(54) [Title of the invention] Vehicle dispatch guidance system and vehicle dispatch guidance method

(57) [Abstract]
[Problem] When a user requests dispatch of a vehicle such as a taxi, to make it possible to provide the user with an approximate indication of the time required for the requested vehicle to arrive at the user’s waiting location and the like.

[Solution] ASP 4 receives taxi 3 location information transmitted from taxi 3, and when a user who wishes to request dispatch of taxi 3 makes a dial-up connection to ASP 4 using a portable terminal 1, switching station 7A transmits location information for portable terminal 1 to ASP 4 as the current location of the user. ASP 4 searches a map DB 15 based on this user location information, extracts map data for the vicinity of the user, and, if the location of an available taxi is contained within this vicinity map, adds display data representing the user at the current location of the user on said map, adds display data representing a taxi at the current location of the available taxi 3, and transmits this together with the vicinity map to portable terminal 1 and causes it to be displayed thereon.
[Scope of patent claims]
[Claim 1] A vehicle dispatch guidance system characterized in that it comprises:
a vehicle which has a radio unit, an operating unit for designating a state of either available vehicle or occupied vehicle, and a GPS navigation unit which detects its own location based on signals from artificial satellites, which vehicle transmits designation information from said operating unit and location information detected by said GPS navigation unit via said radio unit;
a center which is connected to the Internet and which has a database storing map data and a radio unit which exchanges information with said vehicle via radio signals; and
a switching station which, in response to a connection of a portable terminal possessed by a vehicle dispatch requester to said center via the Internet, transmits the location information of said portable terminal to said center;
wherein said center comprises:
a reception means which receives, via said radio unit, said designation information transmitted from said vehicle;
an acquisition means which, upon reception via said radio unit of location information transmitted from a vehicle for which available vehicle designation information has been received by said reception means, acquires this location information as available vehicle location information;
a search means which, upon reception of location information of said portable terminal from said switching station, searches said database based on the received location information;
a generating means which generates map information to which vehicle display data which represents said vehicle dispatch requester has been added at the location of said portable terminal on the map data retrieved by said search means, and to which vehicle display data representing a vehicle is added at the location of said available vehicle on said map data if the available vehicle location information acquired by said acquisition means is contained within said map data; and
a display control means which transmits the map information generated by said generating means to said portable terminal and causes it to be displayed thereon.

[Claim 2] The vehicle dispatch guidance system of claim 1, characterized in that said switching station has a telephone number transmission means which, in response to the connection of a portable terminal to said center via the Internet, transmits the telephone number of said portable terminal to said center; and
said center comprises a notification means which, if a vehicle displayed as said vehicle display data on said portable terminal after transmission of said map information to said portable terminal by said display control means is selected as a dispatch requested vehicle by said portable terminal, said generating means generates vehicle display data for the selected vehicle distinguishable from vehicle display data for non-selected vehicles, and said display control means transmits said vehicle display data generated by said generating means to said portable terminal and causes it to be displayed thereon.

[Claim 3] The vehicle dispatch guidance system of claim 2, characterized in that said center comprises a customer database in which customer telephone numbers and customer names are registered in pairs, and said notification means reads the customer name corresponding to the telephone number transmitted from said vehicle dispatch instruction means, and notifies said selected vehicle using this customer name as said vehicle dispatch instruction information.

[Claim 4] The vehicle dispatch guidance system of claim 1, characterized in that said vehicle comprises an attribute data transmission means which transmits vehicle attribute data including a predetermined base fare, vehicle model and number, and name and sex of driver; and
said generating means, upon receiving said vehicle attribute data from said attribute data transmission means of an available vehicle for which location information has been acquired by said acquisition means, generates vehicle attribute display data in which the received data is associated with said vehicle display data, and said display control means transmits said vehicle attribute data generated by said generating means to said portable terminal and causes it to be displayed thereon.

[Claim 5] The vehicle dispatch guidance system of claim 1, characterized in that, if a vehicle displayed as said vehicle display data on said portable terminal after transmission of said map information to the portable terminal by said display control means is selected as a dispatch requested vehicle by said portable terminal, said generating means generates vehicle display data for the selected vehicle distinguishable from vehicle display data for non-selected vehicles, and said display control means transmits said vehicle display data generated by said generating means to said portable terminal and causes it to be displayed thereon.

[Claim 6] The vehicle dispatch guidance system of claim 2, characterized in that, when said selected vehicle receives vehicle dispatch instruction information from said notification means and initiates travel to the location of said portable terminal, said acquisition means successively acquires location information transmitted from said selected vehicle; said generating means generates map information to which said vehicle display data is added at the acquired location of said acquisition means on said map data each time said location information is acquired by said acquisition means; and said display control means transmits said vehicle display data generated by said generating means to said portable terminal and causes it to be displayed thereon.

[Claim 7] The vehicle dispatch guidance system of claim 4, characterized in that beacons are provided along roads travelled by said vehicle;
said center comprises: a detection means which detects vehicle congestion status based on signals from said beacons, and
a computation means which computes the time required between the available vehicle location acquired by said acquisition means and the location of said portable terminal based on the distance between the locations and the detection results of said detection means; and
said generating means, upon receiving said time required, computed by said computation means, as said vehicle attribute data, generates vehicle attribute display data in which this vehicle attribute data is associated with said vehicle display data, and said display control means transmits said vehicle attribute display data generated by said generating means to said portable terminal and causes it to be displayed thereon.

[Claim 8] The vehicle dispatch guidance system of claim 1, characterized in that
said switching station is connected to said portable terminal via base stations, and comprises:
a detection means which wirelessly connects a first through third base stations, centered about said portable terminal and arranged closest to this portable terminal, with said portable terminal, and detects the field intensity levels from the portable terminal to the first through third base stations; and
a location computation means which draws spheres having the arrangement point of the respective first through third base stations as the center point and a radius inversely proportional to the field intensity level detected by said detection means about these three center points, and computes the intersection point of these three spheres as the location of said portable terminal.

[Claim 9] A vehicle dispatch guidance method characterized in that it comprises:
a 1st step of receiving designation information, transmitted from a vehicle and designating either an available vehicle or occupied vehicle state;
a 2nd step of receiving vehicle location information detected based on signals from artificial satellites;
a 3rd step in which location information, received based on the processing of said 2nd step from a vehicle for which available vehicle designation information has been received based on the processing of the 1st step, is acquired as available vehicle location information;
a 4th step in which, in response to a connection of a portable terminal possessed by a vehicle dispatch requester to a center via the Internet, the location information of said portable terminal is transmitted from a switching station to the center;
a 5th step in which, upon reception of the location information of said portable terminal transmitted based on the processing of said 4th step, a database storing map data is searched based on the location information of said portable terminal, and map data corresponding to the location information of said portable terminal is acquired;
a 6th step in which map information is generated, to which requester display data which represents said vehicle dispatch requester has been added at the location of said portable terminal on said map data acquired based on the processing of said 5th step, and to which vehicle display data representing a vehicle is added at the location of said available vehicle on said map data if the available vehicle location information acquired based on the processing of said 3rd step is contained within said map data; and
a 7th step in which the map information generated based on the processing of said 6th step is transmitted to and displayed on said portable terminal and caused to be displayed thereon.

[Claim 10] The vehicle dispatch guidance method of claim 9, characterized in that it comprises:
an 8th step in which, in response to a connection of said portable terminal to said center via the Internet, the telephone number of said portable terminal is transmitted from the switching station to the center; and
a 9th step in which, after said map information has been transmitted to and displayed on said portable terminal based on the processing of said 7th step, if a vehicle displayed as said vehicle display data on said portable terminal is selected as a dispatch requested vehicle by said portable terminal, said selected vehicle is notified using the location information of said portable terminal and the telephone number based on the processing of said 8th step as vehicle dispatch instruction information.

[Claim 11] The vehicle dispatch guidance method of claim 10, characterized in that the processing of said 9th step includes a 10th step in which the customer name corresponding to the telephone number based on the processing of said 8th step is extracted from a customer database in which customer names and telephone numbers are registered in advance in pairs, and said selected vehicle is notified using this customer name as said vehicle dispatch instruction information.

[Claim 12] The vehicle dispatch guidance method of claim 9, characterized in that it comprises an 11th step of receiving vehicle attribute data transmitted from an available vehicle and including the base fare, vehicle model and number, and driver’s name and sex; the processing of said 6th step includes a 12th step in which said vehicle attribute data received based on the processing of said 11th step is associated with said vehicle display data to generate vehicle attribute display data; and the processing of said 7th step includes a 13th step of transmitting the vehicle attribute display data generated based on the processing of said 12th step to said portable terminal and causing it to be displayed thereon.

[Claim 13] The vehicle dispatch guidance method of claim 9, characterized in that the processing of said 6th step includes a 14th step in which, after said map information has been transmitted to and displayed on said portable terminal based on the processing of said 7th step, if a vehicle displayed as said vehicle display data on said portable terminal is selected as a dispatch requested vehicle by said portable terminal, vehicle display data for the selected vehicle is generated so as to be distinguishable from the vehicle display data for non-selected vehicles; and
the processing of said 7th step includes a 15th step in which the vehicle display data generated based on the processing of said 14th step is transmitted to and caused to be displayed on said portable terminal.

[Claim 14] The vehicle dispatch guidance method of claim 10, characterized in that it comprises a 16th step of successively receiving location information transmitted from said selected vehicle which has received vehicle dispatch instruction information based on the processing of said 9th step and has initiated travel to the location of said portable terminal;
the processing of said 6th step includes a 17th step of generating map information wherein said vehicle display data has been added at the location of said selected vehicle on said map data each time said location information is received based on the processing of said 16th step; and
the processing of said 7th step includes a 18th step in which the map information generated based on the processing of said 17th step is transmitted to and caused to be displayed on said portable terminal.

[Claim 15] The vehicle dispatch guidance method of claim 12, characterized in that it comprises a 19th step of detecting the congestion status of said vehicle based on signals from beacons provided along roads travelled by said vehicle; and
a 20th step in which the time required between the available vehicle location acquired based on the processing of said 3rd step and the location of said portable terminal transmitted based on the processing of said 4th step is computed based on the distance between the respective locations and the processing results of said 19th step;
the processing of said 6th step includes a 21st step in which said time required, computed based on the processing of said 20th step, is received as vehicle attribute data and is associated with said vehicle display data to generate said vehicle display attribute data; and

the processing of said 7th step includes a 22nd step in which the vehicle attribute display data generated based on the processing of said 21st step is transmitted to said portable terminal and caused to be displayed thereon.

[Claim 16] The vehicle dispatch guidance method of claim 9, characterized in that it comprises:
a 23rd step in which said portable terminal is wirelessly connected to a first through third base stations centered around said portable terminal and arranged closest to this portable terminal, and the field intensity levels from the portable terminal to the first through third base stations are detected; and

a 24th step in which spheres are drawn having the arrangement points of the third through third base stations as the center points and a radius inversely proportional to the respective field intensity level detected about these three center points based on the processing of said 22nd step, and the intersection point of these three spheres is computed as the location of said portable terminal; and

the processing of said 4th step includes a 25th step in which said portable terminal is wirelessly connected to the first through third base stations centered around said portable terminal and arranged closest to this portable terminal, and the field intensity levels from the portable terminal to the first through third base stations are detected; and

[Means for solving the problem] To resolve this problem, the present invention comprises: a vehicle which has a radio unit, an operating unit for designating a state of either available vehicle or occupied vehicle, and a GPS navigation unit which detects its own location based on signals from artificial satellites, which vehicle transmits designation information from the operating unit and location information detected by the GPS navigation unit via the radio unit; a center (ASP: application service provider) which is connected to the Internet and which has a DB storing map data and a radio unit which exchanges information with the vehicle via radio signals; and a switching station which, in response to a connection of a portable terminal possessed by a vehicle dispatch requester to the center via the Internet, transmits the location information of the portable terminal to the center; wherein the ASP comprises: a reception means which receives the designation information transmitted from the vehicle; an acquisition means which, upon reception of location information transmitted from a vehicle for which available vehicle state designation information has been received by the reception means, acquires this location information as available vehicle location information; a search means which, upon reception of location information of the portable terminal from the switching station, searches the DB based on the received location information; a generating means which generates map information to which requester display data which represents the vehicle dispatch requester has been added at the location of the portable terminal on the map data retrieved by the search means, and to which vehicle display data representing a vehicle is added at the location of the available vehicle on the map data if the available vehicle location information acquired by the acquisition means is contained within the map data; and a display control means which transmits the map information generated by the generating means to the portable terminal and causes it to be displayed thereon.

[0006] In another aspect of the invention, the switching station comprises a telephone number transmission means which, in response to the connection of a portable terminal to the ASP via the Internet, transmits the telephone number of the portable terminal to the ASP; and the ASP comprises a notification means which, if a vehicle displayed as vehicle display data on the portable terminal after transmission of map information to the portable terminal by the display control means is selected by the portable terminal as a dispatch requested vehicle, notifies the selected vehicle using the telephone number from the telephone number transmission means and the location information of the portable terminal as vehicle dispatch instruction information. In yet another aspect of the invention, the ASP comprises a customer DB in which customer telephone numbers and customer names are registered in pairs, and the notification means extracts from the customer DB the customer name corresponding to the telephone number transmitted from the telephone number transmission means and notifies the selected vehicle using this customer name as vehicle dispatch instruction information. In another aspect of the invention, the vehicle comprises an attribute data transmission means which transmits vehicle attribute data including a predetermined base fare, vehicle model and number and driver name and sex, and the generating means, upon reception of vehicle attribute data transmitted from the attribute data transmission means of an available vehicle for which location information has been acquired by the
acquisition means, associates the received data with vehicle display data to generate vehicle attribute display data, and the display control means transmits the vehicle attribute data generated by the generating means to the portable terminal and causes it to be displayed thereon.

[0007] In another aspect of the invention, after transmission of map information to the portable terminal by the display control means, if a vehicle displayed as vehicle display data on the portable terminal is selected as a dispatch requested vehicle by the portable terminal, the generating means generates vehicle display data for the selected vehicle so as to be distinguishable from the vehicle display data for non-selected vehicles, and the display control means transmits the vehicle display data generated by the generating means to the portable terminal and causes it to be displayed thereon. In another aspect of the invention, when the selected vehicle receives vehicle dispatch instruction information from the notification means and initiates travel to the location of the portable terminal, the acquisition means successively acquires location information transmitted from the selected vehicle, and the generating means generates map information to which vehicle display data has been added at the location acquired by the acquisition means on the map data each time location information is acquired by the acquisition means, and the display control means transmits the map information generated by the generating means to the portable terminal and causes it to be displayed thereon.

[0008] In another aspect of the invention, beacons are provided along roads travelled by the vehicles, the ASP comprises a detection means which detects the congestion status of the vehicles based on signals from the beacons and a computation means which computes the time required between the location of the available vehicle acquired by the acquisition means and the location of the portable terminal based on the distance between the locations and the detection results of the detection means; the generating means, upon receiving the time required, computed by the computation means, as vehicle attribute data, associates this vehicle attribute data with vehicle display data to generate vehicle attribute display data; and the display control means transmits the vehicle attribute display data generated by the generating means to the portable terminal and causes it to be displayed thereon. In yet another aspect of the invention, the switching station which is connected to the portable terminal via base stations comprises: a detection means which wirelessly connects a first through third base stations, centered about the portable terminal and arranged closest to this portable terminal, with the portable terminal, and detects the field intensity levels from the portable terminal to the first through third base stations; and a location computation means which wirelessly connects a first through third base stations, centered about these three center points, and computes the intersection point of these three spheres as the location of the portable terminal.

[0009] Furthermore, the present invention is a method comprising: a 1st step of receiving designation information, transmitted from a vehicle and designating either an available vehicle or occupied vehicle state; a 2nd step of receiving vehicle location information detected based on signals from artificial satellites; a 3rd step in which location information, received based on the processing of the 2nd step from a vehicle for which available vehicle designation information has been received based on the processing of the 1st step, is acquired as available vehicle location information; a 4th step in which, in response to a connection of a portable terminal possessed by a vehicle dispatch requester to an ASP via the Internet, the location information of the portable terminal is transmitted from a switching station to the ASP; a 5th step in which, upon reception of the location information of the portable terminal transmitted based on the processing of the 4th step, a DB storing map data is searched based on the location information of the portable terminal and map data corresponding to the location information of the portable terminal is acquired; a 6th step in which map information is generated, to which requester display data which represents the vehicle dispatch requester has been added at the location of the portable terminal on the map data acquired based on the processing of the 5th step, and to which vehicle display data representing a vehicle is added at the location of the available vehicle on the map data if the available vehicle location information acquired based on the processing of the 3rd step is contained within the map data; and a 7th step in which the map information generated based on the processing of the 6th step is transmitted to the portable terminal and caused to be displayed thereon.

[0010] In another aspect, the invention comprises an 8th step in which, in response to a connection of the portable terminal to the ASP via the Internet, the telephone number of the portable terminal is transmitted to the ASP; and a 9th step in which, after the map information has been transmitted to and displayed on the portable terminal based on the processing of the 7th step, if a vehicle displayed as vehicle display data on the portable terminal is selected as a dispatch requested vehicle by the portable terminal, the selected vehicle is notified using this customer name as vehicle dispatch instruction information. In yet another aspect of the invention, the processing of the 9th step includes a 10th step in which the customer name corresponding to the telephone number based on the processing of the 8th step is extracted from a customer DB in which customer names and telephone numbers are registered in advance in pairs, and the selected vehicle is notified using this customer name as vehicle dispatch instruction information. In another aspect, the invention comprises an 11th step of receiving vehicle attribute data transmitted from an available vehicle and including the base fare, vehicle model and number, and driver’s name and sex; the processing of the 6th step includes a 12th step in which the vehicle attribute data received based on the processing of the 11th step is associated with the vehicle display data to generate vehicle attribute display data; and the processing of the 7th step includes a 13th step of transmitting the vehicle attribute display data generated based on the processing of the 12th step to the portable terminal and causing it to be displayed thereon.

[0011] In another aspect of the invention, the processing of the 6th step includes a 14th step in which, after the map information has been transmitted to and displayed on the portable terminal based on the processing of the 7th step, if a vehicle displayed as vehicle display data on the portable terminal is selected as a dispatch requested vehicle by the portable terminal, vehicle display data for the selected vehicle is generated so as to be distinguishable from the

vehicle display data for non-selected vehicles; and the processing of the 7th step includes a 15th step in which the vehicle display data generated based on the processing of the 14th step is transmitted to and caused to be displayed on the portable terminal. In another aspect, the invention comprises a 16th step of successively receiving location information transmitted from the selected vehicle which has received vehicle dispatch instruction information based on the processing of the 9th step and has initiated travel to the location of the portable terminal; the processing of the 6th step includes a 17th step of generating map information, wherein vehicle display data has been added at the location of the selected vehicle on the map data, each time location information is received based on the processing of the 16th step; and the processing of the 7th step includes an 18th step in which the map information generated based on the processing of the 17th step is transmitted to and caused to be displayed on the portable terminal.

In another aspect, the invention comprises a 19th step of detecting the congestion status of the vehicle based on signals from beacons provided along roads travelled by the vehicle, and a 20th step in which the time required between the available vehicle location acquired based on the processing of the 3rd step and the location of the portable terminal transmitted based on the processing of the 4th step is computed based on the distance between the respective locations and the processing results of the 19th step; the processing of the 6th step includes a 21st step in which the time required, computed based on the processing of the 20th step, is received as vehicle attribute data and is associated with vehicle display data to generate vehicle display attribute data; and the processing of the 7th step includes a 22nd step in which the vehicle attribute display data generated based on the processing of the 21st step is transmitted to the portable terminal and caused to be displayed thereon. In another aspect, the invention comprises a 23rd step in which the portable terminal is wirelessly connected to a first through third base stations centered around the portable terminal and arranged closest to this portable terminal, and the field intensity levels from the portable terminal to the first through third base stations are detected, and a 24th step in which spheres are drawn having the arrangement points of the first through third base stations as the center points and a radius inversely proportional to the respective field intensity level detected about these three center points based on the processing of the 22nd step, and the intersection point of these three spheres is computed as the location of the portable terminal; and the processing of the 4th step includes a 25th step in which the location information of the portable terminal computed based on the processing of the 24th step is transmitted.

[Embodiments of the invention] The present invention will be described below with reference to the drawings. FIG. 1 is a block diagram illustrating the configuration of a vehicle dispatch guidance system according to the present invention. This system allows dispatch of vehicles in response to vehicle dispatch requests of users made using a common telephone, and enables vehicle dispatch in response to vehicle dispatch requests of users made using a portable terminal. Basically, the system comprises a portable terminal 1, such as a PHS or portable telephone, which users employ for vehicle dispatch requests; a common telephone 2, which users employ for vehicle dispatch requests; and an ASP (application service provider) 4, provided on a Web site on the Internet and having the function of dispatching taxis to users in response to vehicle dispatch requests made from portable terminal 1 or common telephone 2. [0014] ASP 4 comprises a management device 11; a customer DB (customer database) 12 which is managed by the management device 11 and which stores the telephone number of portable terminal 1 or the telephone number of common telephone 2 in association with the name, etc. of the user thereof; and a control unit 14 which is connected to the management device 11 and performs exchange of information with taxi 3 via taxi radio unit 13. A map DB (map database) 15 which stores a map of the area serviced by taxi 3 is also provided in ASP 4.

[0015] The taxi 3 has a taxi radio unit 21 for exchanging information through radio signals with ASP 4, and also has a GPS navigation system 22 which determines the latitude and longitude of the taxi 3 based on GPS (Global Positioning System) using artificial satellites 5, and displays this latitude/longitude information as the current location of the taxi 3 on an unilluminated display unit along with a map of the vicinity. The latitude/longitude information from this GPS navigation system 22 is transmitted to the ASP 4 via taxi radio unit 21, allowing the ASP 4 to track the current location of the taxi 3.

[0016] Portable terminal 1 is connected to ASP 4 via base station 6, switching station 7A, switching network 8 and ISP (internet service provider) 9, while common telephone 2 is connected to ASP 4 via switching station 7B, switching network 8 and ISP 9. It should be noted that switching station 7A, as will be described below, is able to detect the location of the portable terminal 1, and the detected location of portable terminal 1 is stored in a location DB (location database) 10.

[0017] The general operation of the vehicle dispatch guidance system configured as above will be described using FIG. 1 and FIG. 4. When a user requests dispatch of a taxi 3, the user makes a dial-up connection to ASP 4 from the user’s portable terminal 1. Thereupon, the telephone number of portable terminal 1 is transmitted as a caller ID from switching station 7A via switching network 8 and ISP 9 to ASP 4, and location information for portable terminal 1 is also transmitted from switching station 7A via switching network 8 and ISP 9 to ASP 4.

[0018] Here, in the ASP 4, the maps in map DB 15 are searched based on the location information for portable terminal 1 transmitted from switching station 7A, and a map of the vicinity of the current location of portable terminal 1 is extracted. An image representing the user (display data representing the user: requester display data) is then generated and display data is generated in which this image has been added at the location of portable terminal 1 on the extracted map. Furthermore, location information for taxis 3, which is transmitted from taxis 3, is constantly received in ASP 4, and if the received location of an available taxi is within the map extracted from map DB 15, a taxi image (display data representing a taxi: vehicle display data) is generated and this image is added at the location of the available taxi on the extracted map to generate display data. Furthermore, in ASP 4, various attribute data which has been received in advance from the taxi 3 along with the location information, such as the taxi’s base fare, vehicle model, driver name and sex and vehicle number, is associated with the taxi image to generate vehicle attribute display data.
The ASP 4 transmits the various display data including the map data which has been thus generated via the route ISP 9 → switching network 8 → switching station 7A → base station 6 to the portable terminal 1, causing it to be displayed on the display unit of portable terminal 1. As a result, a map of the vicinity of the user is displayed on the display unit of the user’s portable terminal 1, along with taxis 3A, 3B currently travelling at certain points on that map, as shown in FIG. 4. Furthermore, in association with each taxi 3A, 3B, the (1) base fare (the base fare of the given company), (2) vehicle model, (3) driver name and sex, and (4) vehicle number of the given taxi 3 are also displayed on the display unit of the portable terminal 1, as shown in FIG. 4.

Here, if the user, upon becoming aware of the aforesaid base fare, vehicle model, driver name and sex, vehicle number, etc., which are the attribute data of each taxi 3A, 3B displayed on the vehicle display of the portable terminal 1, selects, for example, taxi 3A, which is an available taxi which the user wishes to request dispatch of, this selection information is transmitted to ASP 4. Here, ASP 4 transmits display data in which the image of the selected taxi 3A is represented, for example, in reverse video, to the portable terminal 1, causing the image of the taxi 3A to be displayed in reverse video. Furthermore, ASP 4 extracts the name of the user from the customer DB 12 in which the user name has been registered in association with the telephone number of portable terminal 1, transmits this user name, which is the name of the vehicle dispatch requester, along with the current location of the user as vehicle dispatch instruction information to taxi 3A, and causes it to be added to and displayed on the vicinity map displayed on the display unit of the taxi’s GPS navigation system 22. If no customer DB 12 has been provided, the telephone number of the portable terminal 1 is transmitted to the taxi and displayed along with the current location of the user.

As a result, the driver of the taxi 3A becomes aware of that fact that vehicle dispatch has been requested, and initiates travel of the taxi 3A toward the current location of the vehicle dispatch requester displayed on the display unit of the GPS navigation system 22. During such travel of the taxi 3A to the location of the vehicle dispatch requester, the ASP 4 receives input of taxi 3A location information successively transmitted from taxi 3A, adds an image of the taxi to the corresponding location on the vicinity map, and delivers this display data in real time to the portable terminal 1, as a result of which, the status of the requested taxi heading to one’s own current location is displayed in real time along with a map of the vicinity on the display unit of the portable terminal 1 of the user who is the vehicle dispatch requester. Then, once the requested taxi 3A arrives at the current location of the user, the driver looks at the vehicle dispatch requester name displayed on the display unit of the GPS navigation system 22, confirms the user, and then allows the user to board the taxi 3A.

FIG. 3 is a drawing illustrating the method of detecting the location of portable terminal 1. To detect the location of portable terminal 1, three base stations 6A, 6B and 6C surrounding the portable terminal 1 detect the received field intensity from portable terminal 1 and transmit it to switching station 7A, and the switching station 7A determines the location of portable terminal 1 based on the received field intensity transmitted from each of the base stations 6A through 6C. Namely, assuming the portable terminal 1 is in a triangular region surrounded by base stations 6A, 6B and 6C, as shown in FIG. 3, the base stations 6A, 6B and 6C receive the identification code of portable terminal 1 transmitted by portable terminal 1 for location confirmation at fixed time intervals, and transmit it paired with the received field strength at the time to switching station 7A. The switching station 7A, upon receiving these data, identifies the location portable terminal 1 by the well-known principle of triangulation. Here, the switching station 7A draws spheres with a radius inversely proportional to the respective received field strength k1, k2, k3 centered about the three base stations 6A, 6B and 6C, and takes the intersection point of the three spheres as the current location of portable terminal 1 (current latitude/longitude information of portable terminal 1).

The latitude/longitude information of portable terminal 1 determined in this manner in switching station 7A is registered in a pair with the telephone number of portable terminal 1 in location DB 10, and when the user makes a dial-up connection to ASP 4 using this portable terminal 1, the switching station 7A reads the corresponding latitude/longitude information from location DB 10 and transmits it as location information of portable terminal 1 together with the telephone number of portable terminal 1 to ASP 4. It should be noted that if the portable terminal 1 has a GPS function, a configuration may also be employed whereby the portable terminal 1 detects its own location information and sends this information to switching station 7A via a base station 6, and the switching station 7A transmits it to the ASP 4.

FIG. 2 is a sequence diagram illustrating the operation of this vehicle dispatch guidance system. The essential operation of the present invention will be described according to the sequence diagram of FIG. 2. The latitude and longitude of taxi 3 is constantly computed based on signals from artificial satellites 5 in the GPS navigation system 22 of the taxi 3. The location corresponding to the computed latitude and longitude is taken as the current location of the taxi 3 and is added to and displayed on the display unit of the portable terminal 1, and at the same time, the computed latitude/longitude information is transmitted as current location information for the taxi 3 in step S1 to ASP 4 via taxi radio unit 21. Here, to request dispatch of a taxi 3, the user makes a dial-up connection to ASP 4 from the user’s own portable terminal 1 in step S2. Then, in step S3, the switching station 7A transmits the telephone number of portable terminal 1 as a caller ID via switching network 8 and ISP 9 to ASP 4, and transmits location information for portable terminal 1 computed as described above via switching network 8 and ISP 9 to ASP 4.

The control unit 14 of ASP 4 then searches the map data of map DB 15 in step S4 based on location information of portable terminal 1 obtained from switching station 7A via management device 11, and extracts map data for the vicinity of the current location of portable terminal 1. An image representing the user is then generated and display data is generated to which the user image has been added at the location of portable terminal 1 on the extracted map data. Furthermore, ASP 4 receives location information of taxis 3 sent from the taxis 3, and searches to determine if a received location of an available taxi is present within the range of the map data extracted from map DB 15.
Here, if the available taxi location is within the range of the map data (in other words, if there is an available taxi in the vicinity of the user), then in step S5, an image representing the taxi is generated and this image is added to the map data at the location of the available taxi to generate display data. Furthermore, ASP 4 generates display data by associating various types of attribute data for the taxi, such as the base fare, vehicle model, driver name and sex, vehicle number, etc., received in advance together with the location information from the available taxi, with the image of that taxi. The map information representing the location of the user and of the available taxis present in the vicinity of the user along with a map of the vicinity of the user, which has been generated in this manner, is delivered to portable terminal 1 via management device 11.

Portable terminal 1, upon receiving the map information delivered from ASP 4 and representing the location of the user and of available taxis present in the vicinity of the user along with a map of the vicinity of the user, displays it on the display unit in step S6. Based on the map information which has been delivered and displayed on the display unit in this manner, the user selects the taxi which the user wishes to have dispatched in step S7. Thereupon, this selection information is received by ASP 4. Control unit 14 of ASP 4, upon receiving this selection information via management device 11, issues a vehicle dispatch instruction to the selected available taxi in step S8.

Namely, based on the telephone number of portable terminal 1 transmitted from switching station 7A at the time of dial-up connection of portable terminal 1, the control unit 14 of ASP 4 causes the management device 11 to retrieve the corresponding customer name in the customer DB 12, and transmits the retrieved customer name and location information for portable terminal 1 as vehicle dispatch instruction information in step S8 to the selected available taxi via taxi radio unit 13. Upon receiving the vehicle dispatch instruction information from ASP 4, the taxi 3, which is the available taxi selected by the user, in step S9, displays the customer name (i.e. the name of the user) at a location on the vicinity map corresponding to the location of portable terminal 1.

As a result, the driver of the taxi 3 becomes aware of the fact that vehicle dispatch has been requested, and initiates travel of the taxi 3 toward the current location of the vehicle dispatch requester, which is the user displayed on the display unit of the GPS navigation system 22. During such travel to the location of the vehicle dispatch requester as well, the taxi 3 detects its own current position and transmits it to ASP 4 in step S10. Every time input of location information is received from the taxi 3 via taxi radio unit 13, in step S11, the control unit 14 of the ASP 4 generates map information in which an image of the taxi 3 has been added at the location of the taxi 3 on a vicinity map, and to which an image of the user has been added at the current location of the user, and delivers this map information to the portable terminal 1. The portable terminal 1, upon receiving this map information, displays it on its display unit in step S12.

In this way, during travel of the taxi 3 which has received a vehicle dispatch instruction to the current location of the user, the location of the taxi 3 is delivered to and displayed on the portable terminal 1 of the user in real time along with a vicinity map. Then, once the taxi 3 arrives at the current location of the user, in step S13, the user confirms that the number of taxi 3 displayed on portable terminal 1 matches the number of the actual taxi 3 which has arrived, and upon recognizing that this is indeed the taxi which the user requested dispatch of, the user boards the taxi 3. When the user is to board the taxi, the driver can look at the vehicle dispatch requester name displayed on the display unit of the GPS navigation system 22 and confirm the user, so that in cases where multiple vehicle dispatch requesters are waiting for their respective requested taxis at the same location, it becomes possible to prevent situations where a person other than the one who actually made the arrangement ends up boarding the taxi.

In this way, ASP 4 constantly receives location information of taxi 3 transmitted from taxi 3, and when a user who wishes to request dispatch of taxi 3 makes a dial-up connection to ASP 4 using portable terminal 1, location information of portable terminal 1 is sent from switching station 7A to ASP 4 as the current location of the user. ASP 4 searches map DB 15 based on the user’s location information, extracts map data for the vicinity of the user, and if the location of an available taxi is contained in the extracted map data, generates display data to which an image of the user is added at the current location of the user on the map data and an image of a taxi 3 has been added at the location of the available taxi, and transmits this display data to portable terminal 1 and causes it to be displayed thereon. As a result, when the user has requested dispatch of a taxi 3, the user can be cognizant of the approximate time required for the requested vehicle to arrive at the user’s waiting location.

Furthermore, the ASP 4 here sends the base fare, vehicle model, driver name and sex and vehicle number of the taxi 3, received in advance from the taxi 3, to the portable terminal 1 as display data and causes it to be displayed thereon. As a result, the user can appropriately discriminate the taxi 3 which the user would like to ride on before requesting vehicle dispatch.

Here, when the user selects a taxi 3 whereof dispatch is to be requested, the ASP 4 transmits the current location of the user and the name of the user (or the telephone number of the user) to the selected taxi 3 as vehicle dispatch instruction information. The ASP 4, which receives location information in real time from the taxi 3 which has initiated travel to the current location of the user as a result of this transmission of vehicle dispatch instruction information, then adds such location information to a vicinity map and delivers it as display data to portable terminal 1 and causes it to be displayed thereon until the taxi 3 arrives at the current location of the user. As a result, the user can tell at a glance that the taxi 3 which the user has requested is heading to the user’s current location.

It will be noted that if beacons are provided along the road traveled by the taxi 3 and ASP 4 is made to detect the congestion status of the taxi 3 on the road based on signals from the beacons, the ASP 4 can compute the time required between the current location of the taxi 3 and the location of the portable terminal 1 based on the distance
between the locations and the results of detection of congestion on the road between said locations, and can deliver the computed time required in association with the user’s selected vehicle to the portable terminal 1 and cause it to be displayed thereon. This can allow the user to accurately ascertain the approximate time of arrival of the taxi 3 which the user has requested. It will be noted that instead of the detection of congestion status by the ASP 4, detection of congestion may also be performed using information from a VICS (Vehicle Information and System) which generates and transmits road traffic information based on information from transmitters provided along roads. Furthermore, upon manipulation of the indicator which is connected to the meter representing the travel distance and indicates that the vehicle is available or occupied, the taxi 3 transmits this manipulation information to the ASP 4. The ASP 4, based on reception of this manipulation information, discriminates whether the taxi 3 is available or occupied, and acquires location information from available taxis. Therefore, the ASP 4 is able to accurately discriminate whether the taxi 3 is available or occupied and is able to acquire location information from available taxis.

[0037] Furthermore, in the present embodiment, an example was described in which the user requests dispatch of a taxi 3 using a portable terminal 1, but the same applies in cases where dispatch of taxi 3 is requested by making a dial-up connection to ASP 4 employing an Internet connection service using a common telephone 2 or an unillustrated public telephone, which are stationary telephones. In this case, for example, at the time of dial-up connection using a common telephone 2, the telephone number of this common telephone 2 is transmitted as caller ID from switching station 7B to ASP 4, and location information for the common telephone 2 is also transmitted from switching station 7B to ASP 4.

[0038] Furthermore, in the present embodiment, the example of a taxi was described as an example of a vehicle subject to dispatch request, but this can also be implemented by providing vehicles such as fire trucks, ambulances, patrol cars, JAF vehicles, etc. with the functions of taxi 3 described above. The invention can likewise be applied in the case of pick-up of packages by a home delivery service.

[0039] [Effect of the invention] According to the present invention as described above, the ASP (center) is provided with: a reception means which receives designation information transmitted from vehicles; an acquisition means which, upon reception of location information transmitted from a vehicle for which available vehicle state designation information has been received by the reception means, acquires this location information as available vehicle location information; a search means which, upon reception of location information of the portable terminal from the switching station, searches a DB based on the received location information; a generating means which generates map information to which requester display data representing a vehicle dispatch requester has been added at the location of the portable terminal on the map data retrieved by the search means, and to which vehicle display data representing a vehicle is added at the location of the available vehicle on the map data if the available vehicle location information acquired by the acquisition means is contained within the map data; and a display control means which transmits the map information generated by the generating means to the portable terminal and causes it to be displayed thereon. Thus, when a user requests dispatch of a vehicle such as a taxi, the user simply makes a dial-up connection to the ASP using a portable terminal, as a result of which map information in which the location of the user and the locations of available vehicles have been added to a vicinity map is sent from the ASP to the portable terminal and displayed, thereby making it possible to provide the user with an idea of the approximately time required for the vehicle whereof the user requested dispatch to arrive at the user’s waiting location.

[0040] Here, the switching station transmits the telephone number of the portable terminal to the ASP in response to the dial-up connection of the portable terminal to the ASP, and when a dispatch requested vehicle is selected by the portable terminal after transmission of map information to the portable terminal, the ASP notifies the selected vehicle using the telephone number from the switching station and the location information of the portable terminal as vehicle dispatch instruction information, so the driver of the vehicle can accurately drive the vehicle to the waiting location of the vehicle dispatch requester, and can confirm the vehicle dispatch requester before allowing him to board at the waiting location. Furthermore, the ASP extracts the customer name from customer DB corresponding to the telephone number transmitted from the switching station, and notifies the selected vehicle using this customer name as vehicle dispatch instruction information, so the vehicle driver can accurately confirm the vehicle dispatch requester at the waiting location of the vehicle dispatch requester before allowing him to board. Therefore, in cases where multiple vehicle dispatch requesters are waiting for their respective dispatch requested vehicles at the same location and one dispatch requested vehicle arrives, it is possible to situations where a person other than the person who actually arranged for the vehicle ends up inadvertently boarding the vehicle due to the name being misheard or the like.

[0041] Furthermore, the vehicle transmits predetermined attributed data including the base fare, vehicle model and number and driver name and sex to the ASP, and the ASP, upon receiving the attribute data transmitted from the vehicle, associates the received attribute data with vehicle display data to generate vehicle attribute display data, and transmits it to the portable terminal and causes it to be displayed thereon, so that when the user requests vehicle dispatch, the user can request dispatch of an appropriate vehicle after becoming cognizant of the attribute data beforehand. Furthermore, in cases where multiple vehicle dispatch requesters are waiting for their respective dispatch requested vehicles at the same location and one dispatch requested vehicle arrives, each requester can confirm the driver of the vehicle which he has requested, thus making it possible to prevent situations where a person other than the one who actually made the arrangements ends up boarding the vehicle.

[0042] Furthermore, when a dispatch requested vehicle is selected by the portable terminal after transmission of map information to the portable terminal, the ASP generates
vehicle display data for the selected vehicle so as to be distinguishable from non-selected vehicles, and transmits it to the portable terminal and causes it to be displayed thereon, so the user can accurately recognize the vehicle which the user has selected. Furthermore, when the selected vehicle receives vehicle dispatch instruction information and initiates travel to the location of the portable terminal, the ASP successively acquires location information transmitted from the selected vehicle, generates map information to which vehicle display data has been added at the acquired location on map data each time the location information is acquired, and transmits this map information to the portable terminal and causes it to be displayed thereon, so the user is able to track the movement status of the dispatch requested vehicle in real time until the dispatch requested vehicle which the user has selected arrives at the user’s waiting location.

Furthermore, beacons are provided along roads travelled by the vehicles, and the ASP, comprising a detection means which detects the congestion status of vehicles based on signals from the beacons, computes the time required between the acquired available vehicle location and the location of the portable terminal based on the distance between the locations and the detection results of the detection means, and transmits the computed time required to the portable terminal and causes it to be displayed thereon, so the user is able to accurately track approximately when the vehicle which the user has requested will arrive. Furthermore, the switching station wirelessly connects a first through third base stations, centered about the portable terminal and arranged closest to the portable terminal, with the portable terminal, and detects the field intensity levels from the portable terminal to the first through third base stations, and draws spheres having the arrangement point of the respective first through third base stations as the center point and a radius inversely proportional to the field intensity level detected about these three center points, and computes the intersection point of these three spheres as the location of the portable terminal, thus making it possible to compute an accurate location for the portable terminal.

[0043] Furthermore, beacons are provided along roads travelled by the vehicles, and the ASP, comprising a detection means which detects the congestion status of vehicles based on signals from the beacons, computes the time required between the acquired available vehicle location and the location of the portable terminal based on the distance between the locations and the detection results of the detection means, and transmits the computed time required to the portable terminal and causes it to be displayed thereon, so the user is able to track the movement status of the dispatch requested vehicle in real time until the dispatch requested vehicle which the user has selected arrives at the user’s waiting location.

[FIG. 1] is a block diagram illustrating the configuration of a vehicle dispatch guidance system according to the present invention.

[FIG. 2] is a sequence diagram illustrating the essential operation of said system.

[FIG. 3] is a drawing illustrating the situation of computation of the location of a portable terminal in a switching station making up said system.

[FIG. 4] is an explanatory drawing explaining the essential operation of said system.

[Description of reference symbols]
1 ··· portable terminal; 2 ··· common telephone; 3, 3A, 3B ··· taxi; 4 ··· ASP; 5 ··· artificial satellite; 6A, 6B, 6C ··· base station; 7A, 7B ··· switching station; 8 ··· switching network; 9 ··· ISP; 11 ··· management device; 12 ··· customer DB; 13, 21 ··· taxi radio; 14 ··· control unit; 15 ··· map DB; 22 ··· GPS navigation system.
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