

DECLARATION OF ACCURACY

I, David Baldwin, declare the following:

1. I am over 18 years of age and competent to make this declaration.
2. I am a qualified Japanese to English translator.
3. I have translated the attached document identified as JPH10-197277.
4. I affirm that the translated text has been translated and edited to the best of my ability and knowledge to accurately reflect the content, meaning, and style of the original text and constitutes in every respect a correct and true translation of the original document.
5. I declare that all statements made herein of my knowledge are true, and that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

I hereby certify under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Dated and signed on August 8, 2019.



(Translator's Signature)

David Baldwin

(Translator's Printed Name)

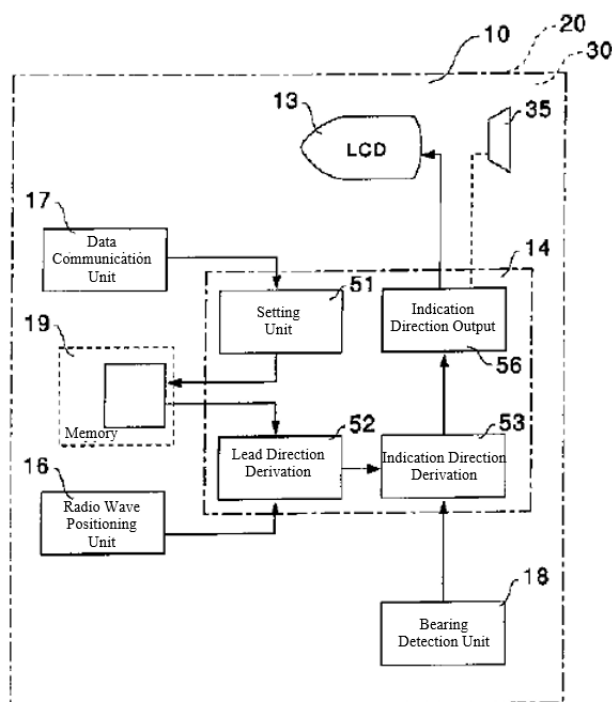
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(54) [Title of Invention] DIRECTION INDICATION DEVICE, DIRECTION INDICATION METHOD, ROAD GUIDANCE SYSTEM, AND ROAD GUIDANCE METHOD

(57) [Abstract]

[Problem] Implementing a miniature and low-cost terminal suitable for navigation for guiding a user to a destination.

[Resolution Means] Providing a radio wave positioning unit 16 for obtaining a first position information showing a current location using GPS; providing a setting unit 51 capable of setting a second position information showing a destination using a service server function via a data communication unit 17; deriving a lead direction showing a direction to the destination from the first and second position information in a lead direction derivation unit 52; and moreover, using a bearing detection unit 18 to detect a direction the LCD 13 is facing. Furthermore, using an indication direction derivation unit 53 to find an indication direction indicating the direction to the destination with respect to the orientation of the user with a relative direction and conveying the direction to the user with an arrow or audio from the indication direction output unit 54. Showing the direction to the destination in this manner without using a large volume of map information enables the construction of a navigation system using a miniature and low-cost user terminal.



[Scope of Patent Claims]

[Claim 1] A direction indication device, comprising:
 positioning means capable of obtaining a first position information showing a current location using radio wave positioning;
 setting means capable of setting a second position information showing a destination;
 bearing detection means capable of grasping a reference bearing of a user;
 means for deriving a lead direction showing a direction to the destination from the current location using the first and second position information; and
 conveyance means for conveying, to the user, an indication direction showing the lead direction with respect to the reference bearing.

[Claim 2] The direction indication device according to claim 1, wherein the conveyance means is display means capable of displaying the indication direction, and the bearing detection means is capable of grasping an orientation of the display means as the reference bearing.

[Claim 3] The direction indication device according to claim 1, wherein the conveyance means is means for conveying the indication direction using audio, and the bearing detection means is capable of grasping an orientation of a body of the user as the reference bearing.

[Claim 4] The direction indication device according to claim 1, further comprising communication means capable of transmitting and receiving data, wherein the setting means is capable of obtaining the second position information via the communication means.

[Claim 5] The direction indication device according to claim 4, wherein the communication means is capable of exchanging the first and second position information with a specific information processing device via a public communication network.

[Claim 6] A direction indication method, comprising:
 a first step for obtaining a first position information showing a current location using radio wave positioning;
 a second step for grasping a reference bearing of a user;
 a third step for deriving a lead direction showing a direction to a destination from the current location using the first position information and a second position information showing the destination; and
 a fourth step for conveying, to the user, an indication direction showing the lead direction with respect to the reference orientation.

[Claim 7] The direction indication method according to claim 6, further comprising a fifth step for obtaining the second position information via a public communication network capable of transmitting and receiving data.

[Claim 8] A road guidance system for performing road guidance to a user terminal capable of grasping a current location using radio wave positioning and showing a direction to a destination with respect to the current location, the road guidance system comprising:

means for setting a final destination of a user;
 means for grasping the current location of the user using a first position information obtained using the radio wave positioning of the user terminal;
 means for deriving a guidance route from the current location to the final destination;

means for deriving a second position information showing a first destination closest to the current location along the guidance route;

means for conveying the second position information to the user terminal; and

means for conveying, to the user terminal, the second position information showing a second destination closest to the first destination when the first position information matches the second position information.

[Claim 9] A road guidance method for performing road guidance to a user terminal capable of grasping a current location using radio wave positioning and showing a direction to a destination with respect to the current location, the road guidance method comprising:

a step for setting a final destination of a user;

a step for grasping the current location of the user using a first position information obtained using the radio wave positioning of the user terminal;

a step for deriving a guidance route from the current location to the final destination;

a step for deriving a second position information showing a first destination closest to the current location along the guidance route;

a step for conveying the second position information to the user terminal; and

a step for conveying, to the user terminal, the second position information showing a second destination closest to the first destination when the first position information matches the second position information.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to a direction indication device and indication method for indicating a movement direction or the like, a road guidance system using the direction indication device, and a road guidance method.

[0002]

[Conventional Art] Several products have been developed to which systems have been applied that are capable of receiving radio waves from a plurality of satellites to detect its own position, and for example, car navigation using a global positioning system (GPS) is used by many users. Using GPS or differential GPS (DGPS), which is corrected using differential information, enables position information such as the latitude, longitude, and altitude expressing a current location to be easily obtained, and a car navigation system matches this position information with road information on a map loaded in a system to be able to indicate a route to a driver.

[0003]

[Problem to be Solved by the Invention]

In recent years, personal navigation systems using GPS other than those loaded in vehicles have been developed, and road guidance using GPS has become possible in fields other than driving. However, personal navigation systems require a display large enough to display a map, and moreover, an external storage medium having a large storage volume such as a CD-ROM must be loaded to accumulate map information in advance. Therefore, it is difficult to miniaturize a personal navigation system, and moreover, they are expensive. Thus, as of yet it has not been possible to provide a navigation system that can be easily used by anyone for personal use.

[0004] Accordingly, an object of the present invention is to provide a portable terminal whereon a navigation system can be configured that can be miniaturized, made lightweight, and can be easily carried by anyone. Furthermore, an object of the present invention is to provide a road guidance system capable of performing navigation using a portable terminal that can be provided at a low price.

[0005]

[Means for Solving the Problem] Thus, the present invention does not use a map to lead a user to a destination, but provides a direction indication device that can indicate a direction to a destination to lead a user, and using this direction indication device as a terminal enables a personal navigation system to be constructed. Furthermore, when using an arrow display, forward, back, left, and right or the like to show the direction to a destination, bearing detection means such as a gyroscope or electronic compass are used to detect a bearing that will be a reference for the user, namely the orientation of the user or the orientation of the display device, and can be conveyed to the user with relative indication directions that enable a destination to be intuitively understood with visual and auditory senses.

[0006] That is, the direction indication device of the present invention has positioning means capable of obtaining a first position information showing a current location using radio wave positioning; setting means capable of setting a second position information showing a destination; bearing detection means capable of grasping a reference bearing of a user; means for deriving a lead direction showing a direction to the destination from the current location using the first and second position information; and conveyance means for conveying, to the user, an indication direction showing the lead direction with respect to the reference bearing. Furthermore, the direction indication method of the present invention has a first step for obtaining a first position information showing a current location using radio wave positioning; a second step for grasping a reference bearing of a user; a third step for deriving a lead direction showing a direction to a destination from the current location using the first position information and a second position information showing the destination; and a fourth step for conveying, to the user, an indication direction showing the lead direction with respect to the reference orientation.

[0007] It is possible to use display means capable of displaying the indication direction as the conveyance means, and the bearing detection means can grasp the orientation of the display means as the reference bearing, and a display such as an arrow or forward, back, left, and right may be used to show a relative indication direction. Furthermore, it is possible to adopt means for conveying the indication direction using audio as the conveyance means, and in such a case, it is preferable for the bearing detection means to grasp the orientation of the body of the user as the reference bearing. Configuring such that the indication direction can be conveyed using audio enables a movement direction to be suggested to users with visual impairments as well, and furthermore, the movement direction is determined without seeing a display, and thus a safe navigation system can be constructed.

[0008] In the direction indication device and direction indication method of the present invention, it is possible to lead a user to a destination without using map information, and thus the display device can be miniaturized, and furthermore, it is also possible to lead the user with audio. Moreover, there is no need to keep map information, and thus a high capacity storage device is

unnecessary, enabling terminals to be provided for navigation systems for personal use that can actually be low-cost and mobile. Furthermore, in a conventional navigation system wherein a destination is displayed in map information, the destination is indicated as shown from an aerial view, and thus the user must mentally think of the direction in which to move or must determine the direction in which to move with respect to landmarks such as stores. In contrast, using the direction indication device and direction indication method of the present invention enables a movement direction to be indicated that can be intuitively understood by the user, and thus it is possible to more safely and reliably guide a user to a destination.

[0009] Furthermore, using the direction indication device and the direction indication method of the present invention allows a suitable destination to be set and the direction to the destination to be constantly understood. Thus, it is possible to use as a compass showing specific places other than north and south, and it is possible to use as a device for amusement such as hide and seek or searching games.

[0010] In the direction indication device and direction indication method of the present invention, it is of course possible to manually set the second position information of the destination, but it is also possible to provide communication means capable of transmitting and receiving data and be able to obtain the second position information via the communication means with the setting means. Providing communication means enables, for example, a car navigation system or a home-use desktop computer capable of displaying a map to be used to determine a destination in advance, and the position information thereof can be set in the direction indication device of the present invention in advance. Furthermore, communication means enabling the first and second position information to be exchanged with a specific information processing device via a public communication network, namely a computer communication network such as phone, radio, or internet, enables the second position information showing the destination to be obtained before moving or during moving. For example, it is possible to use a menu display for restaurants or souvenir shops to select a specific shop stored in an information processing device as the destination to obtain the position information of that shop using communication means. In the direction indication device and the direction indication method of the present invention, when the position information of the destination can be obtained, the direction thereof can be constantly indicated, and thus the user can be unerringly lead to the destination. Furthermore, the data exchanged via the communication means is position information such as latitude, longitude, and altitude, and thus the volume of different information such as map information may be small. Therefore, the communication time and expenses for obtaining the destination can also be small.

[0011] Furthermore, the destination can sometimes be obtained from the information processing device, and thus suitable destinations along the route to the final destination can be obtained, and when arriving at these destinations the user is guided to the next destination, and this process enables the user to be guided to a final destination along a predetermined path

without showing map information. That is, it is possible to use the user terminal of the present invention capable of grasping a current location using radio wave positioning and showing a direction to a destination with respect to the current location, and to provide a road guidance system and a road guidance method for performing road guidance to this user terminal. Thus, the road guidance system of the present invention has means for setting a final destination of a user; means for grasping the current location of the user using a first position information obtained using the radio wave positioning of the user terminal; means for deriving a guidance route from the current location to the final destination; means for deriving a second position information showing a first destination closest to the current location along the guidance route; means for conveying the second position information to the user terminal; and means for conveying, to the user terminal, the second position information showing a second destination closest to the first destination when the first position information matches the second position information. Furthermore, the road guidance method of the present invention has a step for setting a final destination of a user; a step for grasping the current location of the user using a first position information obtained using the radio wave positioning of the user terminal; a step for deriving a guidance route from the current location to the final destination; a step for deriving a second position information showing a first destination closest to the current location along the guidance route; a step for conveying the second position information to the user terminal; and a step for conveying, to the user terminal, the second position information showing a second destination closest to the first destination when the first position information matches the second position information.

[0012] In the road guidance system and method of the present invention, the primary information communicated with the user terminal may be position information only. Therefore, there is no need for the road guidance system to be constantly connected to the user terminal, and moreover, the communication time may be short. Furthermore, it is possible to remove all complex operations such as setting a route from the user terminal and perform them on the road guidance system side, and thus the processing time for the user terminal may be short. Also, an appropriate indication direction is conveyed to the user in real time, and thus the user can reliably arrive at the destination in a short amount of time.

[0013] It is possible for the direction indication method and road guidance method of the present invention to be provided as software. It is possible for software provided with the steps of the direction indication method to be an add-on for a mobile information processing terminal and to be supplemented with functions as the direction indication device according to the present invention. Furthermore, operating a software application provided with the steps of the road guidance method of the present invention on a computer with a high processing performance such as a work station enables the road guidance system of the present invention to be provided. Such software can be provided stored on a computer or CPU readable storage medium such as a magnetic disc or ROM, and can be stored on a fixed type hard disc or ROM and loaded as necessary to exhibit the functions thereof.

[0014]

[Embodiments of the Invention] Embodiments of the present invention will be described below with reference to drawings. FIG. 1 illustrates an example configuring a navigation system 1 using a user terminal provided with a direction indication function according to the present invention. This will be described in detail below, but the user terminal provided with the direction indication function according to the present invention can be implemented as a wrist-watch type 10, a wallet type 20, or an earphone type 30, and is configured to receive radio waves from a GPS satellite 2 to obtain position information (first position information), namely, the latitude, longitude, and altitude of its current location. Furthermore, these user terminals 10, 20, and 30 are configured to use a method such as a dialup IP connection to connect to a computer network (internet 3), and to connect to a navigation server (service server) 40 for providing position information (second position information) for the destination via the internet 3.

[0015] FIG. 2 illustrates an outline of a wrist-watch type user terminal 10. The user terminal 10 in the present example is provided with a disk shaped main body 11 and a belt 12 for wearing the main body 11 on an arm 9 of the user, and the main body 11 is provided with a liquid crystal display (LCD) 13 as the display means. The user terminal 10 in the present example is provided with functionality as a wrist-watch, a communication function, or the like in addition to a direction indication function, and is configured to switch between these functions to be used. FIG. 2 illustrates one example of the display on the LCD 13 when the direction indication function is selected, wherein the coordinates (latitude and longitude) of the current location calculated using a GPS function are displayed in an upper portion 13a and the altitude and distance to the destination are displayed in a lower portion 13b. Furthermore, an arrow 5 showing the direction to the destination is displayed in the center 13c of the LCD 13.

[0016] FIG. 3 and FIG. 4 illustrate an outline of the wallet type user terminal 20. The user terminal 20 in the present example is provided with a substantially rectangular housing 21, and an LCD 13 is installed in the center thereof. The user terminal 20 in the present example is a user terminal loaded with various functions such as a communication function or a schedule management function in addition to the direction indication function, and it is configured to switch between these functions or to be operated using multitasking. FIG. 3 and FIG. 4 illustrate a screen for the direction indication function being displayed on the LCD 13, and similar to the wrist-watch type user terminal 10, it displays an arrow 5 showing the direction to the destination in addition to the position information 22 of the current location obtained using the GPS function.

[0017] FIG. 3 and FIG. 4 illustrate a user 8 facing the LCD 13 up and the arrow 5 displayed thereon (FIG. 3) and the user 8 facing the LCD 13 down above his head and the arrow 5 displayed thereon (FIG. 4) at the same position. In the present example, the direction to the destination is diagonally forward and right of the user 8, and the arrow 5 shown in FIG. 3 is in the upper right direction of the housing 21, and the arrow 5 shown in FIG. 4 is in the lower right direction of

the housing 21. To show the intent of this arrow 5 in further detail with reference to FIG. 5, when a point A represents the current location of the user and a point B represents the destination, when the user holds the user terminal 20 in their hands at the point A and spins 360 degrees, the arrow 5 will constantly face the direction of the point B regardless of the orientation of the user terminal 20. Note that the display on the LCD 13 shown in FIG. 5 also displays a mark 6 showing north in addition to the arrow 5, and this mark 6 also constantly points to north.

[0018] Accordingly, the user terminal 10 and 20 in the present example are configured such that the user terminals 10 and 20 automatically grasp the orientation (bearing) of the LCD 13, and even when the LCD 13 is facing up or down or spun 360 degrees the arrow 5 accurately shows the direction to the destination. Therefore, regardless of which direction the user points the user terminal 10 and 20, the direction to the destination (indication direction) with respect the direction the user terminal 10 is facing, or in other words, to the reference bearing that is the reference to which the user is facing, can be made known with the orientation of the arrow. Thus, the user can intuitively understand the direction to the destination and quickly and reliably move toward the destination without performing any laborious tasks such as mentally converting and comprehending a position on a map and a movement direction or matching up landmarks on the map with actual landmarks to determine a movement direction.

[0019] FIG. 6 shows an outline of a hardware configuration for the direction indicating function of the user terminal 10, 20, and 30 in the present example. The configurations for the direction indication function of the user terminal 10, 20, and 30 in the present example are substantially the same, and thus will be described centered on the wrist-watch type user terminal 10. The user terminal 10 in the present example is provided with a radio wave positioning unit 16 for receiving radio waves from a GPS satellite to find the coordinates of the current location (first position information), a data communication unit 17 capable of using a wireless telephone function to connect to the internet, a liquid crystal display panel 13 as the display device, a bearing detection means 18 that can grasp the orientation of the liquid crystal display panel 13, and a CPU 14 connected to these processing units through a bus 14a for performing general control and data processing. Moreover, the user terminal 10 in the present example is provided with an input device 15 that enables operations such as selecting a function or manually inputting coordinate data for a destination and an internal storage device (memory) 19 for temporarily storing coordinate data of the destination, coordinate data of the current location, or the like, whereon a program is stored for performing direction indication, and these are also connected to the bus 14a.

[0020] The radio wave positioning unit 16 is provided with an antenna unit 16a for receiving radio waves from a GPS satellite, a GPS reception unit 16b, and furthermore, a GPS calculation unit 16c for calculating the coordinates of the current location from received data. Of course it is also possible to use the function of the CPU14 as the GPS calculation unit 16. Moreover, the data communication unit 17 is provided with an antenna unit 17a for communication, and a

data communication device 17b provided with a function to convert, transmit, and receive data such as position information for communication. The data communication unit 17 in the present example is configured to be able to access the internet, which is a computer network using means such as wireless telephone or PHS to spread substantially over the globe, and can exchange data with a specific service server 40 from most places around the world.

[0021] Furthermore, the bearing detection unit 18 in the present example is configured to use an electronic compass 18a and a horizontal sensor 18b to find the bearing and angle the LCD 13 is facing. The configuration of the bearing detection unit 18 is not limited to the present example, and may, for example, use a gyroscope to find the bearing and angle the LCD 13 is facing.

[0022] The wallet type user terminal 20, which has a housing 21 with a large capacity compared to the wrist-watch type user terminal 10, can have an external storage device 25 such as a hard-disc unit or a floppy disc unit added thereto in addition. Moreover, software (a program) for implementing the direction indicating function may be loaded in the external storage device 25, or the position information (coordinates) of the destination may be stored beforehand. Furthermore, an LCD 13 having a larger size compared to the wrist-watch type user terminal 10 can be utilized, and thus a transcription such as left, right, forward, or back can show the direction to the destination instead of or in addition to the arrow 5, and furthermore, map display using simple diagrams is possible.

[0023] Moreover, the earphone type user terminal 30 is provided with an audio transmission device (speaker) 35 for indicating the direction to the destination using audio. Furthermore, the bearing detection unit 18 is configured to be worn on the body of the user to detect not the orientation of an LCD, but the orientation of the body, for example, the head, and to derive the indication direction with the orientation of the body of the user as the reference bearing.

[0024] FIG. 7 uses a block diagram to show the functional configuration of the user terminal 10, 20, and 30 in the present example. The functional configuration is substantially the same for the user terminal 10, 20, and 30, and thus will be described centered on the wrist-watch type user terminal 10. The user terminal 10 in the present example is provided with a setting unit 51 for obtaining position data for the destination from the service server 40 via the data communication unit 15 and setting the position data (second position information) to the position storage region 19a in the memory 19, a lead direction derivation unit 52 for deriving a lead direction showing the destination from position data (first position information) for the current location measured by the radio wave positioning unit 16 and the second position information stored on the position storage region 19a, and an indication direction derivation unit 53 for comparing the bearing of the LCD 13 detected by the bearing detection unit 18 to the lead direction to find the indication direction to display on the LCD 13, wherein an indication direction output unit 54 converts this indication direction into an arrow shape and displays it on the LCD 13. Furthermore, in the user terminal 10 in the present example, the CPU 14 operates while a predetermined program is loaded to implement the functions of these processing units 51, 52, 53, and 54.

[0025] Note that in the earphone type user terminal 30, the indication direction output unit 54, which is a conveyance means, converts the indication direction to audio, and the user can hear the audio via a speaker 35.

[0026] Accordingly, the user terminal 10, 20, and 30 in the present example is configured to be able to receive a radio wave from a GPS satellite to obtain the first position information showing the current location, find the direction to the destination from the first position information and the second position information showing the destination, and use the arrow 5, audio, or the like to indicate (convey) that direction to the user. Furthermore, when conveying the direction to the destination to the user, the user terminal 10, 20, and 30 in the present example is configured to detect the orientation of the LCD 13 or the orientation of the body of the user (reference bearing) and indicate the direction to the destination with respect to the standard bearing. Accordingly, the user terminal 10, 20, and 30 in the present example does not indicate a direction to a destination using a display showing an absolute direction with no relation to the orientation of the user such as a bearing angle, but is configured to indicate the direction to the destination according to the relative orientation that can be intuitively understood by the user. Therefore, the user can immediately determine the direction to the destination and proceed in that direction to reliably arrive at the destination.

[0027] Using the user terminal 10, 20, and 30 in the present example in this manner allows a navigation system to be constructed that uses the arrow 5 or audio to convey the indication direction and guide the user to a predetermined destination. This navigation system performs navigation using simple processing, namely calculating the position information of the current location and the position information of the destination to find a lead direction, and furthermore, finding the indication direction from the lead direction and converting it to an arrow, and there is no need for the navigation system to perform complex processing such as moving a map as the user moves or moving the current location on the map. Furthermore, it is configured to be able to indicate a movement direction to the user without showing map information, and thus there is no need to have map information of the region to be navigated on the user terminal side, and there is no need to provide the user terminal with a storage device having a large capacity such as a CD-ROM. Therefore, it is possible to construct a high-performance navigation system capable of using simple processing to navigate the user wherein the user uses the low cost user terminal 10, 20, and 30 to easily understand and reliably arrive at the destination.

[0028] Furthermore, in the user terminal 10, 20, and 30 in the present example, it is of course possible for the user to input position information such as latitude, longitude, or altitude to set the destination, but it are also configured to obtain position information showing the destination from the service server 40 via the internet and guide the user towards the destination. In such a case, the information to be obtained by the user terminal 10, 20, and 30 in the present example via the internet may be just the position information (latitude, longitude, and if necessary, altitude) of the destination.

Therefore, communication with the service server 40 can be short and connection fees will be small. In contrast, it is possible to use it by connecting a conventional navigation system displaying map information to the internet and downloading a map of a predetermined region. However, it is necessary to exchange a massive volume of map information with the service server, which consumes a large amount of time and expenses for communication. Furthermore, a large portion of the memory and a majority of the processing time of the user terminal are consumed to display the map information obtained via communication. In contrast, the user terminal 10, 20, and 30 in the present example can guide a user with just directional information without map information, and thus communication with the service server can obviously be shortened, the amount of information stocked on the user terminal side can be decreased, and the load on the memory and CPU can be significantly lowered. For example, it is possible to send the position information of the destination to the user terminal from the service server in a format such as internet mail.

[0029] When obtaining position information of the destination from the service server 40, the home page of the service server 40 is displayed using the browser function of the user terminal 10, 20, and 30, and it is possible to use a menu or the like to obtain the position information of the destination. For example, a system can be adopted wherein when a user wishes to go to a restaurant while traveling, they connect to the home page of the service server 40 provided with the information of the region, indicate the name of the restaurant they wish to go to, and then the position information is sent in an email. Or, a service is also possible wherein a menu screen displaying types of restaurant can be used to permit selection of a favorable food, position information of recommended restaurants in that category can be sent in an email, or the like. Obtaining the position information of the destination in this manner allows a user to be guided to the destination without displaying a map even once.

[0030] However, it is possible to connect the user terminal 10, 20, and 30 in the present example to an information processing device capable of displaying a map, such as a car navigation system or home-use desktop computer, before departure, the destination can be selected on the map displayed thereon, and the position information can be set in advance to the memory 19 before departure.

[0031] Moreover, it is possible to use the service server 40 to set a route for the user to arrive at the destination and navigate the user with an arrow or audio according to the route. This road guidance system will be described in further detail below.

[0032] FIG. 8 uses a block diagram to illustrate an outline configuration of the service server 40 provided with a road guidance function. The service server 40 in the present example is provided with: an input and output interface 41 capable of connecting to the internet; a position information processing unit 42 for obtaining the position information showing the current location of the user terminal 10, 20, or 30 via the input and output interface 41, selecting the destination (referred to as

final destination below), and setting the position information thereof; a route setting unit 43 for setting a route to guide from the current location to the final destination; route storage means 44 for storing the set route; and a position information supply unit 45 for transmitting position information of main destinations midway through the stored route to the user terminal via the input and output interface 41. The route setting unit 43 is associated with a database 46 storing information required for route setting such as map information or public transport, and for example, is configured to permit the user side to select whether a train will be used, whether a car will be used, or the like when a far-away destination is set. Moreover, the route storage unit 44 stores the route, position information for destinations along the route such as street corners, train stations, bus stops, or the like, and further stores departure and arrival times of trains and busses, and when the user arrives at one destination the position information of the next destination is supplied via the supply unit 45, and the direction for the user to go in can be successively indicated on the user terminal. Therefore, there is no need to set a route on the user terminal 10, 20, or 30 side, and the burden of performing navigation using the user terminal 10, 20, or 30 can be significantly decreased.

[0033] FIG. 9 uses a flow chart to illustrate the outline of the processing for the user terminal 10, 20, and 30 and the service server 40 in the road guidance system. First, the user terminal 10, 20, and 30 use the radio wave positioning unit 16 to perform radio wave positioning and obtain the coordinates (first position information) of the current location in step 61. Then, in step 62, a selection is made as to whether processing for setting the destination is performed, and when the destination is set it transitions to step 63. In step 63, the data communication unit 17 is used to access the internet 3 and open the home page for destination setting on the service server 40. This enables the service server 40 to start position information obtainment processing to set a route in step 71. First, this processing obtains the position information of the current location of the user terminal 10, 20, or 30 in step 72, and the user selects the final destination and sets the position information thereof in step 73. Next, in step 74 the route setting unit 43 is used to guide a guidance route, and when there are items to be selected in the process thereof it communicates with the user terminal 10, 20, or 30 to be selected by the user. When the guidance route to the final destination is set, the route is stored in the storage unit 44, and in step 75 the position information of the first destination is returned to the user terminal 10, 20, or 30.

[0034] The user terminal 10, 20, or 30 stores the position information (second position information) of the destination sent from the service server 40 in the memory 19a and finishes setting the destination. Next, the first position information showing the current location and the second position information showing the first destination are compared in step 64, and it is confirmed whether the current location is the same as the destination or whether it has entered a predetermined range. When the current location and the destination differ, in step 66 a lead direction showing the direction from the current location to the destination is derived, and in proximity to this, in step 67, the reference bearing

showing the orientation of the LCD 13 or the body of the user is detected. Then, in step 68 an indication direction showing the lead direction with respect to the reference bearing is derived and conveyed to the user via the LCD 13 or the speaker 35. This indicates the direction to the destination from the current location as a relative direction with respect to the direction the user is referencing, and thus proceeding in this direction permits a user to easily arrive at the first destination.

[0035] When the user arrives at the first destination, it transitions from step 64 to step 65, and the service server 40 is called up via the internet 3. The service server 40 side identifies the user from the user terminal, a user ID, or the like, and selects the position information of the next destination previously stored in the route storage unit 44. Then, in step 76 the position information of this next destination is forwarded to the user terminal 10, 20, or 30. The user terminal 10, 20, or 30 side resets the position information set in step 65 as the next destination, supplies the indication information to the user, and navigates the user to the next destination. This procedure repeats to finish the service of the road guidance system using the service server 40 when the user arrives at the final destination.

[0036] Using the user terminal 10, 20, and 30 provided with the direction indication function in the present example in this manner enables a user to reliably arrive at the final destination just by indicating the direction of the destination to the user. Therefore, there is no need to display map information or for map information to be kept on the user terminal side, and thus it is possible to construct a navigation system using a miniature information processing terminal about the size of a wrist-watch or even smaller. Furthermore, the information exchanged with the service server via the internet may be substantially only position information and there is no need to exchange map information, and thus the volume of information to be exchanged via the communication means may be extremely small. Therefore, loading the direction indication device or the direction indication method of the present invention later as a plugin function or an add-on for a mobile processing terminal such as a PDA used by many users allows a terminal to be provided for a navigation system that is small, has a low cost, and can be used by anyone.

[0037] Note that the present example describes an example connecting to the service server via the internet, but it is of course possible to use a data communication network capable of linking directly with the service server using PHS, a wireless phone, or the like. Furthermore, the direction indication device or the direction indication method of the present invention may be used to provide services for amusement such as exchanging position information among a plurality of user terminals provided with the direction indication function and playing hide

and seek or an exploration game where only the direction for a goal is shown and users compete in the method of selecting a route to arrive at the goal.

[0038]

[Effect of the Invention] As described above, the direction indicating device and the direction indicating method of the present invention are configured to indicate the direction to the destination as a relative direction with respect to the bearing to which a user is referencing, and thus it is possible to provide navigation information that the user can easily comprehend and not misunderstand. Furthermore, the direction indication device and the direction indication method in the present invention are configured to use the position information of the current location and the position information of the destination to indicate the direction a user should proceed, and thus there is no need to stock or handle massive volumes of information such as map information or route information as in a conventional car navigation system. Thus, adopting the direction indication device and the direction indication method of the present invention enables construction of a navigation system that can be easily configured and provided at a low cost.

[Brief Description of the Drawings]

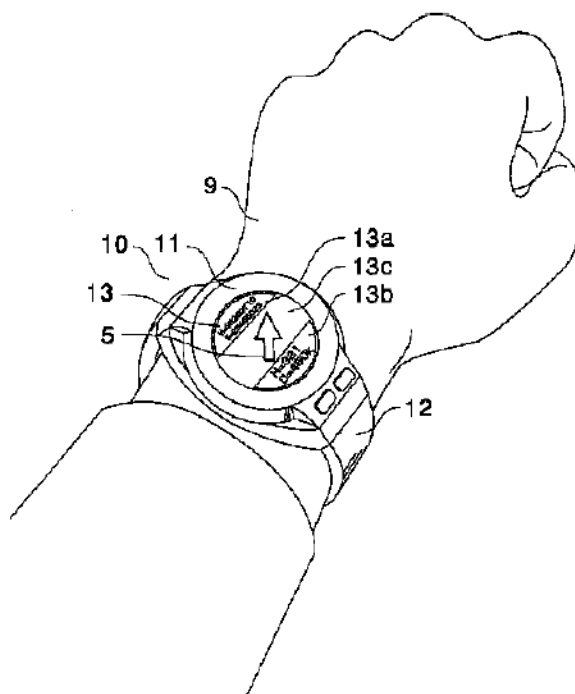
[FIG. 1] is a view showing an outline of a system performing navigation using a user terminal provided with the direction indication function of the present invention.

[FIG. 2] is a view showing a wrist-watch type user terminal when worn on an arm of a user.

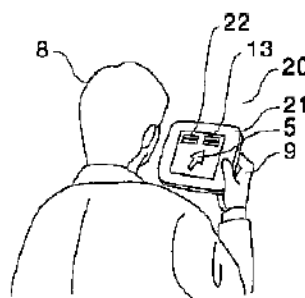
[FIG. 3] is a view showing a wallet type user terminal when held.

[FIG. 4] is a view showing the wallet type user terminal when held upward.

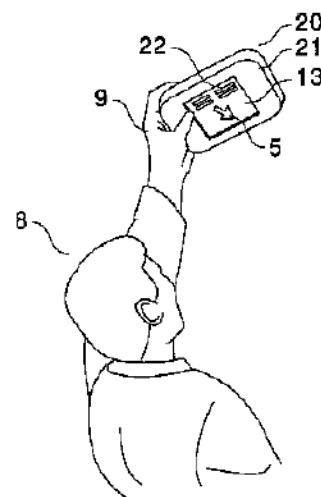
[FIG. 2]



[FIG. 3]



[FIG. 4]



[FIG. 5] is a view showing a change in the display of an arrow showing a destination displayed on an LCD on the user terminal.

[FIG. 6] is a view showing a hardware configuration of the user terminal.

[FIG. 7] is a block diagram showing a function configuration of the user terminal.

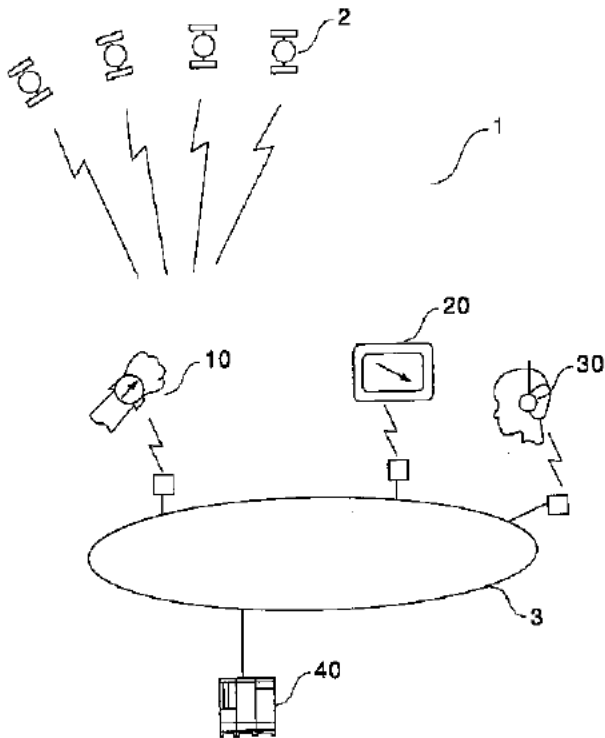
[FIG. 8] is a block diagram showing a function configuration of the service server.

[FIG. 9] is a flow chart showing the processing in the user terminal and the service server.

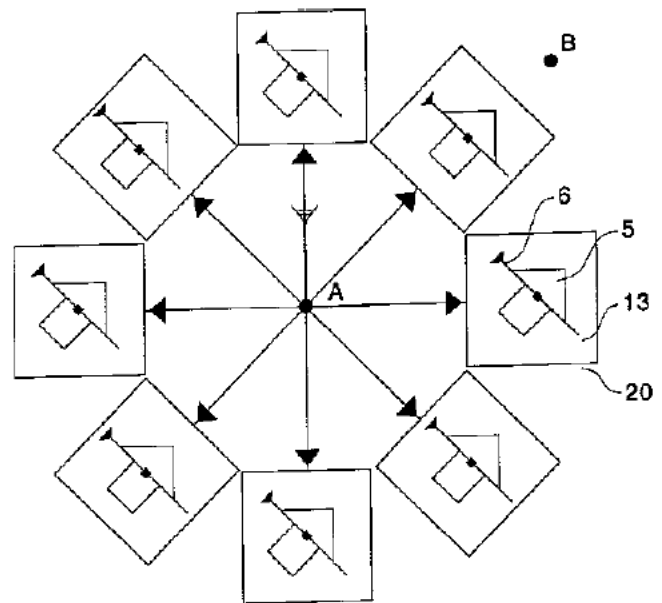
[Description of Reference Numerals]

- 1 ... navigation system
- 2 ... GPS satellite
- 3 ... internet
- 5 ... arrow showing the direction to the destination
- 10, 20, 30 ... user terminal
- 13 ... LCD (display device)
- 16 ... radio wave positioning unit
- 17 ... data communication unit
- 18 ... bearing detection unit
- 35 ... speaker (audio output device)
- 40 ... service server
- 42 ... position information processing unit
- 43 ... route setting unit
- 44 ... route storage unit
- 45 ... position information supply unit
- 51 ... setting unit
- 52 ... lead direction derivation unit
- 53 ... indication direction derivation unit
- 54 ... indication direction output unit

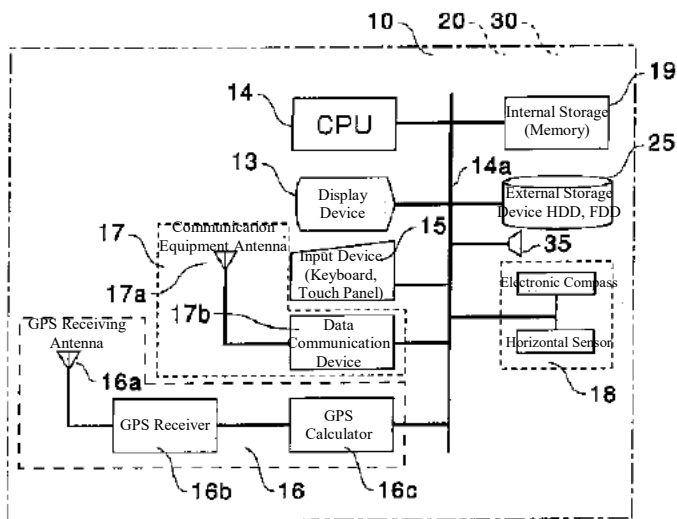
[FIG. 1]



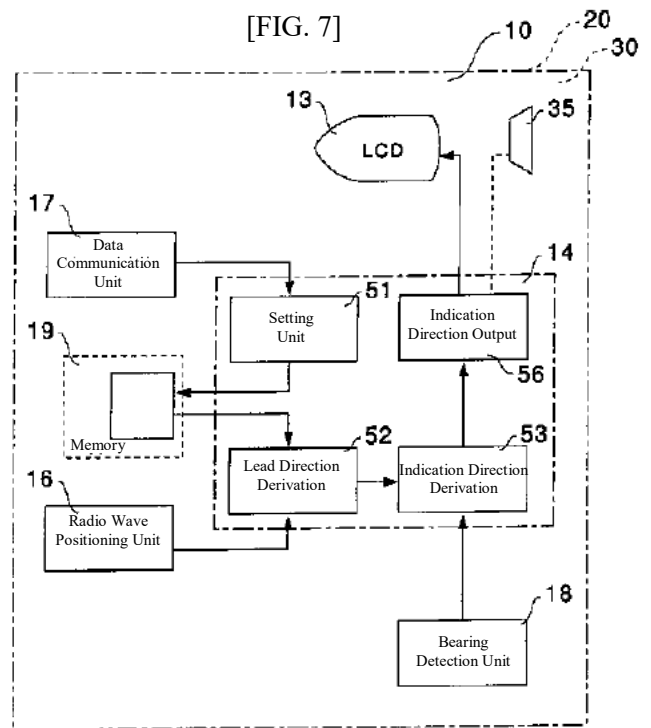
[FIG. 5]



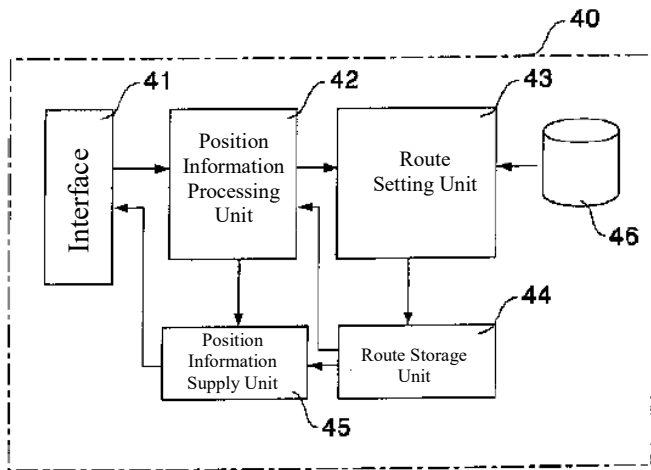
[FIG. 6]



[FIG. 7]



[FIG. 8]



[FIG. 9]

