

(19) Japan Patent Office (JP)

(12) **Japanese Unexamined Patent
Application Publication (A)**(11) Japanese Unexamined Patent
Application Publication Number**2008-217835
(P2008-217835A)**(43) Publication date: **September 18, 2008**

(51) Int. Cl.	F I	Theme Codes (reference)
G08G 1/14 (2006.01)	G08G 1/14 A	5 H 1 8 0

Request for examination Yes Number of claims 7 OL (Total of 13 pages)

Japanese Patent Application		
(21) Application number	2008-156695 (P2008-156695)	(71) Applicant 000004260
(22) Date of application	June 16, 2008 (6.16.2008)	Denso Co., Ltd.
(62) Indication of division	2003-340022 (P2003-340022)	1-1 Showa-cho, Kariya-shi, Aichi Prefecture
	Division of	(74) Agent 100123191
Original date of application	September 30, 2003 (9.30.2003)	Patent attorney Takanobu Ito
		(74) Agent 100145595
		Patent attorney Takanori Kubo
		(74) Agent 100147234
		Patent attorney Satoshi Nagai
		(74) Agent 100096998
		Patent attorney Hirohiko Usui
		(72) Inventor Manabu Matsumoto
		c/o Denso Co., Ltd. 1-1 Showa-cho, Kariya-
		shi, Aichi Prefecture;

Continue on last page

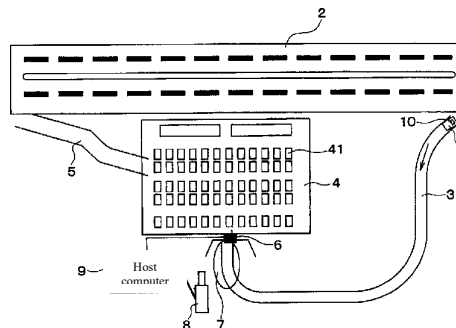
(54) [Title of the invention] Parking lot guidance system

(57) [Abstract]

[Problem to be solved] To provide a guidance system which enables a user to smoothly move to a vacant space in a parking lot, on the basis of the user's own selection.

[Means for solving] A host computer 9 generates an image which makes it possible to visually recognize a vacant parking space in a parking lot 4, on the basis of a bird's-eye image of the parking lot 4 which is photographed by a camera 8, and a narrow-band wireless antenna 6 transmits the image generated to a communication area 7. A vehicle 1, on which a car navigation device 10 having a communication function is mounted, receives the image thus transmitted and makes the display device of the car navigation device 10 display the image.

[Representative drawing] Fig. 1



[Scope of Patent Claims]

[Claim 1]

A parking lot guidance system, which is equipped with the acquiring means (93) for acquiring an image of a parking lot from a camera (8) taking a photo of the aforesaid parking lot (4);

the generating means (92) for generating, based on the aforesaid photographed image acquired by the aforesaid acquiring means, an image in which a position of a vacant parking space in the aforesaid parking lot is visible;

the uploading means for uploading the image generated by the aforesaid generating means (92) to the server; and

the transmitting means (6) for transmitting to a communication terminal the designation of the position of the upload destination by the aforesaid uploading means, as information for enabling the aforesaid communication terminal (10) having an image display function installed in a vehicle (1) that intends to use the aforesaid parking lot to display images generated by the aforesaid generating means.

10

[Claim 2]

The parking lot guidance system as described in Claim 1, wherein the aforesaid generating means detects the position of the aforesaid vacant space based on the aforesaid photographed image acquired by the aforesaid acquiring means, and generates an image in which the position of the aforesaid detected vacant space is highlighted in the aforesaid photographed image.

[Claim 3]

The parking lot guidance system as described in Claim 1 or 2, wherein the aforesaid generating means generates an image consisting of a figure based on the aforesaid photographed image acquired by the aforesaid acquiring means

20

[Claim 4]

The parking lot guidance system as described in any one claim from Claim 1 to 3, wherein the aforesaid generating means generates an image containing images of facilities near the aforesaid parking lot based on the aforesaid photographed image acquired by the aforesaid acquiring means.

[Claim 5]

The parking lot guidance system as described in any one claim from Claim 1 to 4, wherein the aforesaid transmitting means are present in multiple places within the aforesaid parking lot.

[Claim 6]

A parking lot guidance system, which is equipped with the detecting means (81 to 84) for detecting information on the position of a vacant parking space in a parking lot (4);

30

the generating means (92) for generating an image in which the position of a vacant parking space in the aforesaid parking lot is visible, based on the aforesaid information detected by the aforesaid detecting means;

the uploading means for uploading the image generated by the aforesaid generating means (92) to the server; and

the transmitting means (6) for transmitting to a communication terminal the designation of the position of the upload destination by the aforesaid uploading means, as information for enabling the aforesaid communication terminal (10) having an image display function installed in a vehicle (1) that intends to use the aforesaid parking lot to display images generated by the aforesaid generating means.

[Claim 7]

40

The parking lot guidance system as described in any one claim from Claim 1 to 6, wherein the aforesaid transmitting means (6) connects with the aforesaid communication terminal (10) and, if the aforesaid communication terminal (10) is installed in a contracted vehicle, the aforesaid transmitting means (6) transmits information to enable the aforesaid communication terminal (10) to enable displaying the image generated by the aforesaid generating means (92).

[Detailed description of the invention]

[Technical field]

[0001]

This invention relates to a system for indicating to the user the vacant status of a parking lot.

[Background art]

[0002]

50

Conventionally, parking lots may have indications at their entrances indicating whether or not the parking lot is full or empty, to indicate whether or not there is vacant space.

[Disclosure of the invention]

[Problems to be solved by the invention]

[0003]

However, with such indications of only full or empty parking lots, those who intend to use the said parking lot cannot tell which position in the parking lot actually has a vacant space. In such a case, the user may have to spend a long time moving around the parking lot looking for a vacant space, which may increase the risk of collisions with pedestrians or other vehicles in the parking lot.

[0004]

In addition, some parking lots have a system that guides the user to the vacant space by voice or route display, but in such a system, even if there are multiple vacant spaces, the user is guided to the vacant space determined by the system, regardless of the user's intention.

[0005]

In view of the above problem, the purpose of this invention is to provide a guidance system that enables users to smoothly move to a vacant space in a parking lot based on their own selection.

[Means for solving the problem]

[0006]

In order to achieve the above-mentioned objectives, the invention described in Claim 1 is a parking lot guidance system, which is equipped with the acquiring means (93) for acquiring an image of a parking lot from a camera (8) taking a photo of the aforesaid parking lot (4); the generating means (92) for generating, based on the aforesaid photographed image acquired by the aforesaid acquiring means, an image in which a position of a vacant parking space in the aforesaid parking lot is visible; the uploading means for uploading the image generated by the aforesaid generating means (92) to the server; and the transmitting means (6) for transmitting to a communication terminal the designation of the position of the upload destination by the aforesaid uploading means, as information for enabling the aforesaid communication terminal (10) having an image display function installed in a vehicle (1) that intends to use the aforesaid parking lot to display images generated by the aforesaid generating means.

[0007]

In this way, the communication terminal with an image display function displays an image generated based on the photographed image by the camera that shows the position of the vacant parking space in the parking lot, so that the user can see at a glance which position in the parking lot the vacant space is located. Therefore, it is possible to provide a guidance system that enables users to smoothly move to a vacant space in a parking lot based on their own selection.

[0008]

Moreover, the term "image generated based on a photographed image" is a concept that includes newly generated images based on information contained in a photographed image. Furthermore, the term "image generated based on a photographed image" is a concept that includes an image that is the result of processing such as image modification, addition, additional information addition, image format conversion, etc., to a photographed image.

[0009]

In addition, "information to enable display of the image" may also be the data of the image itself or information about the location of the image (e.g., URL (Universal Reference Locator)).

[0010]

In addition, the invention described in Claim 2 is a parking lot guidance system as described in Claim 1, wherein the aforesaid generating means detects the position of the aforesaid vacant space based on the aforesaid photographed image acquired by the aforesaid acquiring means, and generates an image in which the position of the aforesaid detected vacant space is highlighted in the aforesaid photographed image.

[0011]

This makes it easier for the user to see the vacant space by highlighting it, when it is difficult for the user to grasp the vacant space even if the image is sent as it is, such as the resolution of the image taken by the camera is low or the weather conditions are bad, etc.

[0012]

In addition, the invention described in Claim 3 is a parking lot guidance system as described in Claim 1 or 2, wherein the aforesaid generating means generates an image consisting of a figure

10

20

30

40

50

based on the aforesaid photographed image acquired by the aforesaid acquiring means.

[0013]

In this way, by transmitting graphic images, which generally contain less information than normal captured images, the amount of data transmitted can be reduced and the transmission speed can be increased.

[0014]

In addition, the invention described in Claim 4 is a parking lot guidance system as described in any one claim from Claim 1 to 3, wherein the aforesaid generating means generates an image containing images of facilities near the aforesaid parking lot based on the aforesaid photographed image acquired by the aforesaid acquiring means.

[0015]

This allows the user to make a decision on which position in the vacant space to park based on the positional relationship with the displayed facility. Moreover, the parking lot vicinity refers to the area around and within the parking lot.

[0016]

In addition, the invention described in Claim 5 is a parking lot guidance system as described in any one claim from Claim 1 to 4, wherein the aforesaid transmitting means are present in multiple places within the aforesaid parking lot.

[0017]

This allows the parked lot image to be updated by any one of transmitting means at multiple places, even if the user's vehicle is moving in the parking lot and the condition of the vacant space changes.

[0018]

In addition, the intervention described in Claim 6 is equipped with the detecting means (81 to 84) for detecting information on the position of a vacant parking space in a parking lot (4); the generating means (92) for generating an image in which the position of a vacant parking space in the aforesaid parking lot is visible, based on the aforesaid information detected by the aforesaid detecting means; the uploading means for uploading the image generated by the aforesaid generating means (92) to the server; and the transmitting means (6) for transmitting to a communication terminal the designation of the position of the upload destination by the aforesaid uploading means, as information for enabling the aforesaid communication terminal (10) having an image display function installed in a vehicle (1) that intends to use the aforesaid parking lot to display images generated by the aforesaid generating means.

[0019]

In this way, the communication terminal with an image display function displays an image generated based on the information of the position of the vacant parking space in the parking lot detected by the detecting means that shows the position of the vacant parking space in the parking lot, so that the user can see at a glance which position in the parking lot the vacant space is located. Therefore, it is possible to provide a guidance system that enables users to smoothly move to a vacant space in a parking lot based on their own selection.

[0020]

Moreover, the symbols in parentheses in each of the above-mentioned means indicate the correspondence relation with the specific means and components described in the embodiments described below.

[Best form for implementing the invention]

[0021]

Fig. 1 shows a schematic diagram of a parking lot where a parking lot guidance system pertaining to one embodiment of this invention is installed. In this embodiment, vehicle 1 enters parking lot 4 from highway 2 via entry road 3. Upon entering parking lot 4, vehicle 1 parks in one of the vacant parking spaces (i.e., vacant parking space) among the pre-demarcated parking spaces, such as parking space 41. And, when vehicle 1 exits parking lot 4, it returns to highway 2 via exit road 5.

[0022]

A narrow-band wireless antenna 6 is installed at the entrance to parking lot 4 at the end of entry road 3. The communication area 7, which is the area within which radio waves from the narrow-band wireless antenna 6 can reach, forms an elliptical area that includes the end of the entry road 3.

10

20

30

40

50

The vehicle 1 has a car navigation device 10 that can communicate with the narrow-band wireless antenna 6 in this communication area 7 and can display images.

[0023]

In addition, a camera 8 is installed in parking lot 4 in a position that allows to provide a bird's eye view of the entire parking lot 4 and constantly outputs the photographed images to the host computer 9. In addition, the narrow-band wireless antenna 6 transmits the images outputted from host computer 9, which show the position of the vacant parking space in parking lot 4. In addition, vehicle sensors which are not shown in the figure are installed in each parking space in parking lot 4, and the outputs of these sensors are inputted to the host computer 9.

[0024]

The narrow-band wireless antenna 6, camera 8, host computer 9, and vehicle sensor constitute the parking lot guidance system. The specific configuration and operation of the parking lot guidance system are described below.

[0025]

Fig. 2 shows the hardware configuration of the parking lot guidance system as a block diagram. The parking lot guidance system consists of narrow-band wireless antenna 6, camera 8, host computer 9, and vehicle sensors 81 to 84. Moreover, although there are as many vehicle sensors as the number of parking spaces in parking lot 4, only four are shown in Fig. 2 for simplicity.

[0026]

The narrow-band wireless antenna 6 transmits wireless signals outputted from the narrow-band wireless controller 94 of the host computer 9 as radio waves to the communication area 7. In this embodiment, the narrow-band wireless antenna 6 is used to transmit images generated by the information processing unit 92 to the car navigation device 10 of vehicle 1.

[0027]

Camera 8 takes photos of the entire parking lot 4 from above and outputs analog signals of the photographed image to the image processing unit 93 of the host computer 9.

[0028]

One vehicle sensor 81 to 84 is installed at each parking space. These vehicle sensors 81 to 84 consist of infrared sensors, etc., and detect the presence of a vehicle in the parking space and output a detection signal to the information processing unit 92 of the host computer 9 based on the detection result. Moreover, the type of detection signal is different for each vehicle sensor, which makes it possible to identify which parking space the vehicle is in.

[0029]

The host computer 9 has a display 91, information processing unit 92, image processing unit 93, narrow-band wireless controller 94, hard disk drive 95, and keyboard 96.

[0030]

Display 91 displays the said image on its display surface in response to the image signal inputted from the information processing unit 92.

[0031]

The image processing unit 93 acquires the analog signal of the photographed image inputted from camera 8, converts it to digital data, and outputs it to the information processing unit 92.

[0032]

The narrow-band wireless controller 94 performs D/A conversion, modulation, frequency conversion, amplification, and other processing according to the DSRC (Dedicated Short Range Communications) protocol on the data inputted from information processing unit 92, and outputs the resulting signals to the narrow-band wireless antenna 6.

[0033]

The hard disk drive 95 (referred to as HDD in Fig. 2) is a large-capacity magnetic storage medium that contains storage space for the image database (referred to as image DB in Fig. 2) described below.

10

20

30

40

50

[0034]

Keyboard 96 has keys for characters, etc., and outputs signals based on the pressing of said keys by the user to the information processing unit 92.

[0035]

The information processing unit 92 has a CPU, RAM, and ROM, which are not shown in the figure, and this CPU executes the program stored in this ROM and operates based on the executed program and data from the keyboard 96, image processing unit 93, vehicle sensor 81 to 84, and so on. During this operation, data are read from this RAM, ROM, and hard disk drive 95 and written to this RAM and hard disk drive 95 as necessary.

[0036]

Fig. 3 shows a flow chart of the program that the CPU of the information processing unit 92 executes periodically during operation. (the cycle should be as short as the performance of the parking lot guidance system allows. For example, 0.1 second).

[0037]

First, the photographed image is captured in step 310. Specifically, the digital data of the image inputted from the image processing unit 93 is stored in a predetermined area of the RAM of the information processing unit 92.

[0038]

Next, in step 320, a transmission image is generated based on the photographed image captured in step 310. The transmission image refers to image data to be transmitted to the car navigation device 10 in the communication area 7, and is displayed by the car navigation device 10 so that the user of vehicle 1 can see the position of the vacant parking space in the parking lot. The details of the method for generating such a transmission image are described below. Moreover, the transmission image is processed by information processing unit 92 so that it is an image looking at parking lot 4 facing in the same direction as the entry direction of vehicle 1.

[0039]

Next, in step 330, the transmission image generated in step 320 is transmitted. Specifically, the transmission image data generated in step 320 are outputted to narrow-band wireless controller 94. This process sends the transmission image to communication area 7 via narrow-band wireless controller 94 and narrow-band wireless antenna 6.

[0040]

By operating the program as described above, the information processing unit 92 generates a transmission image in which the position of the vacant parking space in the parking lot 4 can be seen based on the photographed image acquired by the image processing unit 93 from the camera 8, and outputs the transmission image to the narrow-band wireless controller 94. The narrow-band wireless antenna 6 then sends out the transmission image to the communication area 7.

[0041]

The above is the configuration and operation of the parking lot guidance system. Next, the configuration and operation of the car navigation device 10 installed in vehicle 1 will be described.

[0042]

Fig. 4 shows the hardware configuration of the car navigation device 10 as a block diagram. This car navigation device 10 has a position detector 11, internal memory controller 16, operation switch group 17, display device 20, remote control sensor 21, narrow-band wireless antenna 23, narrow-band wireless controller 24, and control circuit 18.

[0043]

Display device 20 has a display surface such as a liquid crystal display, etc., and a speaker, and displays the relevant image on the display surface such as a liquid crystal display, etc., in response to the input of an image signal from control circuit 18, and outputs the relevant sound to the speaker in response to the input of an audio signal from control circuit 18.

10

20

30

40

50

[0044]

The operation switch group 17 consists of multiple mechanical switches provided around the display surface of the display device 20 and input devices such as a touch panel superimposed on the said display surface, and outputs the signals based on user pressing of mechanical switches (e.g., pressing of push buttons) and touch of the touch panel to the control circuit 18.

[0045]

The remote control sensor 21 outputs signals received from the remote control 22, which transmits wireless signals by infrared or other means based on user operation, to the control circuit 18.

[0046]

The position detector 11 has sensors such as a geomagnetic sensor, gyroscope, vehicle speed sensor, and GPS receiver, all of which are not shown in the figure, and outputs information to the control circuit 18 to identify the current position based on the properties of these sensors.

[0047]

The internal memory controller 16 is equipped with a nonvolatile storage medium such as a hard disk drive (HDD) and controls the reading and, if possible, the writing of data to this nonvolatile storage medium based on control commands, etc. from the control circuit 18. The information stored in this nonvolatile storage medium includes data for the so-called map matching to improve the accuracy of the above-mentioned position detection, various data including map data and landmark data, and programs for the operation of the car navigation device 10, etc.

[0048]

The narrow-band wireless controller 24 performs amplification, frequency conversion, demodulation, A/D conversion, etc. on the signal received by the narrow-band wireless antenna 23 as processing according to the DSRC communication protocol, and outputs the results to the control circuit 18.

[0049]

The control circuit 18 is configured as an ordinary computer, with a CPU, ROM, RAM, flash memory, I/O, and bus lines connecting these configurations inside. The control circuit 18 executes the program for the operation of the car navigation device 10 read from the ROM and internal memory controller 16, reads information from the ROM, RAM, and flash memory during its execution, and writes information to the RAM and flash memory, and transfers/receives signals to and from position detector 11, operation switch group 17, display device 20, remote control sensor 21, narrow-band wireless controller 24, and other devices via I/O.

[0050]

The CPU of control circuit 18 executes the following programs: Menu program, route search program, map display program, received image display program, and other programs. Moreover, if it is necessary to specify the current position in executing these programs, the CPU of control circuit 18 calculates the current position based on the signal to specify the current position outputted from the position detector 11.

[0051]

The menu program displays various programs running on the OS in a hierarchical menu according to the function and purpose of the program, and allows the user to start execution of a program selected by the user from among those displayed in the menu. Moreover, the menu display is performed by outputting the image data of the menu to the display device 20, and the user's selection is detected based on the signal inputted to the control circuit 18 by the selection operation (cursor movement, pressing the Confirm button, etc.) to the lower remote control 22 or operation switch group 17 via remote control sensor 21.

[0052]

When the destination position is inputted by remote control 22 or by operation switch group 17, the route search program automatically selects the optimal route from the current position to the destination and forms a guidance route, and display it on the display device 20. The Dijkstra method and other methods are known for automatically setting the optimal route.

[0053]

10

20

30

40

50

The map display program overlaps the vehicle current position mark based on the current position information inputted from position detector 11, the map data read from internal memory controller 16, and additional data such as guidance routes formed by the route search program, and displays them on the display surface of display device 20.

[0054]

The received image display program is activated by the selection in the menu program described above or by the input of image data from the narrow-band wireless controller 24, and outputs the input image data to the display device 20 so that the image can be displayed on the display device 20 and the user of vehicle 1 can view the image.

[0055]

With the received image table program described above, the car navigation device 10 functions as a communication terminal with an image display function. And, the car navigation device 10 can receive and display images sent to the communication area 7 by the parking lot guidance system when the vehicle 1 is in the communication area 7.

[0056]

In this way, the communication terminal with an image display function displays an image generated based on the photographed image by camera 8 that the position of the vacant parking space in parking lot 4. This allows the user to see at a glance at which positions in parking lot 4 there are vacant spaces. Therefore, in parking lot 4, the driver of vehicle 1 who uses parking lot 4 can smoothly move to the vacant space based on his/her own selection.

[0057]

Here, the specific method by which information processing unit 92 generates the transmission image in step 320 is described. The method of generating a transmission image depends on the type of transmission image to be generated. In this embodiment, the types of transmission images generated by the information processing unit 92, i.e., images that allow the position of the vacant parking space in the parking lot to be seen, include live-action images, vacant space-highlighted live-action images, and simplified graphic images.

[0058]

A live-action image is the result of processing of the photographed image taken by camera 8 in a manner that the substantial display content is almost unchanged for the vacant space portion of the said parking lot 4. In the case of generating a complete live-action image, the information processing unit 92, in step 320, generates a transmission image through processing the image data inputted from the image processing unit 93 by applying a prescribed compression process (e.g., LZW compression for conversion to GIF format, discrete cosine transformation for conversion to JPEG format), or by applying other processes that have little effect on the visibility of the image itself to the photographed image, such as adding a prescribed header (additional information such as date and time of photographing, type of image data format, etc.), etc. Moreover, the current position of vehicle 1, i.e., the position of communication area 7, may also be highlighted during this generation.

[0059]

An example of such a live-action image displayed by the display device 20 of the car navigation device 10 is shown in Fig. 5. By viewing such an image, the driver of vehicle 1 can immediately see that there is a vacant parking space in areas 42 and 43 and a vehicle (e.g., vehicle 61) at other positions. In addition, based on the positional relationship between the current position 44 of vehicle 1 and areas 42 and 43, the driver can proceed in the direction of areas 42 and 43 without hesitation.

[0060]

In addition, the vacant space-highlighted live-action image is the result of processing of the photographed image to highlight the portion of parking lot 4 that is the vacant parking space. In case of generating a vacant space-highlighted live-action image, the information processing unit 92 identifies the position of the vacant space from the image data inputted from the image processing unit 93 in step 320, and generates a transmission image in which the portion of the position identified in the image data is processed for highlighting. For example, a bold line surrounding the vacant parking space is superimposed on the photographed image. In addition, the current position of vehicle 1, i.e., the position of communication area 7, may also be highlighted during this generation.

10

20

30

40

50

[0061]

An example of such a vacant space-highlighted live-action image displayed by the display device 20 of the car navigation device 10 is shown in Fig. 6. By viewing such an image, the driver of vehicle 1 can immediately grasp the presence of a vacant parking space in areas 42, 43, and 45 by highlighting it. This kind of highlighting is particularly effective when the driver of vehicle 1 has difficulty in identifying the vacant parking space even if the live-action image described above is used as the transmission image, such as when the resolution of the photographic image is poor or when the weather conditions are bad.

[0062]

In addition, a simple graphic image refers to an image in which all parts of the photographed image taken by camera 8, including the vacant parking space, are replaced with a simple graphic such as a rectangle. For example, a simple graphic image is an image in which parking lot 4 is replaced with a large rectangle and the parking space in parking lot 4 is replaced with a small rectangle. In case of generating a simple graphic image, the information processing unit 92 identifies the position of the vacant space from the image data inputted from image processing unit 93 in step 320, and generates a transmission image with processing for highlighting the portion corresponding to the identified position in the converted simple graphic image. For example, a bold line surrounding the vacant parking space is superimposed on the simple graphic image as highlighting. In addition, textual information on the presence or absence of a vehicle may be added to each parking space.

[0063]

Moreover, the image of parking lot 4 converted into a simple graphic image may be created based on the photographed image each time the process of step 320 is performed, or it may also be created in advance and stored in the image database of hard disk drive 95, and the simple graphic image may be read out from the image database each time the process of step 320 is performed.

[0064]

An example of such a simple graphic image displayed by the display device 20 of the car navigation device 10 is shown in Fig. 7. By viewing such an image, the driver of vehicle 1 can immediately grasp the presence of a vacant parking space in areas 42, 43, and 45 by highlighting it. This type of display is particularly effective when the driver of vehicle 1 has difficulty in identifying the vacant parking space even if the live-action image described above is used as the transmission image, such as when the resolution of the photographic image is poor or when the weather conditions are bad. In addition, by transmitting graphic images, which generally have less information than images containing live-action photos taken, the amount of data transmitted to the car navigation device 10 can be reduced and the transmission image transmission speed can be increased.

[0065]

In addition, for each of these three types of transmission images, information on the facilities around and within parking lot 4 and information for guidance may be superimposed. Fig. 8 shows an example of transmission image which superimposed graphics and text display showing restroom 51, restaurant 52, vending machine 53, covered road 54 as facilities in the vicinity of parking lot 4, exit 55, large vehicle designated slot 56, small vehicle designated slot 57 as information on the vicinity (i.e., around and within parking lot 4) of parking lot 4, on the live-action image. By superimposing such indications, the user can make a decision on which position in the vacant space to park based on the positional relationship with the displayed facilities.

[0066]

Moreover, when generating a vacant space-highlighted live-action image and a simple graphic image, the information processing unit 92, in step 320, is required to identify the vacant parking space based on the photographed image of camera 8. This identification is done by detecting a frame (e.g., border) of a parking space in parking lot 4 from the photographed image data and determining whether or not a parked vehicle is present for each parking space. The presence of a parked vehicle is determined by comparing the color data of the road surface of parking lot 4, which is stored on a hard disk drive 95 or the like in advance, with the color in the photographed image in the relevant parking space and if the difference is greater than a predetermined threshold value, the presence of a parked vehicle is determined. If the difference is less than or equal to the predetermined threshold value, it is determined that the parking lot is a vacant parking space.

10

20

30

40

50

[0067]

Here, it should be noted that sometimes, it may be difficult to distinguish the color of road surface due to the onset of rain and sunlight. In such cases where the image processing recognition rate is poor, a vacant parking space is identified based on the detection signals from vehicle sensors 81 to 84.

[0068]

Moreover, the information processing unit 92 is designed to change the type of image to be transmitted, switch whether or not to use vehicle sensors 81 to 84, for example, based on the operation of the keyboard 96 of the person managing the parking lot guidance system for parking lot 4, and make the display 91 to show an indication to that effect.

[0069]

Moreover, in this embodiment, there is only one narrow-band wireless antenna 6 at the entrance of parking lot 4, but this is not necessarily the case, and the narrow-band wireless antenna 6 may be scattered at multiple places within an aforesaid parking lot. An example of narrow-band wireless antennas 6 scattered in the aforesaid parking lot 4 is shown in Fig. 9. By having narrow-band wireless antennas 6 scattered in this way, even if there were changes in the condition of the vacant space while the user's vehicle is moving through the parking lot, the image of the parking lot can be updated by any one of the antennas 6 at multiple places.

[0070]

In addition, in this embodiment, the parking lot guidance system transmits an image to the car navigation device 10 which is the communication terminal, so that the position of the vacant parking space in the parking lot can be seen. However, the information to be transmitted is not limited to the image itself, but can be any information that enables the image to be displayed. For example, the transmission image may be uploaded to a server such as the Internet via a wide-area wireless network, and the designation of location of the upload destination (e.g., URL) may be transmitted to the communication terminal.

[0071]

In addition, in this embodiment, the parking lot guidance system always sends a transmission image regardless of whether the communication terminal enters communication area 7 or not. In other words, the transmission image is sent in broadcast mode. However, it is not necessarily necessary to transmit in such a broadcast mode, instead, it may be fine to be only in individual mode, i.e., a mode in which the transmission image is sent out only after the communication terminal has entered the communication area 7 and negotiated a connection with the parking lot guidance system. For example, in case of transmitting image information only to the contracted vehicle 1 in a contracted parking lot, this individual mode may be more convenient. In case of using such individual mode, information processing unit 92 may store the images generated in step 320 in the image database on hard disk drive 95, read the latest one of the stored images, and output them to narrow-band wireless controller 94.

[0072]

In addition, although a single camera 8 takes photos of the entire parking lot 4 in this embodiment, multiple cameras may take photos of various parts of the parking lot 4, and the information processing unit 92 or the image processing unit 93 of the host computer 9 may also combine these images.

[0073]

In addition, the image transmitted by the parking lot guidance system may be a still or moving image. In other words, it can be any image that enables the user to see the position of the vacant parking space in the parking lot.

[Brief description of the drawings]

[0074]

[Fig. 1] It is a schematic diagram of a parking lot where the parking lot guidance system of this invention is installed.

[Fig. 2] It is a block diagram showing the configuration of the parking lot guidance system.

[Fig. 3] It is a flow chart of the program that is constantly executed by the information processing unit 92 during operation.

[Fig. 4] It is a block diagram showing the configuration of the car navigation device 10 mounted on vehicle 1.

[Fig. 5] It is a diagram showing an example of the display of a live-action image.

[Fig. 6] It is a diagram showing an example of the display of a live-action image with vacant parking space highlighted.

[Fig. 7] It is a diagram showing an example of a simple graphic image.

[Fig. 8] It is a diagram showing an example of a live-action image overlaid with a graphic image of a facility, etc.

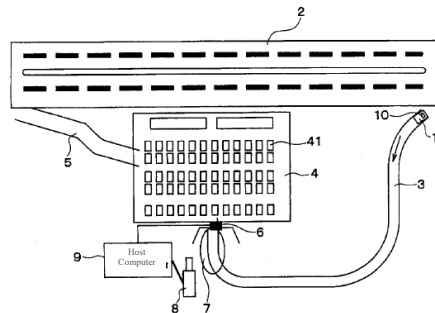
[Fig. 9] It is a diagram showing an example of installation of narrow-band wireless antenna 6.

[Explanation of references]

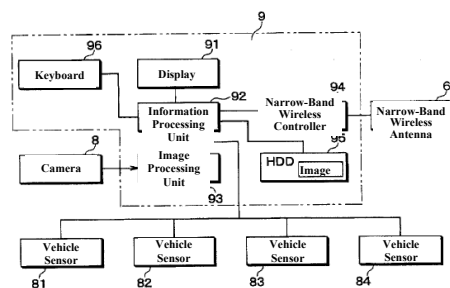
[0075]

1 ... vehicle; 2 ... highway; 3 ... entry road; 4 ... parking lot; 5 ... exit road; 6 ... narrow-band wireless antenna; 7 ... communication area; 8 ... camera; 9 ... host computer; 10 ... car navigation device; 11 ... position detector; 16 ... internal memory controller; 17 ... operation switch group; 18 ... control circuit; 20 ... display device; 21 ... remote control sensor; 22 ... remote control; 23 ... narrow-band wireless antenna; 24 ... narrow-band wireless controller; 41 ... parking space; 42 and 43 ... area; 44 ... current position of vehicle 1; 51 ... restroom; 52 ... restaurant; 53 ... vending machine; 54 ... covered road; 55 ... exit; 56 ... large vehicle designated slot; 57 ... small vehicle designated slot; 81 to 84 ... vehicle sensor; 91 ... display; 92 ... information processing unit; 93 ... image processing unit; 94 ... narrow-band wireless controller; 95 ... hard disk drive; 96 ... keyboard.

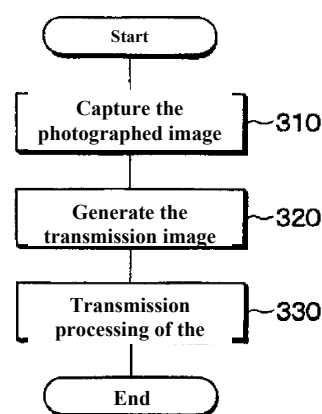
[Fig. 1]



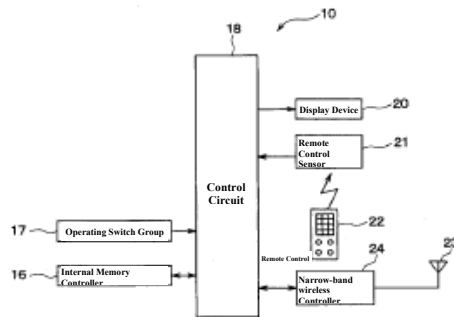
[Fig. 2]



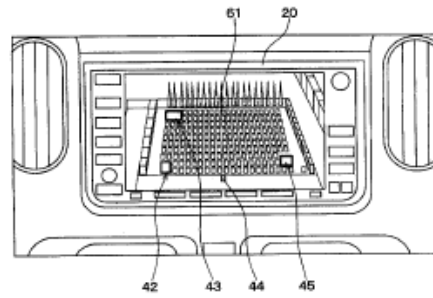
[Fig. 3]



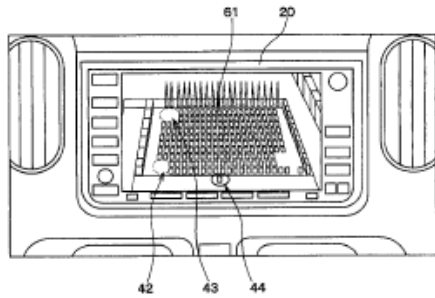
[Fig. 4]



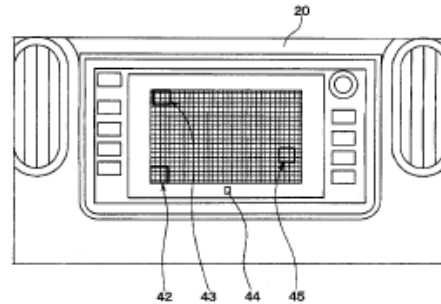
[Fig. 6]



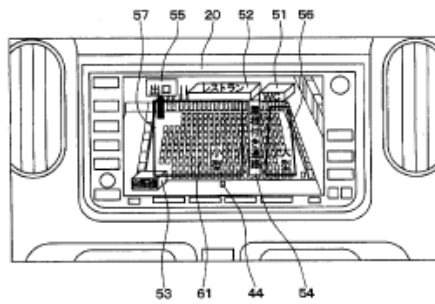
[Fig. 5]



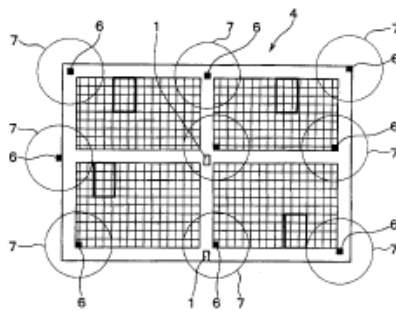
[Fig. 7]



[Fig. 8]



[Fig. 9]



Continued from the front page

F term (reference) 5H180 AA01 BB04 CC02 CC04 FF04 FF05 FF22 FF25 FF27 FF33 FF35 FF38
KK01 KK03 KK07



Tuesday, December 27, 2022

Certification

Translator's Declaration:

I, Harumi Morota, hereby declare:

That I possess advanced knowledge of the Japanese and English languages.

My qualifications are as follows:

- 32 years full time translation experience
- Translated around 40,000,000 words in my career
- Prior to becoming a full time professional translator, worked at a patent office in Japan for 7 years
- Translate 1,500,000 - 2,000,000 words per year.

The attached Japanese into English translation has been translated by me and to the best of my knowledge and belief, it is a true and accurate translation of:

JP2008217835A

I understand that willful false statement and perjury are punishable by fine or imprisonment, or both (18 U.S.C. 1001) and may jeopardize the validity of the application or any patent issuing thereon. I declare under the penalty of perjury that all statements made herein of my own knowledge are true and all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true.

Harumi Morota

LANGUAGE AND TECHNOLOGY SOLUTIONS FOR GLOBAL BUSINESS

1250 BROADWAY, 32ND FLOOR, NEW YORK, NY 10001 | T 212.689.5555 | F 212.689.1059 | WWW.TRANSPERFECT.COM

OFFICES IN 90 CITIES WORLDWIDE

Oracle EX1007, p. 14
Oracle v. Parking WW
IPR2023-00385