remaining battery capacity, the reservation status, and the use state of the share-car which is parked in each of the share-car pools 101, 102, ... are associated with the vehicle ID, to the route guidance device 40. Each of the plurality of share-car pool management servers 11, 12, ... acquires information indicating the remaining battery capacity, from each of the on-board units 31, 32, 33, ... of the share-cars which are parked. Each of the plurality of share-car pool management servers 11, 12, ... is able to receive the information indicating the reservation status or the use state, from a predetermined input unit.

[0017]

The charging station management server 21 is a server that manages the facility information regarding the use states of the charging stations 201 in which a plurality of chargers 71, 72, 73, ... are provided. The charging station 201 is a facility (charging facility) that provides power to the battery of the share-car for car-sharing. The charging station 201 includes a plurality of chargers 71, 72, 73, ... provided therein. A parking space is prepared for parking the share-car being charged at each of the chargers 71, 72, 73, Each of the plurality of chargers 71, 72, 73, ... is a charger that supplies power to the battery of the share-car which is parked, or the battery that is removable from the share-car.

Other charging station management servers 22, 23, ... are servers that manage the facility information regarding the use states of the charging stations 202, 203, ..., similar to the charging station management server 21. The detailed description will be omitted.

The plurality of charging station management servers 21, 22, 23, ... transmit information regarding the use state of the charging state to the route guidance device 40 through a network. For example, each of the plurality of charging station management

servers 21, 22, 23, ... transmits information in which the information indicating the reservation status or the use state of each of the chargers which are provided in the charging stations 201, 202, 203, ... is associated with the charger ID, to the route guidance device 40. Each of the plurality of charging station management servers 21, 22, 23, ... is able to receive the information indicating the reservation status or the use state, from a predetermined input unit. The charger ID is predetermined specific identification information which is assigned to each of the chargers provided in the charging stations.

[0018]

A plurality of on-board units 31, 32, 33, ... and a plurality of share-cars 61, 62, 63, ... which include the respective on-board units mounted therein are associated with each other by the vehicle IDs. In the present embodiment, an example in which an electric car (EV) which is a rechargeable car is used as an example of the share-car will be described. The present embodiment is not limited thereto, and the share-car includes fuel vehicles using gasoline or the like, and hybrid vehicles.

The plurality of on-board units 31, 32, 33, ... transmit the facility information regarding the use state of the share-car including each on-board unit mounted therein, to the route guidance device 40, through a network. For example, the plurality of on-board units 31, 32, 33, ... acquire information indicating the remaining battery capacity of the share-cars including the on-board units 31, 32, 33, ... mounted therein, information indicating the current position of the on-board unit that is obtained using a satellite positioning system, or information indicating the reservation status or the use state of the share-car having the mounted on-board units, and transmits information in which information pieces indicating the remaining battery capacities, the current position, and the reservation status or the use state of the share-cars are associated with the vehicle ID

to the route guidance device 40.

[0019]

The route guidance device 40 is connected to the share-car pool management servers 11, 12, ... , the charging station management servers 21, 22, 23, ..., the on-board units 31, 32, 33, ..., the terminal 50, and the external information providing server 70, through a network. The route guidance device 40 searches for a plurality of movement routes to the destination including the facility for movement to be used, based on the information regarding the facility for movement and the map information. The route guidance device 40 finds the priorities of a plurality of movement routes obtained from searching, based on the guiding and restricting information. The route guidance device 40 gives incentives to the movement routes, based on the priorities. The route guidance device 40 provides the given incentive and the route guidance for the movement route to the user. The facility for movement includes public transportation such as buses, trains, airplanes, taxis, rental cars, share-cars (a share-car pool or a charging station) and the like.

[0020]

Here, the guiding and restricting information is information that includes information indicating the position of a location or a facility for movement to which the moving object is to be guided, and information indicating the position of a location or a facility for movement from which the moving object is to be restricted. The location to which the moving object is to be guided is a location in which it is desired to gather people or vehicles, and includes, for example, a tourist spot, a shopping mall, a predetermined road, or the like. The facility for movement to which the moving object is to be guided is a facility for movement in which it is desired to gather people or vehicles, and includes, for example, a share-car pool, a car rental shop, an airplane, an

express train or the like for which use promotion is required. The location to which the moving object is to be restricted is a location in which it is desired to disperse people or vehicles, and includes, for example, a road that is congested, a road for which the congestion is expected due to festivals or fireworks, or the like. The facility for movement from which the moving object is to be restricted is a facility for movement in which it is desired to disperse people or vehicles, and includes, for example, a share-car pool or a charging station, for which a “Full” state is expected. The moving object is an object that is moving, and includes, for example, people or transportation (for example, private cars, taxis, rental cars, share-cars, buses, trains, airplanes, and the like).

10 [0021]

The terminal 50 is a terminal of a user who has been registered in advance in a rechargeable car management system of the present embodiment. The terminal 50 is, for example, a mobile phone terminal, a smartphone, a tablet terminal, or the like. The terminal 50 includes a touch panel which functions as an input section and the output section.

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[0022]

The external information providing server 70 is a server that acquires congestion information of a road, special event information such as festivals or fireworks, tourist information indicating the position of a tourist spot, commercial facility information indicating the position such as a shopping mall or a theme park, or the like, and transmits them to the route guidance device 40.

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[0023]

Next, the configuration example of the route guidance device 40 according to the present embodiment will be described with reference to FIG. 2. FIG. 2 is a block diagram illustrating the configuration example of the route guidance device 40 according

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to the present embodiment.

As illustrated in FIG. 2, the route guidance device 40 includes a communication unit 401, a dynamic table generation unit 402, a dynamic table updating unit 403, an guiding and restricting information calculation unit 404, a movement route searching unit
5 405, a priority calculation unit 406, an incentive setting unit 407, a route guidance unit 408, a reservation processing unit 409, and a storage unit 410.

[0024]

The communication unit 401 transmits and receives information to and from the device that is connected through a network. The route guidance device 40 may be
10 configured to include an input interface that acquires information through an operation unit or a connector, instead of the communication unit 401. Further, the communication unit 401 may be, for example, an acquisition unit that acquires guiding and restricting information regarding a location or a facility for movement to which a moving object is to be guided, or a location or a facility for movement from which the moving object is to
15 be restricted, from outside.

[0025]

The dynamic table generation unit 402 generates the share-car pool dynamic table 411 by writing the facility information regarding the use state of a share-car pool that provides share-cars to the share-car pool dynamic table 411 in the storage unit 410,
20 based on the information pieces which are received from a plurality of share-car pool management servers 11, 12, ... , a plurality of charging station management servers 21, 22, 23, ..., or a plurality of on-board units 31, 32, 33,

The dynamic table generation unit 402 generates the charging station dynamic table 412 by writing the facility information regarding the use state of a charging station
25 that provides power to the battery of the share-car, to the charging station dynamic table

412 in the storage unit 410, based on the information pieces which are received from the plurality of share-car pool management servers 11, 12, ... , the plurality of charging station management servers 21, 22, 23, ..., or the plurality of on-board units 31, 32, 33,

5 [0026]

The dynamic table updating unit 403 updates the facility information of the share-car pool dynamic table 411, based on the remaining charge capacity of the share-car which is input. In addition, in a case where the reservation information dynamic table 416 is updated, the dynamic table updating unit 403 updates the facility
10 information of the share-car pool dynamic table 411, or the facility information of the charging station dynamic table 412, based on the contents of the movement plan that is reserved.

[0027]

The guiding and restricting information calculation unit 404 is an acquisition
15 unit that acquires the guiding and restricting information. The guiding and restricting information calculation unit 404 writes the obtained guiding and restricting information to the guiding and restricting information table 414 of the storage unit 410.

For example, the guiding and restricting information calculation unit 404 obtains the guiding and restricting information, based on a movement demand prediction value
20 for the moving object. The movement route searching unit 405 obtains the movement demand prediction value for the moving object depending on the date, the time, the day of the week, the season, and the like, based on the movement actual value of the moving object that was collected in the past. The guiding and restricting information calculation unit 404 obtains the sum of the obtained movement demand prediction values,
25 as the guiding and restricting information. The guiding and restricting information

calculation unit 404 writes the obtained guiding and restricting information, in association with the position information about a location or a facility for movement to which the moving object is to be guided, or a location or a facility for movement from which the moving object is to be restricted, to the guiding and restricting information table 414. In a case where the guiding and restricting information is a positive value, the guiding and restricting information indicates that the associated region is the guided area. In a case where the guiding and restricting information is a negative value, the guiding and restricting information indicates that the associated region is the restricted area.

In the present embodiment, the guiding and restricting information calculation unit 404 obtains the degree of moving objects being crowded in a certain area by the concentration of the moving objects, or the degree of moving objects being scattered in a certain area by the dispersion of the moving objects, as the movement demand prediction value.

[0028]

The guiding and restricting information calculation unit 404 obtains the degree of congestion of a share-car pool or a charging station as the predicted value of the use demand, based on the reservation status and the use state of the share-car pool dynamic table 411 or the charging station dynamic table 412.

The guiding and restricting information calculation unit 404 assigns the positive predicted value depending on the degree of congestion, to a share-car pool or a charging station that is congested, for example, the facility for movement for which the degree of congestion (utilization efficiency, or the like) or the waiting time is the threshold or more. Meanwhile, the guiding and restricting information calculation unit 404 assigns the negative predicted value depending on the degree of congestion, to a share-car pool or a

charging station that is not congested, for example, the facility for movement for which the degree of congestion or the waiting time is less than the threshold. The share-car pools that are congested include a share-car pool for which the use of a lot of share-cars is reserved, a share-car pool in which few share-cars are secured, a share-car pool in which a waiting time occurs, or the like. In addition, the charging stations that are congested include a charging station for which the use of a lot of chargers is reserved, a charging station in which a waiting time occurs, or the like. The waiting time of the charging station includes a charging waiting time depending on the remaining charge capacity of the share-car.

[0029]

Further, the guiding and restricting information calculation unit 404 obtains the degree of road congestion which is determined as the predicted value of the usage demand, based on the congestion information that was received from the external information providing server 70 in the past.

Examples of a situation in which moving objects are crowded include a situation in which congestion occurs on the main road in the commute time zone in the morning and evening, a situation in which congestion occurs on a road to a shopping mall in the suburban when it is a holiday, a situation in which people and vehicles are crowded around a famous place for cherry trees during cherry blossom season, and a situation in which people and vehicles are crowded around the region where the festival is held during the season of the festival. The guiding and restricting information calculation unit 404 assigns, for example, a positive predicted value depending on the length of the congestion, in association with the position information of a predetermined main road in the time zone of a predetermined day of the week, based on the congestion information in the past.

Examples of the area where the moving objects are dispersed include a road in the suburban where there are no stores or the like, a road which is not well known to non-locals, and the like. The guiding and restricting information calculation unit 404 assigns, for example, a predetermined negative predicted value, in association with the position information of a predetermined road in the time zone of a predetermined day of the week, based on the congestion information in the past.

[0030]

Without being limited to the above, the guiding and restricting information calculation unit 404 may be configured to receive the guiding and restricting information that is determined in advance from the outside, through the communication unit 401, and write the received guiding and restricting information to the guiding and restricting information table 414 of the storage unit 410.

For example, in a case where the local government of each region or the tourism association desires to gather people in the tourist spot, the guiding and restricting information calculation unit 404 assigns positive guiding and restricting information (in other words, information indicating the guided area), in association with the position information of the region of this tourist spot.

Further, in a case where the congestion is expected due to festivals or fireworks, the guiding and restricting information calculation unit 404 assigns negative guiding and restricting information (in other words, information indicating the restricted area), in association with the position information of the peripheral region of this venue.

[0031]

The movement route searching unit 405 searches for a plurality of movement routes to the destination, including the facility for movement to be used, based on the information regarding the facility for movement and the map information.

The movement route searching unit 405 searches for a movement route, based on the time table that is provided for the public transportation, and the movement demand prediction value (congestion, reservation of a share-car, day of the week, a time zone, or the like) of the moving object. The movement route searching unit 405 searches for a movement route satisfying the priority conditions, based on the priority conditions that are set. For example, in a case where the priority condition is a mobile time, the movement route searching unit 405 searches for a movement route through which it takes the shortest time, among movement routes by all facilities for movement. In addition, in a case where the priority condition is a fee, the movement route searching unit 405 searches for the movement route for which the fee is the cheapest, among the movement routes by all facilities for movement.

[0032]

Further, the movement route searching unit 405 searches for a movement route that passes through the location or the facility for movement to which the moving object is to be guided, or a movement route that does not pass through the location or the facility for movement from which the moving object is to be restricted, based on the guiding and restricting information. For example, the movement route searching unit 405 determines whether or not the guided area or the restricted area overlap, in the movement route area including the vicinity of the movement route that is obtained from searching. In a case where the movement route area and the guided area overlap, the movement route searching unit 405 searches for a movement route passing through the movement route. In a case where the movement route area and the restricted area overlap, the movement route searching unit 405 searches for a movement route without passing through the movement route.

[0033]

The priority calculation unit 406 finds the priorities of a plurality of movement routes which are obtained from searching by the movement route searching unit 405, based on the guiding and restricting information. The priority calculation unit 406 finds, for example, the priority that is determined in advance, depending on the value of the guiding and restricting information. In addition, the priority calculation unit 406 finds, for example, the priority that is determined in advance, depending on the extent to which the moving objects are crowded in the guided area due to the concentration of moving objects, or the extent to which the moving objects are scattered to the restricted area due to the dispersion of the moving objects.

The priority calculation unit 406 finds the priority, based on the weight that is determined in advance, depending on the guiding and restricting information or the extent of being crowded or scattered. The priority calculation unit 406 acquires the priority associated with the position information of a predetermined guided area, or the priority associated with the position information of a predetermined restricted area, from the outside, through the communication unit 401.

The priority calculation unit 406 determines the priorities of the movement routes by arranging the priorities in descending order. The priority calculation unit 406 writes information in which the determined priority and the movement route are associated, to the movement route table 415.

[0034]

The incentive setting unit 407 gives an incentive to the movement route, based on the priority that has been found by the priority calculation unit 406. The incentive setting unit 407 sets, for example, the incentive that has been determined in advance depending on the priority, to the corresponding movement route. In other words, the incentive setting unit 407 assigns an incentive to the movement route of priority for

which an incentive has been assigned, and does not assign the incentive to the movement route other than the priority for which the incentive has been assigned.

Further, the incentive setting unit 407 obtains an incentive corresponding to the movement route, based on the guiding and restricting information or the actual value of the movement demand of the moving object. The incentive setting unit 407 obtains, for example, an incentive that is determined in advance depending on the value of the guiding and restricting information. Further, the incentive setting unit 407 obtains, for example, an incentive that is determined in advance depending on the extent to which the moving objects are crowded in the guided area, due to the concentration of the moving objects and the extent to which the moving objects are scattered in the restricted area, due to the dispersion of the moving objects. The incentive setting unit 407 obtains an incentive, based on the weight that is determined in advance, depending on the guiding and restricting information or the extent of being crowded or scattered. The incentive setting unit 407 obtains the incentive associated with the position information of a predetermined guided area, or, the incentive associated with the position information of a predetermined restricted area, from the outside, through the communication unit 401.

[0035]

The route guidance unit 408 provides the incentive that is given by the incentive setting unit 407, and the route guidance for a movement route. The route guidance unit 408 displays the movement conditions (a moving time, a moving distance, a fee, or the like) associated with an incentive, as the route guidance for the movement route to which an incentive is given, generates an image displaying the movement conditions (a moving time, a moving distance, a fee, or the like) as the route guidance for a movement route to which an incentive is not given, and transmits the image to the terminal 50.

The route guidance unit 408 performs the route guidance for a movement route

satisfying the priority condition, based on the set priority condition. In a case where the priority condition is a moving time, the route guidance unit 408 performs, for example, the route guidance for the movement route through which it takes the shortest movement time, among movement routes using all facilities for movement. In a case where the
5 priority condition is a fee, the route guidance unit 408 performs, for example, the route guidance for the movement route for which the fee is the cheapest, among movement routes using all facilities for movement.

[0036]

In a case where the content of the movement route generated by the movement
10 route searching unit 405 is reserved, the reservation processing unit 409 receives the reservation of the facilities for movement included in the movement route (for example, share-cars, rental cars, trains, buses, airplanes, or the like), based on the information indicating the reservation that is received from the terminal 50, through the terminal 50. The reservation processing unit 409 writes the contents of the accepted reservation, to the
15 reservation information dynamic table 416 of the storage unit 410.

[0037]

The storage unit 410 stores a variety of pieces of information necessary for the process of the route guidance device 40. The storage unit 410 includes, for example, a share-car pool dynamic table 411, a charging station dynamic table 412, a static table for
20 a time table 413, a guiding and restricting information table 414, a movement route table 415, and a reservation information dynamic table 416. The details of each table will be described below with reference to the drawings.

Further, the storage unit 410 holds map information and movement condition information. The map information is information in which the position information of
25 the facility for movement (for example, information indicating the positions of a bus stop,

a train station, an airport, a share-car pool, or a charging station) is associated with the map illustrating a general geography.

The movement condition information is information for calculating a moving time, a moving distance, a fee, or power consumption in a case of moving through the route obtained from searching, by each facility for movement or by walking.

[0038]

The storage unit 410 stores information for calculating the usage fee of the facility for movement, and information for calculating the waiting time in the share-car or the charging station, as the facility information. The information for calculating the usage fee includes information pieces respectively indicating the usage fee of the public transportation, which is stored in the static table 413 for a time table, the usage fee that is determined depending on the charge capacity of power, or the usage fee that is determined depending on the use time of the share-car or the charger. The information for calculating the waiting time includes a waiting time for transit of the facility for movement, and a charging time that is determined depending on the type of the charger or the battery. The information indicating the reservation status or the use state in the dynamic table can also be referred to as information for calculating the waiting time.

The storage unit 410 may be provided in the outside of the route guidance device 40. In this case, the route guidance device 40 acquires the information stored in the above-mentioned storage unit 410 from the external storage unit.

[0039]

Next, an example of the share-car pool dynamic table 411 will be described with reference to FIG. 3. FIG. 3 is a diagram illustrating an example of the share-car pool dynamic table 411. The share-car pool dynamic table 411 is a dynamic table that is generated for each of the plurality of share-car pools 101, 102, The share-car pool

dynamic table 411 illustrated in FIG. 3 is a table that stores the facility information regarding the use state for the share-car pool 101.

As illustrated in FIG. 3, the share-car pool dynamic table 411 is a table in which information pieces respectively indicating a vehicle ID, a remaining battery capacity, a reservation status, and a use state are associated with each other.

The information indicating a vehicle ID is information indicating a vehicle ID of the share-car which is parked in the share-car pool 101.

The information indicating the remaining battery capacity is information indicating the remaining level of the battery of each share-car.

The information indicating the reservation status is information indicating the reservation status of each share-car. The information indicating the reservation status is information indicating a period during which the share-car is rented, and includes, for example, a time to rent the share-car in a riding spot, and a time to return the share-car in a drop-off point.

The information indicating a use state is information indicating the use state of each share-car. The information indicating the use state is information indicating a state in which each share-car is used (in other words, a state where a share-car is not in a share-car pool), or a state in which each share-car is not used (in other words, a wait state in the share-car pool), at the current time.

[0040]

Next, an example of the charging station dynamic table 412 will be described with reference to FIG. 4. FIG. 4 is a diagram illustrating an example of the charging station dynamic table 412. The charging station dynamic table 412 is a dynamic table generated for each of the plurality of charging stations 201, 202, 203, The charging station dynamic table 412 illustrated in FIG. 4 is a table that stores the facility

information regarding the use state of the charging station 201.

As illustrated in FIG. 4, the charging station dynamic table 412 is a table in which information pieces respectively indicating a charger ID, a reservation status, and a use state are associated with each other.

5 The information indicating the charger ID is information indicating the charger ID of the charger that is provided in the charging station 201.

 The information indicating the reservation status is information indicating the reservation status of each charger. The information indicating the reservation status is information indicating a period during which the charger is in use, and includes, for
10 example, information pieces respectively indicating the start time and the end time of the use of the charger.

 The information indicating a use state is information indicating a use state of each charger. The information indicating a use state is information indicating whether each user is in use or is not in use, at the current time.

15 [0041]

 The static table for a time table 413, which is not illustrated, is a table in which information indicating the timetables and information indicating the fees of public transportation such as buses, trains, and airplanes are associated with each other.

 [0042]

20 Next, an example of the guiding and restricting information table 414 will be described with reference to FIG. 5. FIG. 5 is a diagram illustrating an example of the guiding and restricting information table 414.

 As illustrated in FIG. 5, the guiding and restricting information table 414 is a table in which position information and guiding and restricting information are associated
25 with each other.

The position information is information indicating the position of the guided area or the restricted area.

The guiding and restricting information is information indicating whether the position indicated by the position information is the guided area or the restricted area.

5 In the present embodiment, in a case where the guiding and restricting information is a positive value, it indicates the guided area; and in a case where the guiding and restricting information is a negative value, it indicates the restricted area. The present embodiment is not limited thereto, and in a case where the guiding and restricting information is a threshold or more, it indicates the guided area; and in a case where the
10 guiding and restricting information is less than the threshold, it indicates the restricted area.

[0043]

Next, an example of the movement route table 415 will be described with reference to FIG. 6. FIG. 6 is a diagram illustrating an example of the movement route
15 table 415.

As illustrated in FIG. 6, the movement route table 415 is a table in which movement route numbers, movement route contents, movement times, fees, priorities, extents of given points (discounts), and fees corresponding to given points are associated with each other. In the illustrated example, information regarding movement routes 1 to
20 6 is stored.

The priority is the priority of the movement route that is determined by the priority calculation unit 406.

The extent of given point (discount) is information indicating the content of a discount incentive of the fee that is given to the incentive setting unit 407.

25 The fee corresponding to given point is information indicating the discounted

fee after the incentive has been given by the incentive setting unit 407.

[0044]

Next, an example of the reservation information dynamic table 416 will be described with reference to FIG. 7. FIG. 7 is a diagram illustrating an example of the reservation information dynamic table 416. The reservation information dynamic table 416 is, for example, a dynamic table that is generated in association with each facility for movement for each reservation.

As illustrated in FIG. 7, the reservation information dynamic table 416 is a table that stores the reservation information regarding the share-cars included in the share-car pool 101. The reservation information dynamic table 416 is a table in which information pieces indicating the vehicle ID, the user ID, the point of departure, the destination, the reservation time, the reservation route, the waypoint, the remaining battery capacity, and the content of an incentive are associated with each other.

The information indicating the vehicle ID is information indicating the vehicle ID of the share-car of which the use is reserved.

The information indicating the user ID is information indicating the user ID of a user who makes a reservation for use.

The information indicating the point of departure and the information indicating the destination is information indicating the point of departure and the destination that the user makes a reservation.

The information indicating the reservation time is information indicating a period during which the share-car is rented, and includes, for example, the information indicating a time at which the share-car is rented in the riding spot, and a time to return the share-car at the drop-off point.

The information indicating the reservation route is information indicating a route

included in the movement plan that is reserved by the user.

The information indicating the waypoint is information indicating the waypoint included in the route indicated by the reservation route. This waypoint includes a charging station that supplies power to the battery of the share-car in middle of the route,
5 or a share-car pool that supplies another share-car for the exchange of the share-car in middle of the route.

The information indicating the remaining battery capacity is information indicating the remaining capacity of the battery of the share-car of which use is reserved.

The content of the incentive is information indicating the content of the
10 incentive given by the incentive setting unit 407.

[0045]

Next, an example of the movement route obtained from searching by the route guidance device 40 according to the present embodiment will be described with reference to FIG. 8. FIG. 8 is a diagram illustrating the example of the movement route obtained
15 from searching by the route guidance device 40 according to the present embodiment.

Here, the route contents of the movement routes 1 to 6 will be described with reference to FIG. 8.

The movement route 1 is a movement route to move by walk from the point of departure to an airport at A point, move by airplane from the airport at the A point to an
20 airport at B point, move by walk from the airport at the B point to a car rental shop at C point, and move to the destination by using a rental car that is rented at the car rental shop at the C point. A part of the movement route from the car rental shop at the C point to the destination overlaps the restricted area.

A movement route 2 is a movement route to move by walk from the point of
25 departure to a station at D point, move by train from the station at the D point to a station

at E point, move by walk from the station at the E point to a bus stop at F point, move by bus from the bus stop at the F point to a bus stop at G point, move by walk from the bus stop at the G point to the destination.

[0046]

5 The movement route 3 is a movement route to move by walk from the point of departure to a share-car pool at H point, move to the destination through the charging station at I point, by using a share-car that is rented at the share-car pool at the H point, and return the share-car in a share-car pool at J point. A part of the movement route from the charging station at the I point to the destination overlaps the restricted area.

10 The movement route 4 is a movement route to move by walk from the point of departure to the share-car pool at the H point, move to the share-car pool at L point by using a share-car that is rented at the share-car pool at the H point and transfer to another share-car therein, move to the destination, and return the share-car in the share-car pool at the J point. A part of the movement route from the share-car pool at the L point to
15 the destination overlaps the guided area.

[0047]

A movement route 5 is a movement route to move by walk from the point of departure to the share-car pool at the H point, move to the destination through the charging station at the I point by using a share-car that is rented at the share-car pool at
20 the H point, and return the share-car in the share-car pool at the K point. The movement route from the charging station at the I point to the destination overlaps the restricted area. The share-car pool at the K point overlaps the guided area.

A movement route 6 is a movement route to move by walk from the point of departure to the share-car pool at the H point, move to the share-car pool at the L point
25 by using a share-car that is rented at the share-car pool at the H point and to transfer to

another share-car therein, move to the destination, and return the share-car in the share-car pool at the K point. A part of the movement route from the share-car pool at the L point to the destination overlaps the guided area. The share-car pool at the K point overlaps the guided area.

5 [0048]

Next, an example of a route guidance method according to the present embodiment will be described with reference to FIG. 9. FIG. 9 is a flowchart illustrating an example of the route guidance method according to the present embodiment.

10 (Step ST101)

The dynamic table generation unit 402 of the route guidance device 40 generates the share-car pool dynamic table 411 and the charging station dynamic table 412, based on information which is received from the plurality of share-car pool management servers 11, 12, ... , the plurality of charging station management servers 21, 22, 23, ..., or
15 the plurality of on-board units 31, 32, 33, ... , and stores the share-car pool dynamic table 411 and the charging station dynamic table 412 in the storage unit 410. The dynamic table generation unit 402 is not limited thereto, and in a case of receiving information for calculating the usage fee for a share-car or a charging station, and information for calculating the waiting time for the share-car or the charging station, as facility
20 information, the dynamic table generation unit 402 may generate a dynamic table that stores the information in the storage unit 410.

[0049]

(Step ST102)

The dynamic table updating unit 403 of the route guidance device 40 updates
25 dynamic table that is stored in the storage unit 410, for example, the share-car pool

dynamic table 411, and the charging station dynamic table 412, at a predetermined timing, based on the facility information that is transmitted from the charging station management servers 21, 22, 23, ..., the share-car pool management servers 11, 12, ..., or the on-board unit 31, 32, 33, The dynamic table updating unit 403 updates each

5 dynamic table, in a case where, for example, a predetermined time has elapsed from the time when each dynamic table is generated, or in a case where a predetermined time has elapsed from the last update.

[0050]

(Step ST103)

10 Next, the user who is the owner of the terminal 50 inputs the point of departure and the destination to the terminal 50. The terminal 50 transmits information indicating the point of departure and the destination, which are received, to the route guidance device 40. Here, the terminal 50 receives a scheduled departure time, an estimated time for arrival, a priority condition and the like, and transmits the received information to the

15 route guidance device 40. The priority condition is a condition to be prioritized when searching for a movement route, and is, for example, information indicating the order of the condition to be prioritized, among the fee, the moving time, and the moving distance. The present embodiment is not limited thereto, and a condition that waiting time is the shortest, a baggage is not required, or there is no limit in the number of people is

20 determined as the priority condition.

[0051]

(Step ST104)

The movement route searching unit 405 of the route guidance device 40 searches for the movement route to a destination, including a facility for movement to be

25 used (buses, trains, airplanes, share-car, or rental car, or the like), based on the

information indicating the point of departure and the destination, which are received, by referring to the map information and the dynamic table of the storage unit 410. Then, the priority calculation unit 406 of the route guidance device 40 finds the priority of the movement route that is obtained from searching. The incentive setting unit 407 of the route guidance device 40 gives incentives to the movement routes, based on the priorities that are found by the priority calculation unit 406.

The details of the process will be described later.

Then, the route guidance unit 408 of the route guidance device 40 transmits the incentive that has been given by the incentive setting unit 407, and information indicating the route guidance for the movement route that is obtained from searching by the movement route searching unit 405, to the terminal 50.

(Step ST105)

The terminal 50 receives the information indicating the route guidance for the movement route from the route guidance device 40, and displays information indicating the route guidance for at least one movement route on the screen of the terminal 50. In this case, the terminal 50 displays the movement route to which an incentive has been given, in association with the incentive.

(Step ST106)

Then, the user selects any one of the movement routes being displayed, through the touch panel of the terminal 50, and instructs the reservation of the facility for movement to be used in the selected movement route.

The terminal 50 receives the reservation of the facility for movement to be used in the movement route selected by the user, and transmits information indicating the reservation of the facility for movement to be used in the selected movement route to the route guidance device 40.

[0052]

(Step ST107)

The reservation processing unit 409 of the route guidance device 40 executes a process of receiving the reservation, based on information received from the terminal 50 and the contents of the movement route selected by the user. Here, in a case where the incentive is given to the facility for movement to be used in the selected movement route, the reservation processing unit 409 gives an incentive to the user who has made a reservation. In other words, the reservation processing unit 409 stores information in which the contents of the movement route that is reserved and the information indicating the contents of the incentive given to the movement route, in the reservation information dynamic table 416.

[0053]

Next, an example of a route guidance process that is included in the route guidance method illustrated in FIG. 10 will be described with reference to FIG. 10. FIG. 10 is a flowchart illustrating an example of the route guidance process that is included in the route guidance method illustrated in FIG. 9.

(Step ST201)

The movement route searching unit 405 searches for a route to go from the point of departure to the destination by using at least one of predetermined facilities for movement (buses, trains, airplanes, share-cars, rental cars, or the like), by referring to the map information of the storage unit 410, based on the information indicating the point of departure and the destination, which are received from the terminal 50.

To be more specific, in a case where the point of departure and the destination are set, the movement route searching unit 405 searches for a facility for movement in a riding spot which is located in a range of a certain distance away from the point of

departure, and a facility for movement in a drop-off point which is located in a range of a certain distance away from the destination, with reference to the map information. In addition, the movement route searching unit 405 searches for a route from the facility for movement in the riding spot to the facility for movement in the drop-off point, with reference to the map information. The movement route searching unit 405 searches for the facility for movement passing through the route. Then, the movement route searching unit 405 searches for the route from the point of departure to the riding spot, and the route from the drop-off point to the destination, or the route from the destination to the drop-off point with reference to the map information. Then, the movement route searching unit 405 obtains the route using a facility for movement which is continuous from the point of departure to the destination. In a case of using a plurality of types of moving means (for example, walking, buses, trains, airplanes, share-cars, rental cars, or the like) from the point of departure to the destination, a route using a facility for movement which is continuous from the point of departure to the destination is obtained, based on the route by the plurality of types of moving means.

[0054]

For example, the movement route searching unit 405 obtains from searching, a movement route 1 to move by walk from the point of departure to the airport at the A point, move by airplane from the airport at the A point to the airport at the B point, move by walk from the airport of at the B point to the car rental shop at the C point, and move to the destination by using a rental car that is rented at the car rental shop at the C point, with reference to the static table for a time table and the map information.

The movement route searching unit 405 obtains from searching, a movement route 2 to move by walk from the point of departure to the station at the D point, move by train from the station at the D point to the station at the E point, move by walk from

the station at the E point to the bus stop at the F point, to move by bus from the bus stop at the F point to the bus stop at the G point, and move by walk from the bus stop at the G point to the destination, with reference to the static table for a time table and the map information.

5 The movement route searching unit 405 obtains from searching, a movement route 3 to move by walk from the point of departure to a share-car pool at the H point, move to the destination through the charging station at the I point, by using a share-car that is rented at the share-car pool at the H point, and return the share-car in a share-car pool at the J point, with reference to the map information.

10 The movement route searching unit 405 obtains from searching, a movement route 4 to move by walk from the point of departure to the share-car pool at the H point, move to the share-car pool at the L point by using a share-car that is rented at the share-car pool at the H point and transfer to another share-car therein, move to the destination, and to return the share-car in the share-car pool at the J point, with reference
15 to the map information.

[0055]

(Step ST202)

Next, the movement route searching unit 405 obtains the movement demand prediction values corresponding to the movement routes 1 to 4, with reference to the
20 congestion information, or the share-car pool dynamic table 411 or the charging station dynamic table 412 of the storage unit 410, which is received from the external information providing server 70. This movement demand prediction value includes congestion information indicating the road that is congested, the reservation statuses of the share-cars that are secured in the share-car pool, and the reservation statuses of the
25 chargers that are provided in the charging station.

[0056]

Then, the movement route searching unit 405 obtains the movement conditions of the movement route, based on the movement demand prediction value.

For example, the movement route searching unit 405 obtains the moving distance, the moving time, the usage fee, and the power consumption in a case of moving through the movement route 3, based on the map information and the movement condition information. The movement route searching unit 405 obtains the moving time in walking from the point of departure to the H point, based on the moving distance from the point of departure to the H point, and a predetermined walking speed. The movement route searching unit 405 obtains the moving time to the destination of the share-car, based on the moving distance from the share-car pool at the H point to the destination through the charging station at the I point and a predetermined travel speed. The movement route searching unit 405 obtains the time obtained by adding the moving time in walking to the moving time by the share-car, as the movement time in the movement route 3.

[0057]

Then, the movement route searching unit 405 obtains the delay time of the movement time, by using the movement demand prediction value of the type that is determined in advance depending on the facility for movement to be used in the route. The movement route searching unit 405 obtains a value obtained by adding the delay time to the movement time that is obtained based on the map information and the movement condition information, as the moving time corresponding to the movement demand.

For example, in a case where it is determined that the road from the I point to the destination in the movement route 3 is congested in the scheduled travel time zone of

the scheduled travel date, the movement route searching unit 405 obtains the congestion capacity of the road that is determined as being congested, based on the congestion information. The congestion capacity may be, for example, a distance of congestion, or information included in the congestion information. The movement route searching
5 unit 405 obtains that the arrival to the destination is delayed by a delay time which is determined in advance according to the obtained congestion capacity. The movement route searching unit 405 obtains a delay time which is determined in advance according to the obtained congestion capacity and scheduled travel date and time (including day of the week).

10 Further, the movement route searching unit 405 determines whether the use of the charger is congested in the scheduled arrival time of the scheduled travel date at the I point, based on the charging station dynamic table 412. For example, in a case where the ratio of the charger being in use among the chargers provided in the charging station is equal to or greater than the threshold, the movement route searching unit 405
15 determines that a charging station is congested. In this case, the movement route searching unit 405 obtains the congestion capacity of the use of the charger in the scheduled arrival time at the I point. The movement route searching unit 405 obtains the waiting time (in other words, the delay time) until the charger is available, based on the obtained congestion capacity and the reservation status.

20 In this manner, the movement route searching unit 405 obtains the value obtained by adding the delay time (including waiting time) to the movement time obtained based on the map information and the movement condition information, as a moving time corresponding to the movement demand.

[0058]

25 Further, the movement route searching unit 405 obtains the moving distance, the

moving time, the usage fee, and the power consumption in a case of moving through the movement route 4, based on the map information and the movement condition information. The movement route searching unit 405 obtains the moving time in walking from the point of departure to the H point, based on the moving distance from the point of departure to the H point, and a predetermined walking speed. The movement route searching unit 405 obtains the moving time of the share-car to the destination, based on the moving distance from the share-car pool at the H point to the destination through the share-car pool at the L point, and a predetermined travel speed of the share-car.

10 The movement route searching unit 405 obtains the time obtained by adding the moving time in walking and the moving time by the share-car, as the movement time in the movement route 4.

[0059]

Further, the movement route searching unit 405 obtains the delay time of the moving time, by using the movement demand prediction value of the type that is determined in advance according to the facility for movement that is used in the route. The movement route searching unit 405 obtains a value obtained by adding the delay time to the movement time that is obtained based on the map information and the movement condition information, as the moving time corresponding to the movement demand.

For example, the movement route searching unit 405 determines whether or not share-cars of a certain number (for example, one) or more are secured in the scheduled arrival time of the scheduled travel date at the L point, based on the share-car pool dynamic table 411. In a case where it is determined that share-cars of a certain number or more are not secured, the movement route searching unit 405 obtains the congestion

capacity of the use of the share-car in the scheduled arrival time at the L point. The movement route searching unit 405 obtains the waiting time (in other words, the delay time) until the share-car is available, based on the obtained congestion capacity and the reservation status. Then, the movement route searching unit 405 obtains the value
5 obtained by adding the waiting time until the share-car is available to the movement time obtained based on the map information and the movement condition information, as a moving time corresponding to the movement demand.

[0060]

Further, the movement route searching unit 405 obtains the moving distance, the
10 moving time, and the usage fee in a case of moving through the movement route 1, based on the map information, a static table for a time table, and the movement condition information. The movement route searching unit 405 obtains the moving time in walking from the point of departure to the A point, and the moving time in walking from the B point to the C point, based on the sum of the moving distance from the point of
15 departure to the A point and the moving distance from the B point to the C point, and a predetermined walking speed. The movement route searching unit 405 obtains the flight time from the A point to the B point, and the travel time from the C point to the destination. The movement route searching unit 405 obtains the sum of the movement time in walking, the flight time by airplane, and a travel time by a rental car, as the
20 movement time in the movement route 1.

[0061]

Further, the movement route searching unit 405 obtains the moving distance, the
moving time, and the usage fee in a case of moving through the movement route 2, based on the map information, a static table for a time table, and the movement condition
25 information. The movement route searching unit 405 obtains the moving time in

walking from the point of departure to the D point, and the moving time in walking from the E point to the F point, based on the sum of the moving distance from the point of departure to the D point and the moving distance from the F point to the G point, and a predetermined walking speed. The movement route searching unit 405 obtains the travel time by train from the D point to the E point, and the travel time by bus from the F point to the G point. The movement route searching unit 405 obtains the sum of the movement time in walking, the travel time by train and the travel time by bus, as the movement time in the movement route 2.

[0062]

10 (Step ST203)

Next, the priority calculation unit 406 reads the guiding and restricting information corresponding to the movement route area including the movement routes 1 to 4 and the surrounding area thereof, from the storage unit 410, in the respective movement time zones of the movement routes 1 to 4. This storage unit 410 stores the guiding and restricting information which is obtained in advance by the guiding and restricting information calculation unit 404.

[0063]

(Step ST204)

Then, the priority calculation unit 406 finds the respective priorities of the movement routes obtained from searching by the movement route searching unit 405, based on the acquired guiding and restricting information.

For example, the priority calculation unit 406 determines that a part of the movement route of the movement route 1 through which the rental car travels overlaps the restricted area. In this case, the priority calculation unit 406 assigns a negative evaluation value corresponding to the restricted area, as the priority of the movement

route 1.

Further, the priority calculation unit 406 determines that a part of the movement route of the movement route 4 through which the share-car travels overlaps the guided area. In this case, the priority calculation unit 406 assigns a positive evaluation value
5 corresponding to the guided area, as the priority of the movement route 4.

[0064]

(Step ST205)

Then, the movement route searching unit 405 determines whether or not there is an guided area or a restricted area, in the vicinities of the movement routes 1 to 4.

10 (Step ST206)

In a case where it is determined that there is the guided area or the restricted area, in the vicinity of any one route out of the movement routes 1 to 4, the movement route searching unit 405 searches for a movement route through this guided area, or a movement route without passing through the restricted area.

15 For example, the movement route searching unit 405 determines that there is a share-car pool of the K point that is included in the guided area, in the vicinities of the drop-off positions in the route 3 and route 4. In this case, the movement route searching unit 405 searches for a movement route in which the share-car pool at the J point of the drop-off position is replaced with the share-car pool at the K point in the route 3 and
20 route 4. Here, the route guidance device 40 obtains the movement route 5 and the movement route 6, which will be described below, from searching.

In other words, the movement route searching unit 405 obtains from searching a movement route 5 to move by walk from the point of departure to the share-car pool at the H point, move to the destination through the charging station at the I point by using a
25 share-car that is rented at the share-car pool at the H point, and return the share-car in the

share-car pool at the K point, with reference to the map information.

Further, the movement route searching unit 405 obtains from searching, a movement route 6 to move by walk from the point of departure to the share-car pool at the H point, move to the share-car pool at the L point by using a share-car that is rented at the share-car pool at the H point and transfer to another share-car therein, move to the destination, and return the share-car in the share-car pool at the K point, with reference to the map information.

[0065]

Then, the route guidance device 40 executes the process of steps ST202 to 205, for the movement route 5 and the movement route 6, which are obtained from searching.

In other words, the movement route searching unit 405 obtains the movement demand prediction values corresponding to the movement routes 5, 6, with reference to the congestion information, or the share-car pool dynamic table 411 or the charging station dynamic table 412 of the storage unit 410, which is received from the external information providing server 70. Then, the movement route searching unit 405 obtains the movement conditions (the moving distances, the moving times, the usage fees, and the power consumptions) of the movement routes 5, 6, based on the obtained movement demand prediction value.

Next, the priority calculation unit 406 reads the guiding and restricting information corresponding to the movement route areas including the movement routes 5, 6 and the surrounding area thereof, from the storage unit 410, in the respective movement time zones of the movement routes 5, 6. Then, the priority calculation unit 406 finds the respective priorities of the movement routes 5, 6 obtained from searching by the movement route searching unit 405, based on the acquired guiding and restricting information.

[0066]

(Step ST207)

Then, the priority calculation unit 406 determines the priorities of the movement routes 1 to 6, based on the found priority, and writes the priorities to the movement route table 415. The incentive setting unit 407 determines the incentives of the movement routes 1 to 6, based on the priorities that are obtained by the priority calculation unit 406.

[0067]

(Step ST208)

Next, the route guidance unit 408 provides the incentive that is given by the incentive setting unit 407, and the route guidance for a movement route obtained from searching by the movement route searching unit 405, to the terminal 50, with reference to the movement route table 415. The route guidance unit 408 may provide a movement route in the descending order of the priority. In a case where the priority conditions are set by the user, the movement route satisfying the priority condition may be provided to the user.

For example, in a case where a cheap fee is set as a priority condition, the route guidance unit 408 compares the discounted fees after the fees were discounted by applying the incentive, and provides route guidance for movement routes in order from the cheapest fee, or a movement route for which the fee is cheapest.

[0068]

In the movement routes 1 to 6 illustrated in FIG. 8, a discount due to an incentive is made to the movement routes 6, 4 having the first and second priorities. A discount due to an incentive is not made to the movement route 2 having the third priority. The route guidance unit 408 can provide route guidance for the movement routes having the first to third priorities to the terminal 50. The route guidance unit 408

does not provide route guidance for the movement routes other than those having the first to third priorities. In addition, in a case where the fee is set as the priority condition, the route guidance unit 408 provides route guidance for the movement routes 6, 4, 3, 5 having top three priorities, in order from the cheapest fee, from among movement routes illustrated in Fig. 6.

[0069]

The present embodiment is not limited to the above-described configuration. For example, the guiding and restricting information calculation unit 404 determines the number of share-cars that are wanted to be moved to the share-car pool and a limit time, based on a movement demand prediction value after a predetermined time from the current time, and gives guiding and restricting information in which the share-car pool is a guided area.

For example, it is assumed that the guiding and restricting information calculation unit 404 obtains a movement demand prediction value indicating that the use of four or more share-cars are predicted, in the share-car pool of K point after 2 hours from the current time. Since there are only two share-cars in the share-car pool at the current time, there is a need to increase the number of share-cars by two until 2 hours. In this case, the guiding and restricting information calculation unit 404 assigns guiding and restricting information of a positive predetermined value, for the use of dropping off the share-car in a share-car pool at the K point, from the current time until 2 hours. In other words, the guiding and restricting information calculation unit 404 associates information indicating the guided area with position information of the share-car pool at the K point that is used for the drop-off location of the share-car.

Thus, the incentive setting unit 407 gives an incentive to the routes 5, 6.

Therefore, it is possible to reduce the fee on the movement routes 5, 6 using the share-car

pool at K point, as compared to the movement routes 3, 4 using the share-car pool at J location, as the share-car pool in a drop-off point. Accordingly, an increase in users who use the movement routes 5, 6 can be expected.

In a case where the number of share-cars in the share-car pool at K point reaches a target number (for example, 4), the guiding and restricting information calculation unit 404 removes the guiding and restricting information in which the share-car pool at K point is an guided area, from the guiding and restricting information table 414. As a result, the K point is no longer any of the guided area and the restricted area. In other words, in a case where the number of share-cars reaches a predetermined guiding target value, the guiding and restricting information calculation unit 404 releases the setting of the guided area, for the region that is set to the guided area. Further, in a case where the number of share-cars reaches a predetermined restriction target value, the guiding and restricting information calculation unit 404 releases the setting of the restricted area, for the region that is set to the restricted area.

[0070]

The route guidance device 40 according to the present embodiment finds the priorities of a plurality of movement routes which are obtained through the searching by the movement route searching unit 405, based on the guiding and restricting information regarding a location or a facility for movement to which a moving object is to be guided, or a location or a facility for movement from which the moving object is to be restricted, and gives an incentive to the movement routes based on the found priorities.

This configuration enables the route guidance device 40 to provide route guidance for a movement route for dispersing the movements of the crowded people and vehicles. This makes it possible to relieve the traffic congestion or improve the efficiency of use of the facility for movement, by dispersing the movements of the

crowded people and vehicles.

Further, the route guidance device 40 can realize the route guidance for a movement route, by which both the wish of the user (the provision of route guidance for the movement route that satisfies a priority condition) and the wish of the region and business man (relief of traffic congestion, guiding of people into a tourist spot, a commercial facility, or a special event) are realized.

[0071]

Further, the incentive setting unit 407 of the route guidance device 40 according to the present embodiment obtains an incentive corresponding to the movement route, based on the guiding and restricting information. The guiding and restricting information calculation unit 404 can give a stepwise value corresponding to the extent to be guided, or the extent to be restricted, as the guiding and restricting information. With this configuration, it is possible to set a stepwise guiding level for the guided area, and determine the priorities of the guided areas. Similarly, it is possible to set the stepwise regulation level for the restriction area, and determine the priorities of the restricted areas.

Further, the incentive setting unit 407 of the route guidance device 40 according to the present embodiment obtains an incentive corresponding to the movement route, based on the actual value of the movement demand of the moving object. The incentive setting unit 407 can give an incentive having a high discount fee, or having a high number of points to be given, to main roads which are always congested, based on the actual value of the movement demand of the moving object. With this configuration, it is possible to increase the possibility of guiding by assigning a higher incentive as the performance of the movement demand of the moving object, to the area for which the guiding is difficult.

[0072]

Further, the movement route searching unit 405 of the route guidance device 40 according to the present embodiment searches for a movement route that passes through the location or the facility for movement to which the moving object is to be guided, or a movement route that does not pass through the location or the facility for movement from which the moving object is to be restricted, based on the guiding and restricting information. This configuration enables the route guidance device 40 to make the movements of people or vehicles be crowded in the guided area, and to make the movements of people or vehicles be dispersed in the restricted area.

[0073]

Further, the movement route searching unit 405 of the route guidance device 40 according to the present embodiment searches for a movement route, based on the time tables that are provided for public transportation, and the movement demand prediction value (congestion, reservation of a share-car, date of the week, and time zone) of the moving object. With this configuration, the route guidance device 40 can provide route guidance for an optimal movement route, among all available facilities for movement.

[0074]

Further, the guiding and restricting information calculation unit 404 of the route guidance device 40 according to the present embodiment rewrites the guiding and restricting information of the guiding and restricting information table 414, depending on a time zone, a day of the week, season, and a region. With this configuration, it is possible to change the guided area or the restricted area, depending on a predetermined time, a day of week, season, and a region. Thus, the guiding and restricting information calculation unit 404 can assign the guiding and restricting information depending on the flows of people or vehicles which change depending on a time, a day of the week, season,

a special event, or the like.

[0075]

Further, the movement route searching unit 405 of the route guidance device 40 according to the present embodiment can search for a route to the destination including
5 the facility for movement to be used, based on map information and facility information. Accordingly, the route guidance device 40 can determine the facility for movement to be used, in the route to the destination, and provide the determined route and the facility for movement to be used, to the user. Therefore, the user can know the facility for movement to be used in the route to destination, only by specifying the destination and
10 the arrival location.

[0076]

Further, the dynamic table updating unit 403 of the route guidance device 40 according to the present embodiment can update the dynamic table, based on information which is received from a terminal, a share-car pool, a charging station, or an on-board
15 unit. Thus, even in a case where the facility information that varies due to the use of the share-car, for example, the use number and the available time zones of the share-cars that are secured in a share-car pool, available chargers in a charging station and the available time zone thereof, and the remaining charge capacity of the share-car change vary every moment, it is possible to reflect the information according to the latest use state in the
20 dynamic table.

Further, the movement route searching unit 405 of the route guidance device 40 according to the present embodiment searches for a route from the point of departure to the destination with reference to the dynamic table that is updated by the dynamic table updating unit 403, and specifies a share-car pool that are used in the route obtained by the
25 search. Thus, the movement route searching unit 405 can search for a movement route

according to the latest use state and provide the movement route to the user.

[0077]

Further, the movement route searching unit 405 of the route guidance device 40 according to the present embodiment creates a movement plan including a movement
5 route between the point of departure or the current position and the first shared car pool in a route, and a movement route between the destination and the last shared car pool in a route, based on the map information and the facility information. For example, a movement plan is generated which includes a determination as to whether to go from the current position of the user to the first share-car pool by walk or by train, and the route.
10 Thus, the user can know a share-car pool or a charging station that is used in a route to a destination, only by designating the destination and the arrival location.

[0078]

The program for implementing the functions of the route guidance device 40 in the present embodiment may be recorded on a computer readable recording medium, and
15 the process may be performed by causing a computer system to read and execute the program that is recorded in the recording medium. The “computer system” which is referred to herein includes an OS and hardware such as peripheral devices.

Further, the “computer system” also includes a WWW system having a homepage providing environment (or display environment). In addition, the
20 “computer-readable recording medium” refers to a portable medium such as a flexible disk, a magneto-optical disk, a ROM, and a CD-ROM, and a storage device such as a hard disk built into the computer system. Furthermore it is assumed that the “computer-readable recording medium” includes those holding a program for a predetermined time, such as a volatile memory (RAM) inside a computer system which
25 is a server or a client in a case where the program is transmitted through a network such

as the Internet, or a communication line such as a telephone line.

[0079]

Further, the above program may be transmitted to other computer systems through a transmission medium or through transmission waves in the transmission medium, from a computer system which stores the program in a storage device or the like. Here, the “transmission medium” that transmits the program refers to a medium having a function of transmitting information, through a network (communication network) such as the Internet, or a communication line such as a telephone line. Further, the program may implement a part of the above-mentioned functions. Furthermore, the program may be implemented in combination with a program that is already recorded in the computer system having above-mentioned functions, that is, a so-called differential file (differential program).

Industrial Applicability

[0080]

It is possible to provide a route guidance device, a route guidance method, and a program described above, that are capable of providing route guidance for a movement route for dispersing the movements of the crowded people and vehicles.

Reference Signs List

[0081]

11 SHARE-CAR POOL MANAGEMENT SERVER

21 CHARGING STATION MANAGEMENT SERVER

31 ON-BOARD UNIT

40 ROUTE GUIDANCE DEVICE

	50	TERMINAL
	61	SHARE-CAR
	70	EXTERNAL INFORMATION PROVIDING SERVER
	71	CHARGER
5	101	SHARE-CAR POOL
	201	CHARGING STATION
	401	COMMUNICATION UNIT
	402	DYNAMIC TABLE GENERATION UNIT
	403	DYNAMIC TABLE UPDATING UNIT
10	404	GUIDING AND RESTRICTING INFORMATION CALCULATION
		UNIT
	405	MOVEMENT ROUTE SEARCHING UNIT
	406	PRIORITY CALCULATION UNIT
	407	INCENTIVE SETTING UNIT
15	408	ROUTE GUIDANCE UNIT
	409	RESERVATION PROCESSING UNIT
	410	STORAGE UNIT
	411	SHARE-CAR POOL DYNAMIC TABLE
	412	CHARGING STATION DYNAMIC TABLE
20	413	STATIC TABLE FOR A TIME TABLE
	414	GUIDING AND RESTRICTING INFORMATION TABLE
	415	MOVEMENT ROUTE TABLE
	416	RESERVATION INFORMATION DYNAMIC TABLE

CLAIMS

1. A route guidance device comprising:
 - a guiding and restricting information calculation unit that calculates a movement demand prediction value based on a movement actual value of a moving object collected in the past, and creates guiding and restricting information in which sum of the movement demand prediction value is in association with position information of a location or a facility for movement to which the moving object is to be guided, or a location or a facility for movement from which the moving object is to be restricted;
 - a movement route searching unit that searches for a plurality of movement routes to a destination, including a facility for movement to be used, based on information regarding the facility for movement and map information;
 - a priority calculation unit that finds priorities of the plurality of movement routes which are obtained from searching by the movement route searching unit, based on the guiding and restricting information;
 - an incentive setting unit that gives incentives to the movement routes, based on the priorities that are found by the priority calculation unit; and
 - a route guidance unit that provides route guidance for the movement route, and the incentives that are given by the incentive setting unit.
2. The route guidance device according to Claim 1,
 - wherein the incentive setting unit obtains an incentive depending on the movement route, based on the guiding and restricting information, or an actual value of a movement demand of the moving object.
3. The route guidance device according to Claim 1 or 2,
 - wherein the movement route searching unit searches for a movement route that passes through the location or the facility for movement to which the moving object is to be guided, or a movement route that does not pass through the location or the facility for movement from which the moving object is to be restricted, based on the guiding and restricting information.
4. The route guidance device according to any one of Claims 1 to 3,
 - wherein the movement route searching unit searches for the movement route, based on a timetable that is provided for public transportation and the movement demand prediction value for the moving object.
5. A route guidance method comprising:

a guiding and restricting information calculation step of calculating a movement demand prediction value based on a movement actual value of a moving object collected in the past, and creating guiding and restricting information in which sum of the movement demand prediction value is in association with position information of a location or a facility for movement to which the moving object is to be guided, or a location or a facility for movement from which the moving object is to be restricted;

a movement route searching step of searching for a plurality of movement routes to a destination, including a facility for movement to be used, based on information regarding the facility for movement and map information;

a priority calculation step that finds priorities of the plurality of movement routes which are obtained from searching in the movement route searching step, based on the guiding and restricting information;

an incentive setting step of giving incentives to the movement routes, based on the priorities that are found in the priority calculation step; and

a route guidance step of providing route guidance for the movement route, and the incentives that are given in the incentive setting step.

6. A program causing a computer to function as:

guiding and restricting information calculation means of calculating a movement demand prediction value based on a movement actual value of a moving object collected in the past, and creating guiding and restricting information in which sum of the movement demand prediction value is in association with position information of a location or a facility for movement to which the moving object is to be guided, or a location or a facility for movement from which the moving object is to be restricted;

movement route searching means for searching for a plurality of movement routes to a destination, including a facility for movement to be used, based on information regarding the facility for movement and map information;

priority calculation means for finding priorities of the plurality of movement routes which are obtained from searching by the movement route searching means, based on the guiding and restricting information;

incentive setting means for giving incentives to the movement routes, based on the priorities that are found by the priority calculation means; and

route guidance means for providing route guidance for the movement route, and the incentives that are given by the incentive setting means.