5. The car navigation system as claimed in claim 1, 2 or 3, wherein said destination setting means and said place-name input means are constructed by a handwrite character input device and a handwrite character recognition device.

6. The car navigation system as claimed in any of claims 1 to 5, wherein said route judgement means judges whether the input place name is suitable on the basis of an intersection angle between a line connecting the current position of the car and the destination and a line connecting the current position of the car and the position of an input place name.

7. The car navigation system as claimed in any of claims 1 to 6, wherein said route judgement means compares a route extending from the current position of the car to the destination with a route extending from the current position of the car to the position of an input place name, and judges whether the input place name is suitable on the basis of the distance or ratio of a common portion between the routes.

8. The car navigation system as claimed in any of claims 1 to 5, wherein said route judgement means sets a prescribed area at both sides of a line connecting the current position of the car and the destination, and judges the input place name to be suitable as a via-place if the input place name is within the set area.

9. The car navigation system as claimed in any of claims 1 to 5, wherein when the destination is far away from the current position of the car, said route judgement means judges the input place name to be suitable as a via-place if the input place name is located at a prescribed distance or less from the destination.

10. The car navigation system as claimed in any preceding claim, wherein when the input place name contains a route such as a superhighway on which the car can run at a higher speed than on a general road, said route judgement means converts the distance of the route to a shorter value than the actual distance thereof (on the basis of a preset reduction rate) to calculate the distance to the destination, and a route through which the car arrives at the destination most early is selected/ identified on the basis of the converted distance (calculated in consideration of an arrival time).

11. The car navigation system as claimed in any preceding claim, wherein said judgement result output means comprises a voice synthesizer.

12. The car navigation system as claimed in any preceding claim, wherein said judgement result output means comprises an image display device, and displays a map containing the current position of the car on a screen of said image display device and further displays a line extending from the current position of the car to the destination and a line extending from the current position of the car to the position of the input place name on the screen.

FIG.1

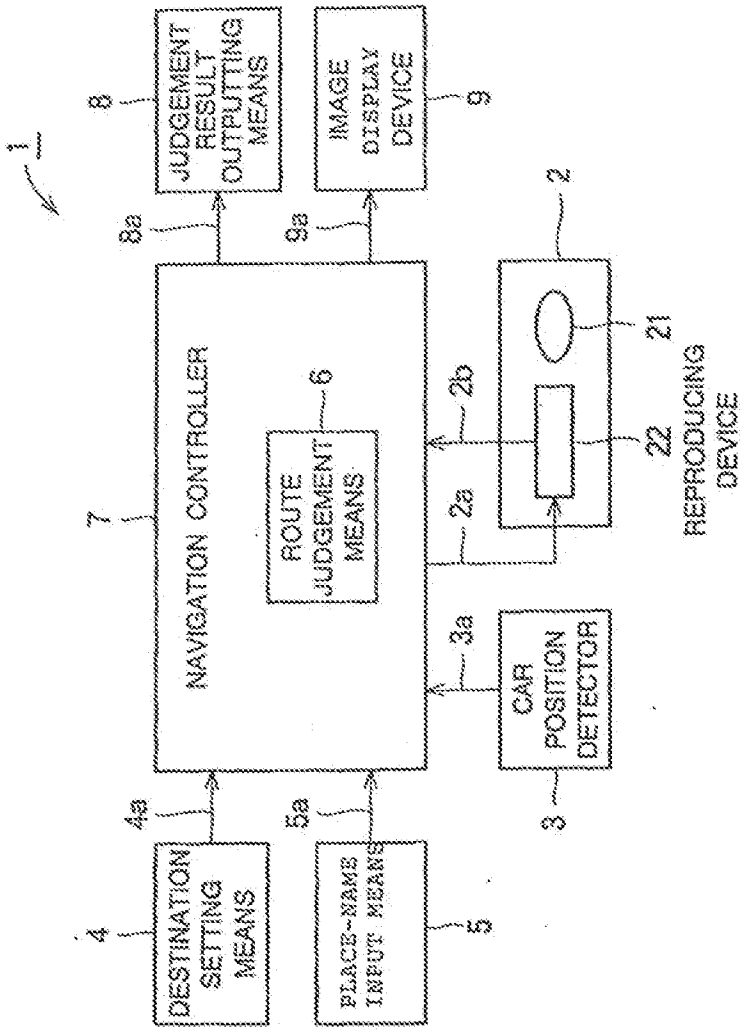


FIG. 2.

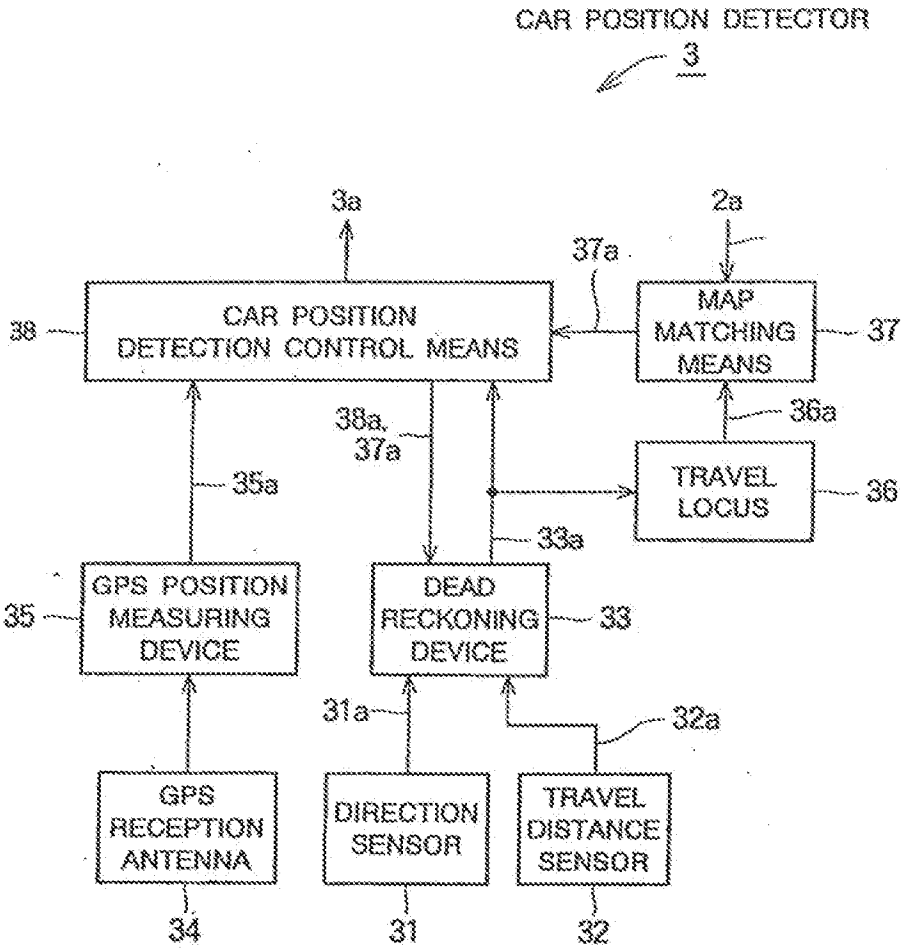


FIG. 3

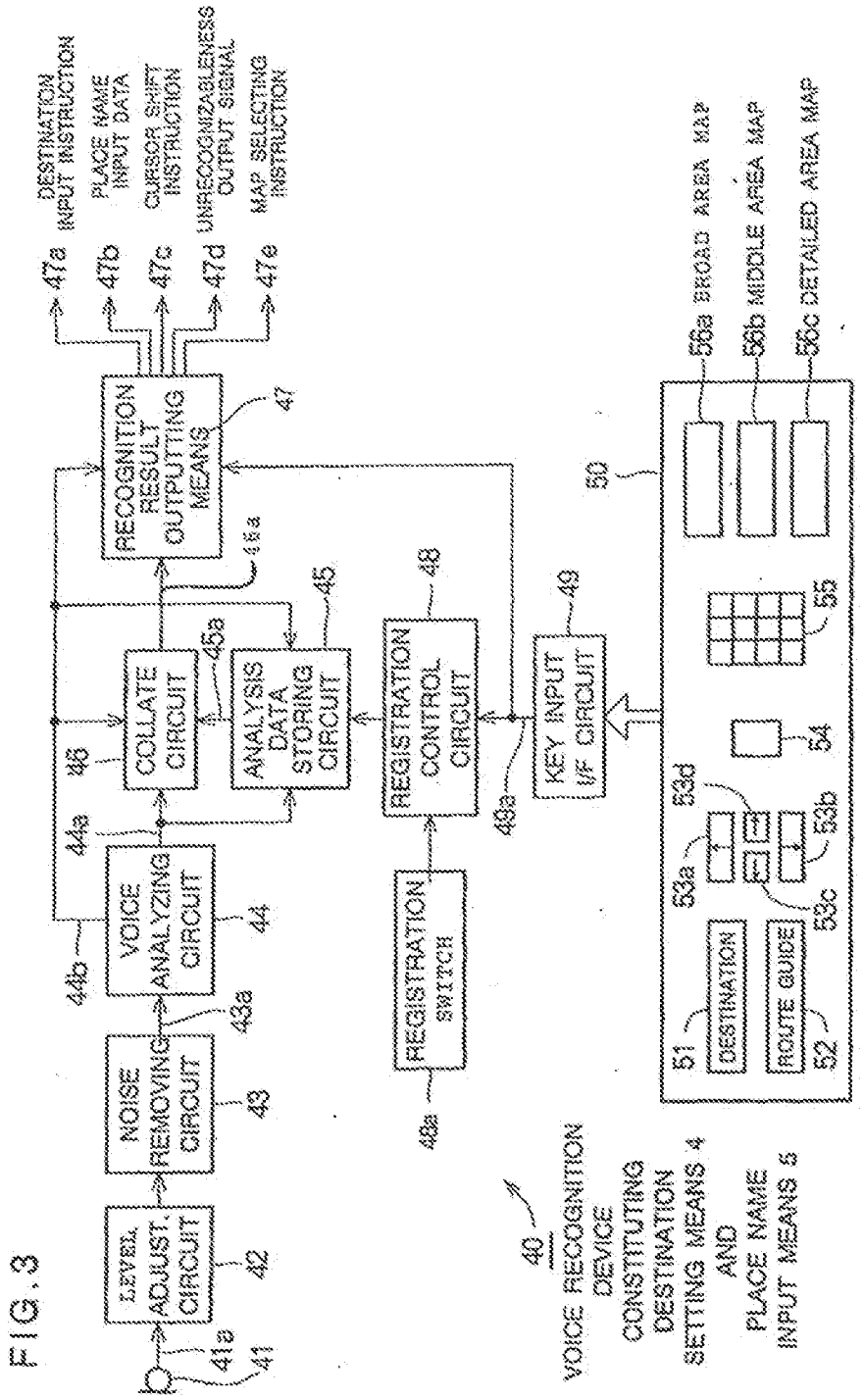


FIG. 4

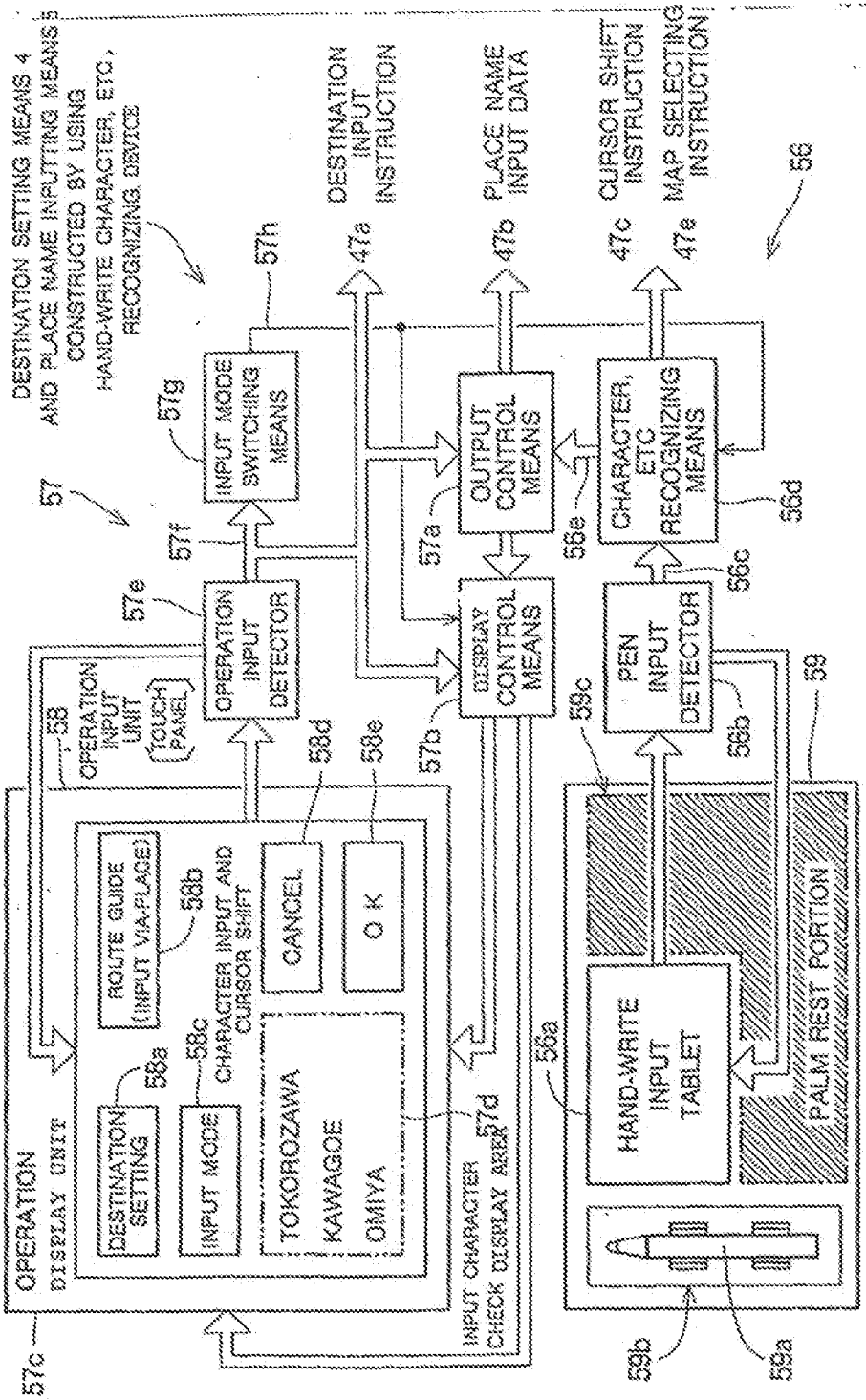


FIG. 5

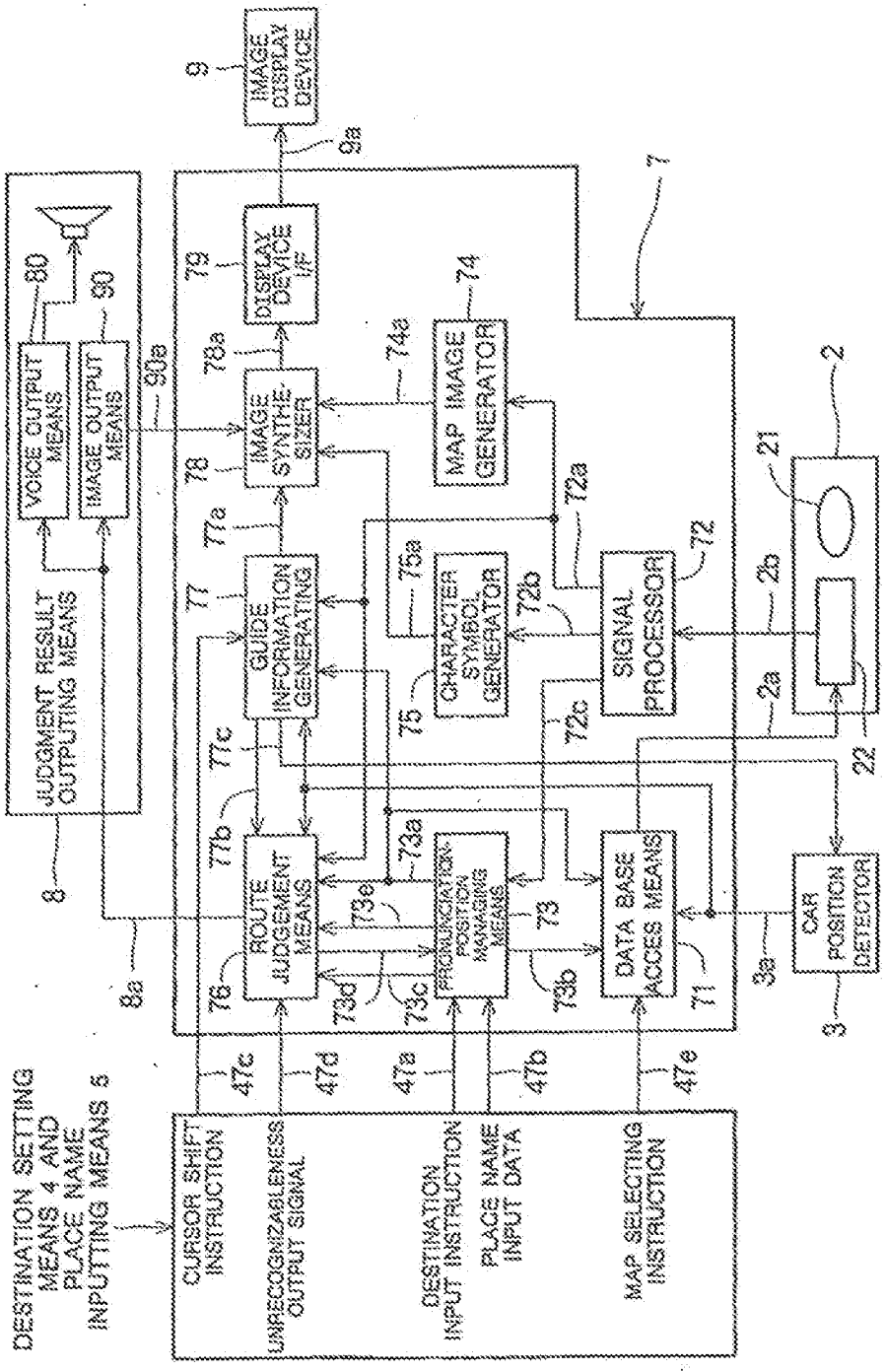


FIG. 6

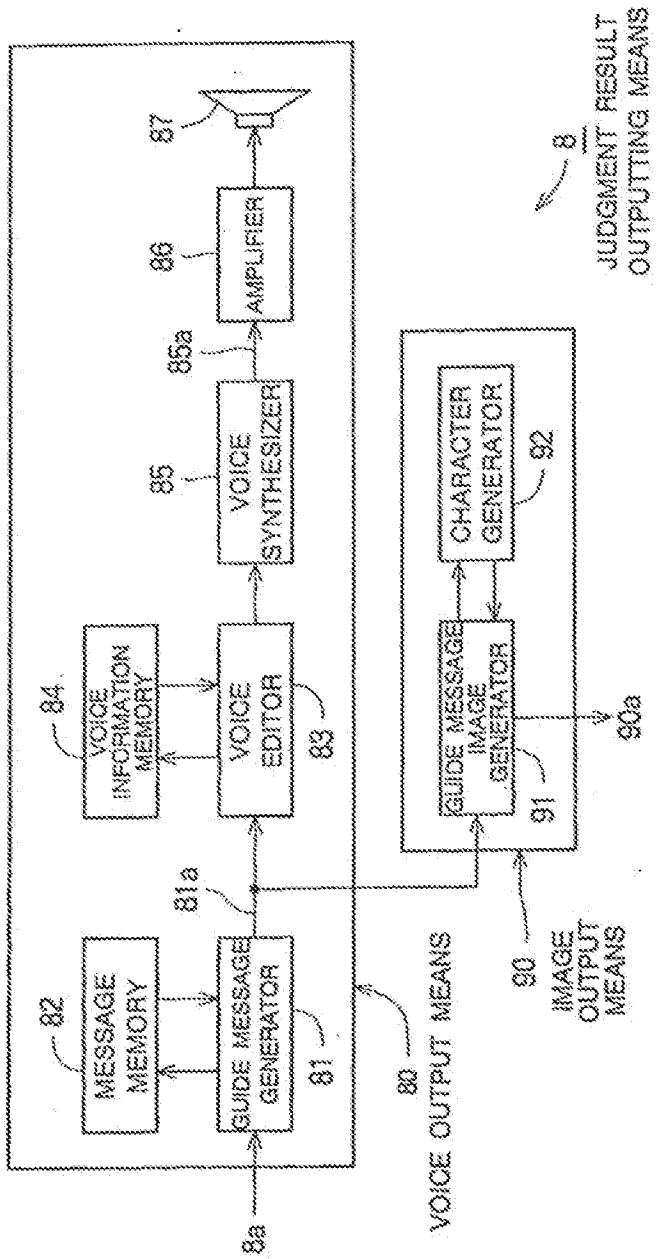
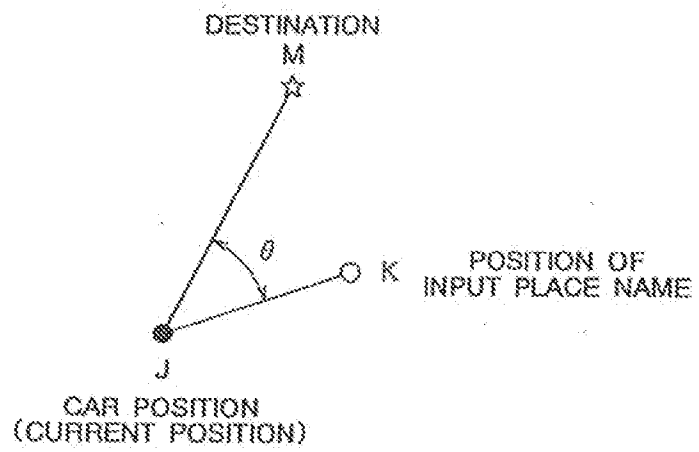

8
JUDGMENT RESULT OUTPUTTING MEANS
87
86
AMPLIFIER
85a
85
VOICE SYNTHESIZER
92
CHARACTER GENERATOR
84
VOICE INFORMATION MEMORY
VOICE EDITOR
83
GUIDE MESSAGE IMAGE GENERATOR
91
90a
Message Image Data
81a
82
MESSAGE MEMORY
GUIDE MESSAGE GENERATOR
81
80
VOICE OUTPUT MEANS
90
IMAGE OUTPUT MEANS
8a

FIG.7

JUDGMENT ON SUITABILITY OF ROUTE ON THE BASIS OF DIRECTIONS OF DESTINATION AND INPUT VIA-PLACE

(a) WHEN INPUT PLACE NAME IS ONE



(b) WHEN INPUT PLACE IS PLURAL

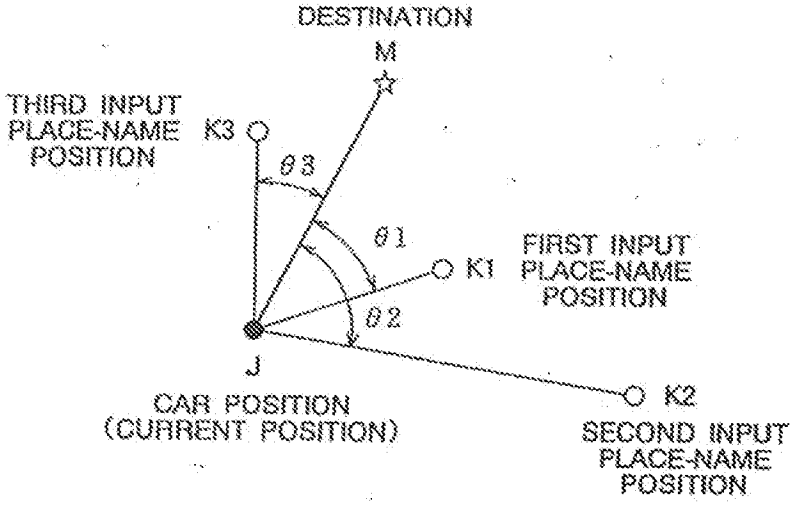
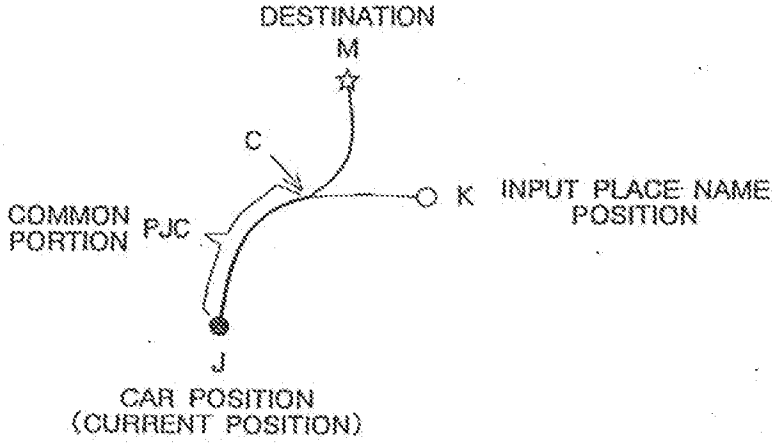


FIG. 8

COURSE SUITABILITY JUDGMENT BASED ON COMMON PORTION BETWEEN ROUTE TO DESTINATION AND ROUTE TO INPUT PLACE NAME

(a) WHEN INPUT PLACE NAME IS ONE



(b) WHEN INPUT PLACE IS PLURAL

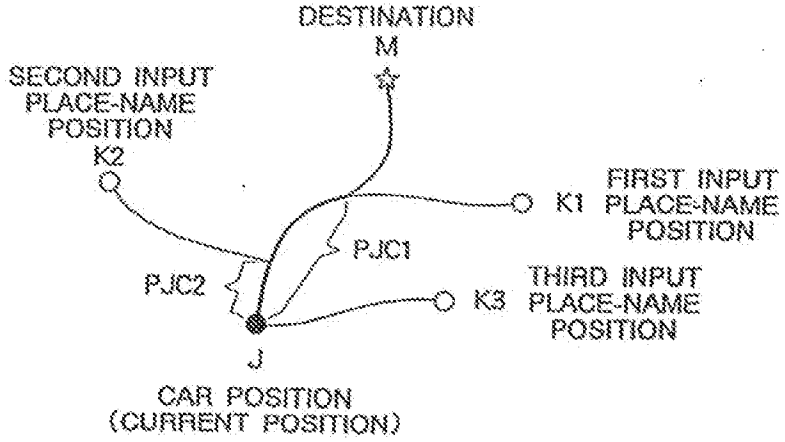


FIG. 9

COURSE SUITABILITY JUDGMENT BASED ON PERMISSIBLE RANGE SET IN ACCORDANCE WITH DISTANCE BETWEEN DESTINATION AND CURRENT POSITION

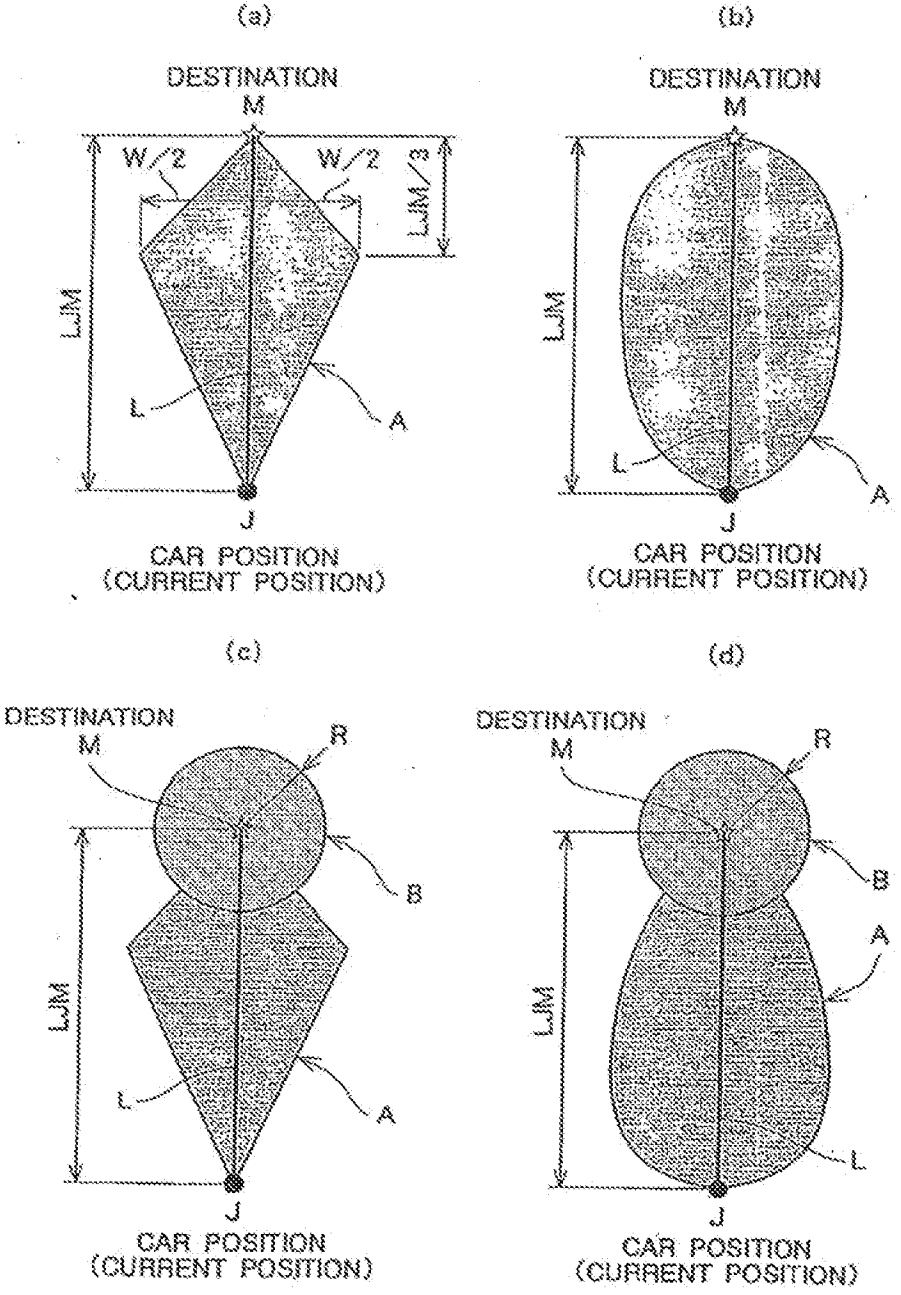


FIG.10

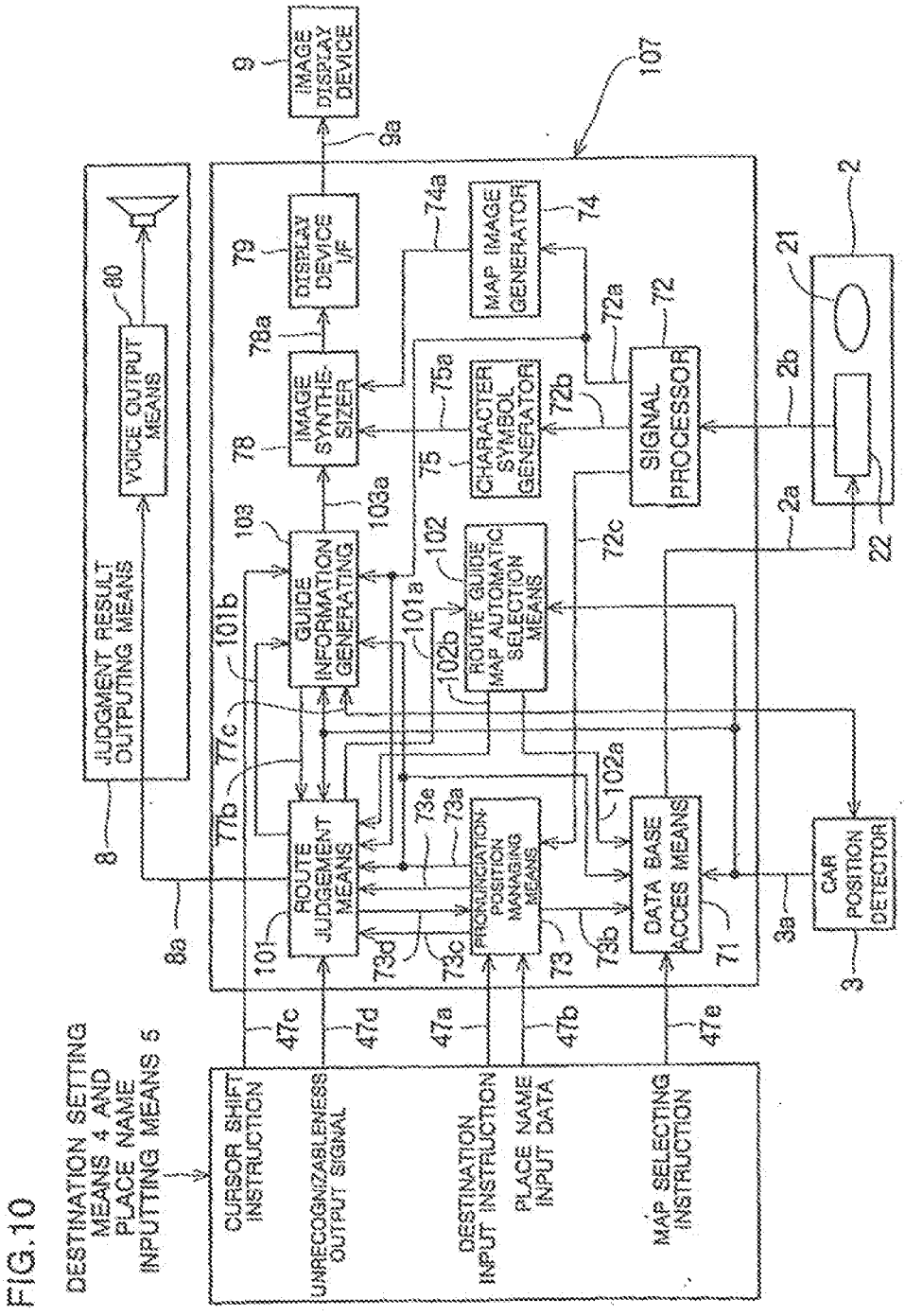
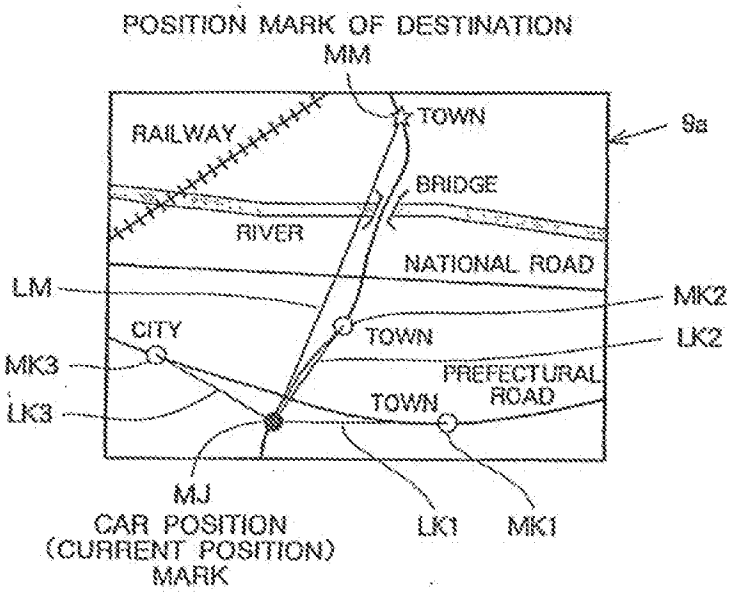


FIG.11

EXAMPLE OF ROUTE GUIDE IMAGE

(a) DISPLAY OF CAR POSITION, DESTINATION AND POSITION OF ALL INPUT PLACE NAMES



(b) WHEN DESTINATION AND POSITIONS OF SOME INPUT PLACE NAMES CANNOT BE DISPLYED

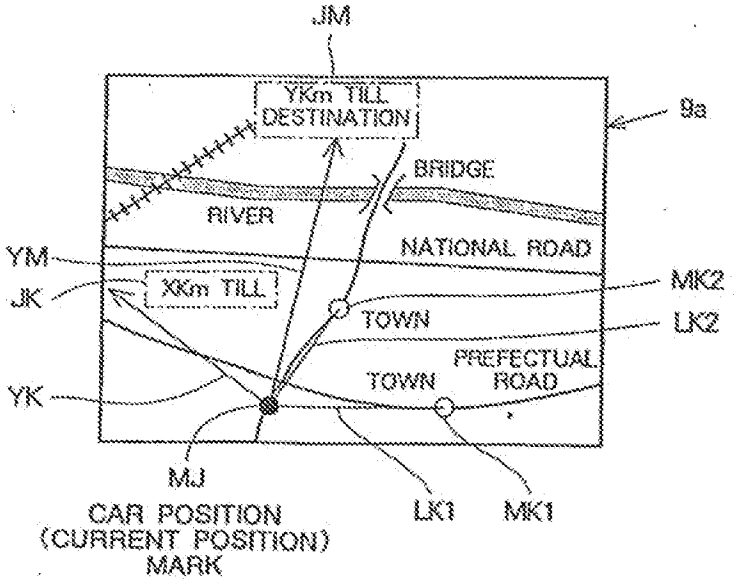


FIG.12

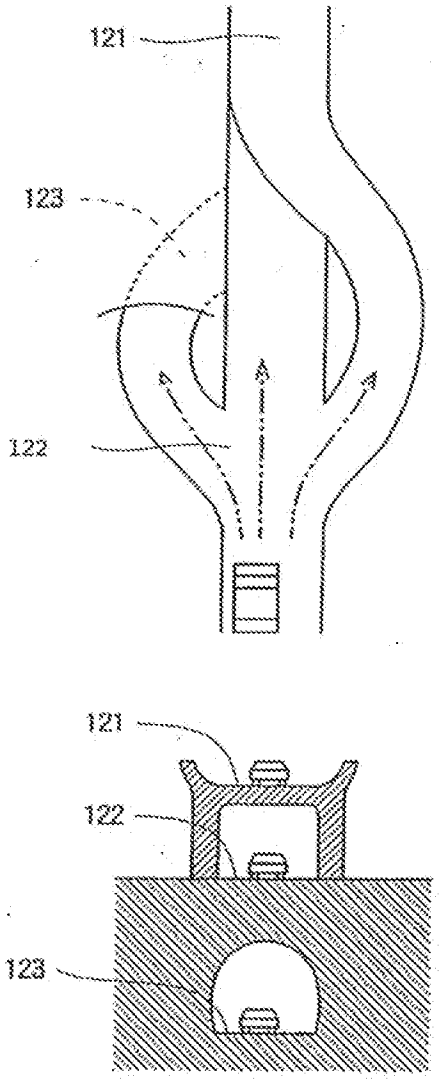


FIG.13

EXAMPLE OF SIGNPOST

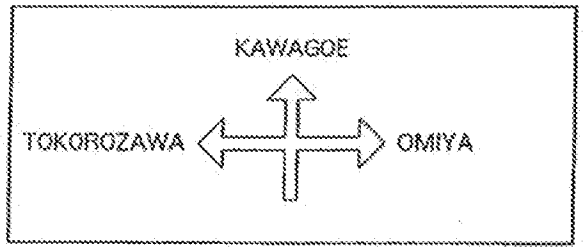
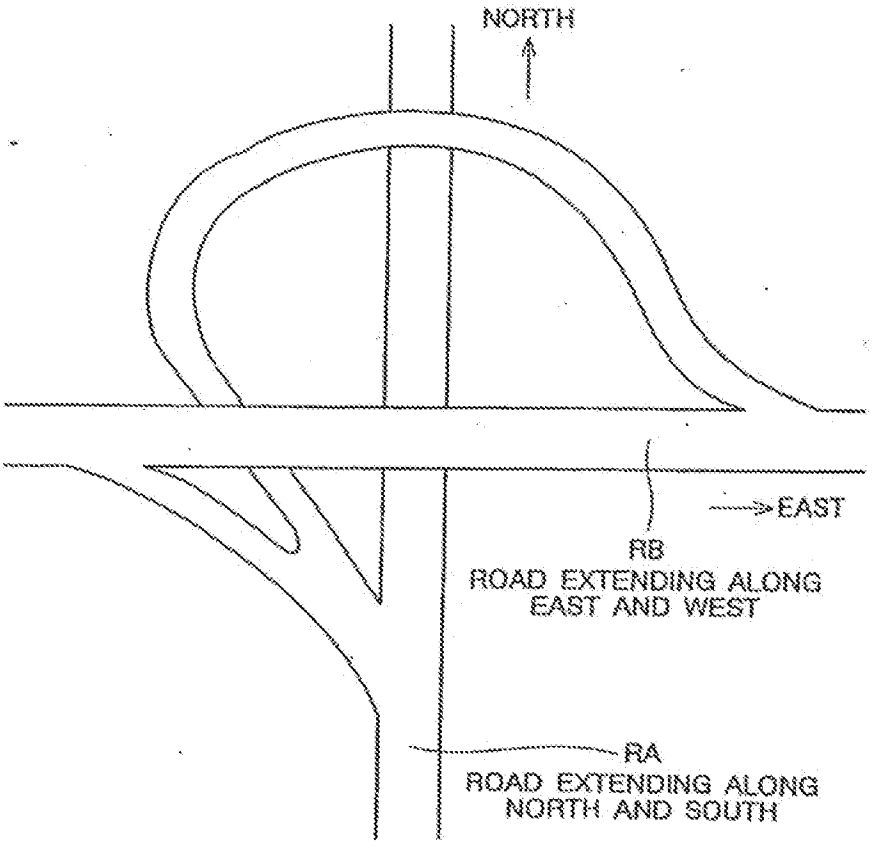


FIG.14

EXAMPLE OF SOLID CROSSING



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 2088

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	GB-A-2 079 453 (WOOTTON) * abstract; page 2, line 1 - page 3, line 29; page 3, lines 39-56; page 4, line 42 - page 7, line 13; page 8, lines 26-36; figure 2 *	1-4,11, 12	G01C21/20 B60R16/02 G06F3/16 G09B29/10
Y	US-A-5 177 685 (DAVIS ET AL.) * abstract; column 23, line 64 - column 24, line 60 *	1-4,11, 12	
D,Y	PATENT ABSTRACTS OF JAPAN vol. 16, no. 60 (P-1312) 14 February 1992 & JP-A-03 257 485 (MITSUBISHI ELECTRIC CORP) 15 November 1991 * abstract *	1-4,11, 12	
A	WO-A-92 09866 (AUDIO NAVIGATION SYSTEMS, INC.) * abstract; page 11, line 15 - page 12, line 30; page 20, lines 17-26; page 21, line 32 - page 22, line 16 *	1-4,11, 12	
A	DE-A-35 15 471 (MITSUBISHI DENKI K.K.) * abstract; page 9, line 23 - page 10, line 35; page 17, line 12 - page 22, line 11; page 24, line 13 - page 27, line 37; figures 4-9 *	1,2,12	
A	PATENT ABSTRACTS OF JAPAN vol. 14, no. 230 (P-1048) 16 May 1990 & JP-A-02 056 590 (DAIHATSU MOTOR CO LTD) 26 February 1990 * abstract *	5	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
G01C
B60R
G06F
G08G
G09B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	20 July 1995	Beitner, H

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 771 686 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
07.05.1997 Bulletin 1997/19

(51) Int. Cl.[6]: B60K 35/00

(21) Application number: 96307400.8

(22) Date of filing: 10.10.1996

(84) Designated Contracting States:
DE FR GB

(30) Priority: 06.11.1995 JP 288915/95

(71) Applicant: Toyota Jidosha Kabushiki Kaisha
Toyota-shi, Aichi-ken 471-71 (JP)

(72) Inventors:
- Nojima, Akihiko
  Toyota-shi, Aichi-ken, 471-71 (JP)
- Yanagisawa, Takashi
  Toyota-shi, Aichi-ken, 471-71 (JP)

(74) Representative: Wood, Anthony Charles et al
Urquhart-Dykes & Lord
91 Wimpole Street
London W1M 8AH (GB)

(54) Information display apparatus for vehicles

(57) An information display apparatus for vehicles for securely providing the driver with only information necessary corresponding to the running condition, the information display apparatus comprising an information processor (16) for receiving information detected by various sensors (28) and monitors (26) and detecting the running condition of the vehicle, a memory (14) containing information on respective running conditions for display and weight of information importance, the memory being used to read information corresponding to the detected running condition and the degree of information importance, and a display unit (10) for displaying information in a display area or in an amount according to the degree of importance, wherein the display area of speed information is increased when the vehicle is running straight and the display area of information about conditions behind the vehicle is increased when the vehicle is traveling in reverse.

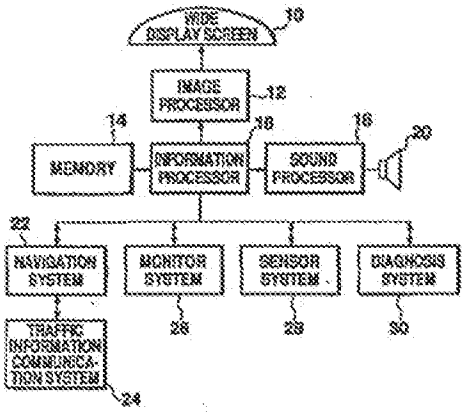


Fig. 1

EP 0 771 686 A2

Printed by Rank Xerox (UK) Business Services
2.14.2/3.4

Description

BACKGROUND OF THE INVENTION

TECHNICAL FIELD

The present invention relates to an information display apparatus for vehicles, and more particularly to a flexible display apparatus for displaying desired information in a desired form.

PRIOR ART

With the increasing functional sophistication of vehicles in recent years, it is becoming important from a viewpoint of human interface or safety to display information necessary for running of a vehicle in a manner that the driver can see easily.

As for such a technology, for example, a display console is disclosed in Japanese Patent Laid-Open Publication No. Hei 7-5817, in which information about various states is selectively shown in a three-partition display area on a flat image-receiving screen.

However, the above prior art has a problem that although various items of information are selectively shown, forms of display of different items of information are uniform because the display area is limited.

If consideration is started with display of information while a vehicle is running, the kind of information the driver requires naturally differs with the condition in which the vehicle is running, and even with the same kind of information, the degree of information importance varies with the condition in which the vehicle is running. More specifically, while the vehicle is running on a straight road, speed information is relatively important, but as the vehicle is approaching an intersection, information concerning whether the vehicle should turn left or right or information about the ambient condition assumes an increasing importance over speed information. As described, since the importance of information that the driver requires changes continuously (perhaps abruptly), it has been impossible under the uniform pattern of display to aptly and securely provide the driver with information whose importance changes with the vehicle running conditions.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a display apparatus which can aptly display information according to the running condition of a vehicle to securely and readily supply information truly necessary to the driver or the crew.

To achieve the above object, in one form of the invention, the information display apparatus for vehicles comprises detection means for detecting the running condition, memory means for storing information to display corresponding to respective running conditions and different degrees of importance of information, display means for displaying information, and control means for reading display information corresponding to the detected running condition as well as the degree of importance of the display information and displaying the display information in a display area according to its weighted degree of importance. The running conditions to be detected include, for example, a straight running condition, a backward running condition, a running condition just before an intersection, etc. In a backward running condition, information about the condition behind the vehicle has a relatively high importance, while in a straight running condition, speed information has a relatively high importance and just before an intersection information about turning left or right becomes relatively important. As described, since the importance of information differs with the running conditions, necessary information can be securely supplied to the driver if important information is displayed prominently.

In another form of the invention, the information display apparatus for vehicles comprises detection means for detecting the running condition, memory means for storing items of information to display corresponding to respective running conditions and different in degrees of importance of these items, display means for displaying information, and control means for reading the item of display information corresponding to the detected running condition and the degree of importance of the item of display information from the memory means and displaying the item of display information in the display means giving prominence according to the degree of importance. Only necessary information would be supplied to the driver in order to make effective use of the limited display by displaying a large amount of information related to the running condition and a small amount of information with a relatively low importance. The amount of information is set as follows. When the car is running straight, a larger amount of speed information is supplied. When the car is running in reverse, a larger amount of information about conditions behind the car is supplied. When the car is approaching an intersection, a larger amount of information about the intersection condition is supplied.

In yet another form of the invention, the information display apparatus for vehicles comprises detection means for detecting the running condition; memory means for storing items of information to display corresponding to respective running conditions, different degrees of importance of the items of information and an allowable total amount of information, display means for displaying information, and control means for reading the item of display information corresponding to the detected running condition, the degree of importance of the item of display information, and the allowable amount of information from the memory means and displaying the display information item in a display area according to its degree of importance within the allowable amount of information in the display means. In a running condition in which the driver must pay attention to the environment around the vehicle, a large amount of

information should not be shown on the display. Therefore, by setting an allowable amount of information according to the running condition, the driver can be provided with only necessary information. A case where a large allowable amount of information can be set is, for example, when the vehicle is at a standstill. A case where a small allowable amount of information must be set is when the vehicle is going backward, for example.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram of the display apparatus according to an embodiment of the present invention;
Fig. 2 is a table of data stored in the memory of the display apparatus shown in Fig. 1;
Fig. 3 is an operation flowchart of the display apparatus shown in Fig. 1;
Fig. 4 is a screen image on the display when the driver enters a vehicle;
Fig. 5 is a screen image on the display when a destination is set;
Fig. 6 is a screen image on the display when the shift position is set in reverse (R);
Fig. 7 is a screen image on the display after the shift position is set in R;
Fig. 8 is a screen image on the display after the shift position is set in D (drive);
Fig. 9 is a screen image on the display when the vehicle is running on a general automobile road (without route guide);
Fig. 10A is a screen image on the display when running straight while following a route guide;
Fig. 10B is a screen image on the display when running at a point 700 m before an intersection while following a route guide;
Fig. 10C is a screen image on the display when running at a point 300 m before an intersection while following a route guide;
Fig. 11 is a screen image on the display at an intersection where the driver cannot get a clear view ahead;
Fig. 12 is a screen image on the display when a warning message is received from a traffic information communication system;
Fig. 13 is a screen image on the display when running straight on a highway;
Fig. 14 is a screen image on the display when operating the radio tuner while traveling on a highway;
Fig. 15 is a screen image on the display when traffic information is received from a traffic information communication system;
Fig. 16 is a screen image on the display when changing a lanes while traveling on a highway;
Fig. 17 is a screen image on the display while running in a dense fog;
Fig. 18 is a screen image on the display when the ACC switch is turned on while the vehicle is at a standstill; and
Fig. 19 is a screen image on the display when the ignition key is removed.

PREFERRED EMBODIMENTS OF THE PRESENT INVENTION

An embodiment of the present invention will be described with reference to the accompanying drawings.

Fig. 1 is a block diagram of this embodiment. The instrument panel of the vehicle is formed by a wide display screen 10 (125 mm x 700 mm), which is not conventional fixed indicators. This display may be a liquid-crystal display or a CRT. The wide display 10 is connected through an image processor 12, probably including VRAMs, to an information processor 16 for editing information for display. The image processor 16 includes a CPU for specified arithmetic operations, a ROM containing a processing program to be described later, an I/O interface. The image processor 16 accesses a memory 14 containing information to display according to the running condition and degrees of importance of information and decides which information to display, the size of display area, and the amount of information to display. The information processor 16 receives various information items from a navigation system 22, a traffic information communication system 24, a monitor system 26, a sensor system 28, and a diagnosis system 30; decides the running condition; and picks out and outputs necessary information to the image processor 12. Since some information should preferably be given in sound (an alarm, for example), the information processor 16 outputs such audio information from a speaker 20 through a sound processor 18.

The navigation system 22 includes a position detecting system such as a GPS device, a map data memory such as a CD-ROM, and a route search system. When the route guide is used, the position of the vehicle and a recommended route, along with map data are supplied, to the information processor 16. The traffic information communication system 24 includes communication means for radio-wave or optical two-way communications with information centers through beacons installed along the road, and obtains and supplies the road conditions including information about congestion or accidents to the information processor 16. The monitor system 26 includes monitors such as a back monitor for viewing the scene behind the vehicle, corner monitors for viewing the left and right sides, and an infrared monitor for picking up the scene in front of the vehicle. This monitor system supplies images to the information processor 16. The sensor system 28 detects the running speed or the engine rotating speed of the vehicle, fuel level, water temperature, shift position, rain, fog, etc. and supplies data to the information processor 16. The diagnosis system 30 makes decides the battery voltage, oil level, etc. are adequate and supplies this information to the information processor 16.

Under the above arrangement, the information processor 16 decides information to display according to the running conditions, and displays information in a display area or in an amount of information according to the degree of information importance. The following processes will now be described, showing example running conditions.

Fig. 2 shows items of information for respective running conditions and degrees of their importance which are stored in the memory 14. The running conditions include:

(1) "The driver enters a vehicle and the key is inserted into the ignition switch."
(2) "The shift lever is fixed in R."
(3) "The car is running straight while the route guide is in operation."
(4) "The car is running at a point 700 m before an intersection."
(5) "The car is running at a point 300 m before an intersection."
(6) "The car is at an intersection where the driver cannot get a clear view ahead."
(7) "There is a possibility that a pedestrian will enter the road while the car is running straight."
(8) "The car is running straight on a highway."

In the case of (1), the items of information to display are diagnosis, warning, shift position, fuel level, and temperature. The allowable amount of information that can be displayed is as follows. If the display capability of the display 10 is set at 100, the amount of information can be shown to the driver or the crew is considered to be 100%. This is because while the vehicle is at a standstill, the driver can concentrate his attention upon the display 10 and therefore full display is possible. The order of priority of information is diagnosis, warning, shift, fuel and temperature. The ratio of display area is 20% for each item of information. In the case of (2), the items of information to display are back monitor, shift, fuel and temperature. The allowable amount of information is 20%. Information is limited to 20% because when traveling in reverse, the driver must confirm conditions to the rear of the vehicle and cannot watch the display closely so it is necessary to reduce the amount of information displayed. The order of priority is back monitor, shift, fuel and temperature and the ratio of display area is 60%, 20%, 10% and 10%, in that order. This ratio is based on the fact that while traveling in reverse, information about the condition at the rear of the vehicle is most important. In the case of (3), the items of information to display are route guide with the arrow mark, speed, fuel and temperature, and as the vehicle is running, the allowable amount of information is limited to 40%. The order of priority of information is route guide with arrow mark, speed, fuel and temperature and the ratio of display area is 30%, 50%, 10% and 10%, in that order. Although route guide with arrow mark has been given the highest priority, the ratio of display area for speed is largest because route guide can be given to the driver with a simple arrow mark which occupies a very small area. In the case of (4), the items of information to display, the allowable amount of information and the order of priority are the same as in (3), but the ratio of display area is different with 40%, 40%, 10% and 10%. More specifically, the display area for route guide with arrow mark is increased while the display area for speed is reduced because, as the vehicle approaches an intersection, the importance of information about the intersection increases and more information about the intersection is displayed with a greater display area. In a similar manner as described, regarding the cases of (5), (6), (7) and (8), the items of information, the allowable amount of information, the order of priority and the ratio of display area are decided and stored in memory. The information processor 16 accesses the memory 14 containing such a table as this to read the items of information corresponding to the current running condition, and displays information with a specified ratio of display area.

Fig. 3 is a process flowchart of the information processor 16. The information processor 16 recognizes the current running condition using information from the navigation system 22 and the sensor system 28, and accesses the memory 14. The information processor 16 decides the amount of information to display, that is, the allowable amount of information according to the running condition (S101), and also decides the priority (the degree of importance) of the respective items of information (S102). The priority is, to be more specific, the order of priority and the ratio of display area. A decision is made whether the item of information with the highest priority has a display area ratio of greater than 50% (S103). In the case of (2), for example, since the ratio of the back monitor with the first priority is 60%, the result of the above decision is YES. In the case of (4), the ratio of the intersection guide with the first priority is 40%, the result of the decision is NO. If the ratio of an item of information with the first priority is larger than 50%, a decision is made if the ratio of the item of information with the second priority is larger than 25% (S104). If the ratio of the second-priority item is less than 25%, in other words, if the first-priority item is far more important than the other items, the first-priority item of information is displayed in a large area at the center of the display 10, and consequently the other items of information are displayed according to their ratios around the first-priority item (S105). If the second-priority item of information has an area ratio of larger than 25%, the first- and second-priority items are displayed according to their ratios on the left and the right sides of the display 10 (S106). The first-priority item should preferably be displayed on the side closer to the driver's seat.

On the other hand, if the first-priority item has an area ratio of less than 50%, a decision is made whether the area ratio of this first-priority item is larger than 25% (S107). If so, a decision is made if the second-priority item also has an area ratio of larger than 25% (S108). If

the first and second priority items both have an area ratio of larger than 25%, they are displayed in a large area on the left and the right sides of the display 10 (S108). If the first and second priority items both have an area ratio of less than 25%, they are displayed according to their ratios in an ordinary picture composition (S110). Though not illustrated, when operation or accident information is supplied singly from any of the systems, the information processor 16 displays the information superimposed on the screen image.

By the process as described, the information processor 16 displays various items of information by suitably changing their display areas. Examples are shown in the following.

Fig. 4 shows an example of screen image of (1), that is, when the driver gets into a vehicle and puts the engine key in the starter switch. The first-priority item of diagnosis and the second-priority item of warning both have a display area of less than 25%, they are shown in almost equal display areas in an ordinary picture composition. In Fig. 4, reference numeral 100 denotes warning about the seat belt and the open/close condition of doors, 102 denotes diagnosis, 104 denotes shift position, 106 denotes fuel and 108 denotes temperature.

Fig. 5 shows a case where the driver stops the car and sets a destination. The screen shows a destination setting map 110 and a speedometer 112 in place of warning 102. The destination setting map 110 is supplied from the navigation system 22. The display area ratios of the destination setting map and the speedometer are respectively set to be more than 25%, and are displayed on the left and the right sides on the display 10.

Fig. 6 shows a case where the shift lever is shifted from the P (parking) position to the R (reverse) position. In this case, when receiving information from the sensor system 28 that the shift lever has been moved from P to R, the information processor 16 displays the shift position information 104 superimposed at the center of the display 10. From this, the driver can easily recognize that the shift lever has been shifted to the R position.

Fig. 7 shows the condition that the shift lever has been set at the R position, namely, case (2). The back monitor image 114 as the first-priority information, that is, the image of the scene to the rear of the vehicle supplied from the monitor system 26 is displayed in a large area at the center of the display 10. Therefore, from this image, the driver can easily grasp the condition to the rear of the vehicle, making it possible for him to smoothly back up.

Fig. 8 shows a case where the driver puts the shift lever in the D (drive) position and is preparing to drive. The speedometer 112 is shown in a large area at the center of the display 10. Note that the speed scale is graduated in 20 km/h intervals up to 180 km/h.

Fig. 9 shows a case where the car has begun motion with the shift lever put in the D position. As the accelerator pedal is depressed, the engine rotating speed increases, so that the tachometer 116 is shown in almost the same display area as the speedometer 112. If a decision is made from information from the navigation system that the vehicle is running on a general automobile road, the speedometer scale is changed to a maximum of 100 km/h and the region up to the speed limit of 60 km/h appears in blue.

Fig. 10 shows an example of display when the vehicle is running while following the route guide. Fig. 10A shows a display screen while running straight, in which the arrow mark 118 is shown on the left and the speedometer is shown on the right side of the display screen 10. The display area ratio of the arrow mark to the speedometer is 30% to 50%. Route guide information "straight line 5 km" from the navigation system 22 is shown above the arrow mark. Fig. 10B shows a display screen when the vehicle is 700 m before an intersection, in which the arrow guide and the speedometer are shown like in Fig. 10A, but the area ratio is 40% to 40%. More specifically, the area of the arrow guide is increased, while the area of the speedometer is decreased. The broken lines show the changes of the display areas. Above the arrow guide, there is a guide message "700 m to Yamashita-cho". In addition, there is a turn-right arrow guide to indicate that the vehicle should turn to the right at the intersection. Fig. 10C shows a display screen when the vehicle is 300 m before an intersection, in which the items of information are the arrow guide and the speedometer as in the above two display images, but the display area ratio is 50% to 30%. In other words, the area of the arrow guide is further increased, while the area of the speedometer is further decreased. (The broken lines show how the areas change.) As the display area of the speedometer decreases, the amount of information is changed to show only the current speed (40 km/h). On the other hand, the arrow guide changes to a three-dimensional image display to give a stereoscopic representation of the condition near the intersection. Note that three-dimensional image data is supplied from the navigation system. As described, while the same items of information are displayed, the display areas and the amounts of information are varied sequentially according to running conditions, in other word, the display screen changes according to running conditions to enable the driver to easily see and understand the display screen and obtain needed information. In Fig. 10, the mode of supply of information was changed at 700 m and 300 m before the intersection, but it is also possible to successively change the display areas at every 100 m, for example.

Fig. 11 shows a display screen when the vehicle is passing an intersection where it is difficult to see far ahead. The information processor 16, which detects through navigation system data that the vehicle has come to such an intersection, displays the left and right images 120 from the corner monitors of the monitor system 26 on the display screen 10. Since the display area ratio of corner monitor is 60%, the corner monitor information is shown in a large proportion on the display

(a) detection means for detecting a running condition;

(b) memory means for storing information to display corresponding to respective running conditions and degrees of importance of information;

(c) display means for displaying information;

(d) control means for reading display information corresponding to a detected running condition and a degree of importance of said display information from said memory means and displaying said display information in a display area according to the degree of importance of said information in said display means.

2. An information display apparatus according to Claim 1, wherein said detection means includes a navigation system for guiding a vehicle by detecting its current position.

3. An information display apparatus according to Claim 1, wherein said detection means includes a monitor for monitoring the environment around the vehicle.

4. An information display apparatus according to Claim 1, wherein said detection means includes a diagnosis system for deciding whether devices necessary for operation of said vehicle are normal or not.

5. An information display apparatus according to Claim 1, wherein said detection means detect at least said vehicle's straight running condition, reverse running condition and running condition before an intersection.

6. An information display apparatus according to Claim 1, wherein said degree of information importance is decided by order of priority and display area ratios.

7. An information display apparatus according to Claim 5, wherein said control means displays speed information in a larger proportion than other items of information when said vehicle is running straight, information about the condition behind said vehicle in a larger proportion than other items of information when said vehicle is going in reverse, and information for intersection guide in a larger proportion than other items of information when said vehicle is approaching an intersection.

8. An information display apparatus for vehicles comprising:

(a) detection means for detecting a running condition;

(b) memory means for storing items of information to display corresponding to respective running conditions and degrees of importance of the items of information;

(c) display means for displaying information

(d) control means for reading an item of display information corresponding to the detected running condition and a degree of importance of the item of display information from said memory means and displaying said item of display information in an amount of display information according to the degree of importance in said display means.

9. An information display apparatus according to Claim 8, wherein said control means displays a larger amount of speed information than other information when the vehicle is running straight, a larger amount of information about conditions behind the vehicle than other information when the vehicle is going in reverse, and a larger amount of intersection guide than other information when the vehicle is approaching an intersection.

10. An information display apparatus for vehicles comprising:

(a) detection means for detecting a running condition;

(b) memory means for storing items of information to display corresponding to respective running conditions, degrees of importance of the items of information and an allowable total amount of information;

(c) display means for displaying information;

(d) control means for reading an item of display information corresponding to the detected running condition, a degree of importance of the item of display information and the allowable amount of information from said memory means and displaying the item of display information in a display area according to the degree of importance within the allowable amount of information in said display means.

11. An information display apparatus according to Claim 10, wherein said allowable amount of information is set at a smaller amount when the vehicle is running than when the vehicle is not in motion.

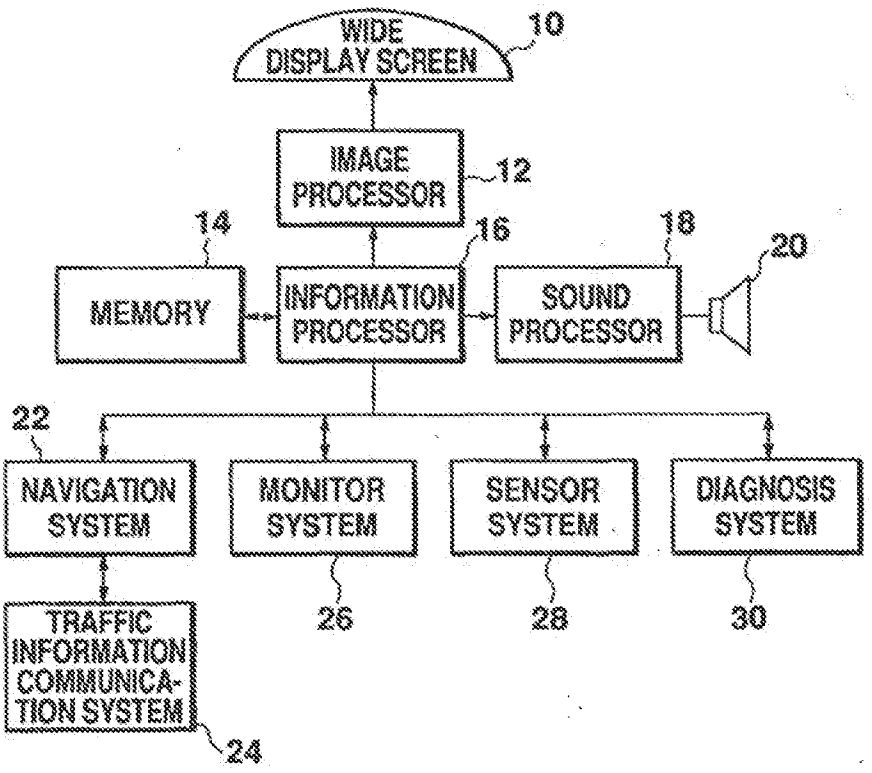


Fig. 1

RUNNING CONDITION	ITEM OF INFORMATION	ALLOWABLE AMOUNT OF INFORMATION	ORDER OF PRIORITY	RATIO
GET IN AND INSERT KEY INTO IGNITION	DIAGNOSIS WARNING SHIFT FUEL TEMP	100%	1 2 3 4 5	20% 20% 20% 20% 20%
SHIFT LEVER IN R	BACK MONITOR SHIFT FUEL TEMP	20%	1 2 3 4	60% 20% 10% 10%
WHEN ROUTE GUIDE IS DISPLAYED, CAR GOES STRAIGHT.	ARROW GUIDE SPEED FUEL TEMP	40%	1 2 3 4	30% 50% 10% 10%
WHEN ROUTE GUIDE IS DISPLAYED, CAR IS 700M BEFORE INTERSECTION.	CROSSING GUIDE SPEED FUEL TEMP	40%	1 2 3 4	40% 40% 10% 10%
WHEN ROUTE GUIDE IS DISPLAYED, CAR IS 300M BEFORE INTERSECTION.	CROSSING GUIDE SPEED FUEL TEMP	40%	1 2 3 4	50% 30% 10% 10%
AT INTERSECTION WHERE DRIVER CANNOT GET A CLEAR VIEW	CORNER MONITOR ARROW GUIDE FUEL TEMP	40%	1 2 3 4	60% 20% 10% 10%
WHILE GOING STRAIGHT, PRECAUTION IS GIVEN ON A PEDESTRIAN ABOUT TO CROSS	PRECAUTION SPEED FUEL TEMP	20%	1 2 3 4	50% 30% 10% 10%
CAR GOES STRAIGHT ON A HIGHWAY	SPEED AMBIENT CONDITION FUEL TEMP	40%	1 2 3 4	40% 40% 10% 10%

Fig. 2

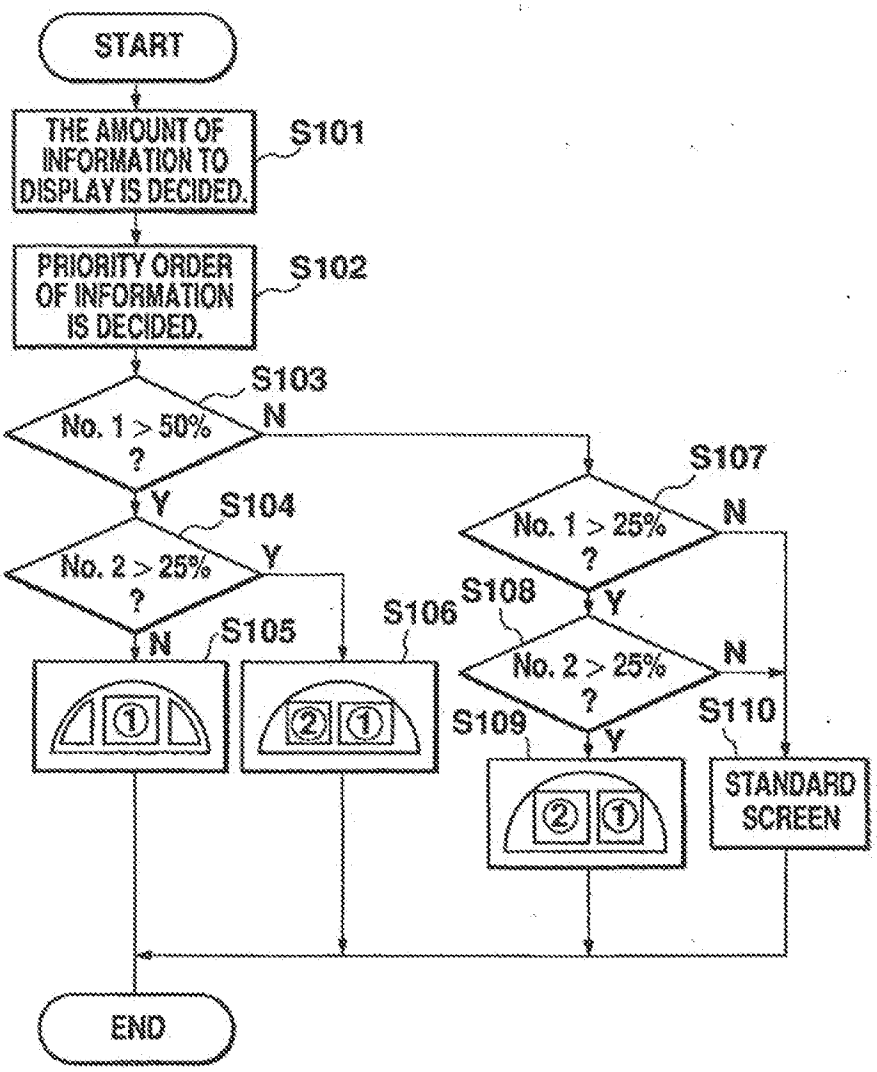


Fig. 3

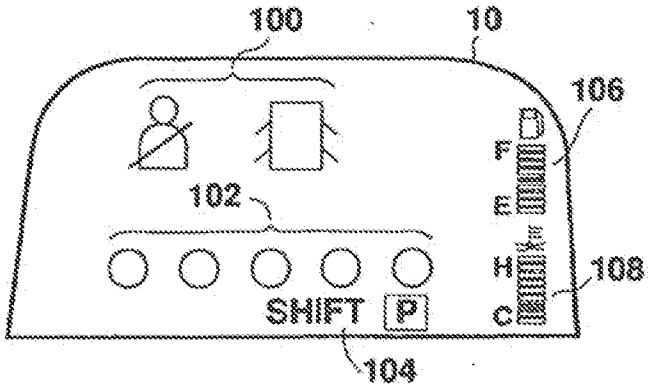


Fig. 4

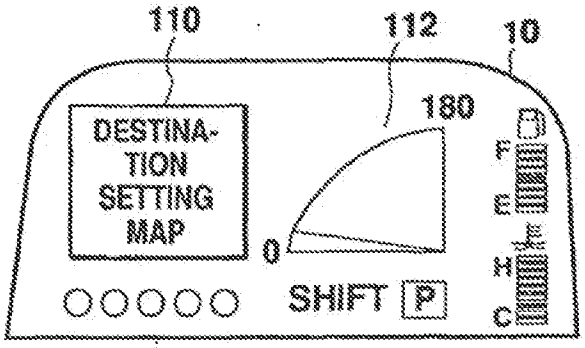


Fig. 5

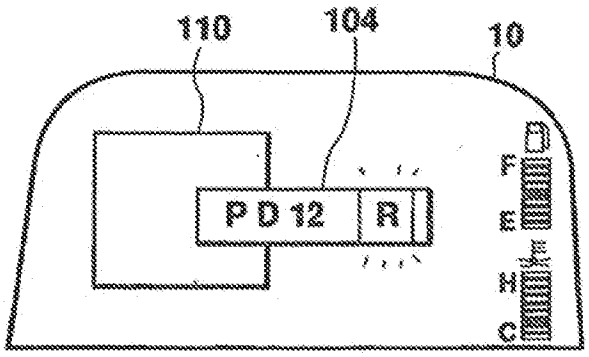


Fig. 6

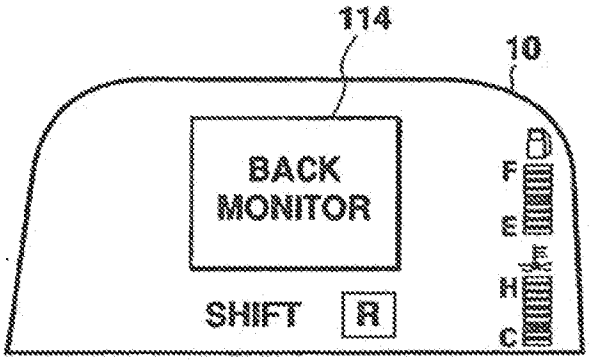


Fig. 7

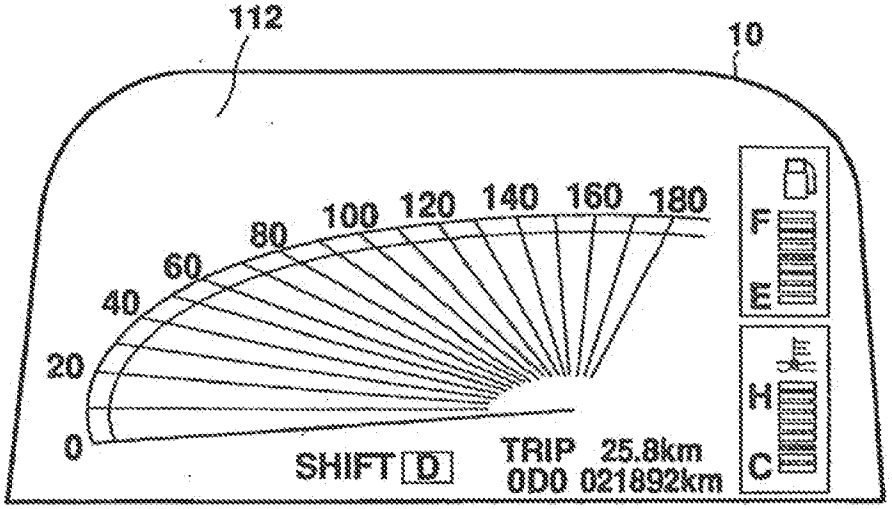


Fig. 8

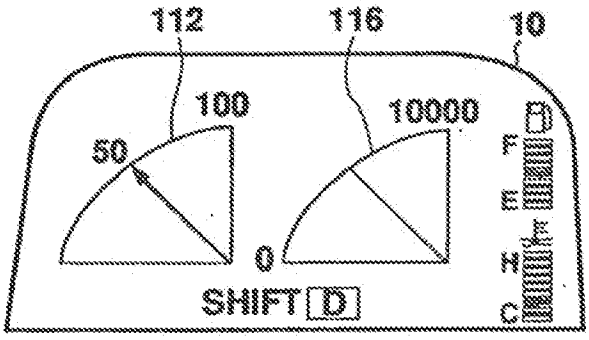


Fig. 9

Fig. 10A

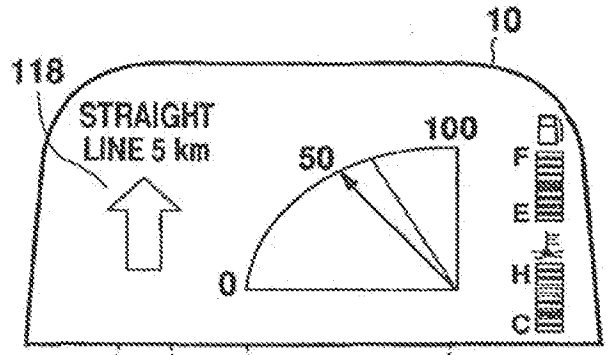


Fig. 10B

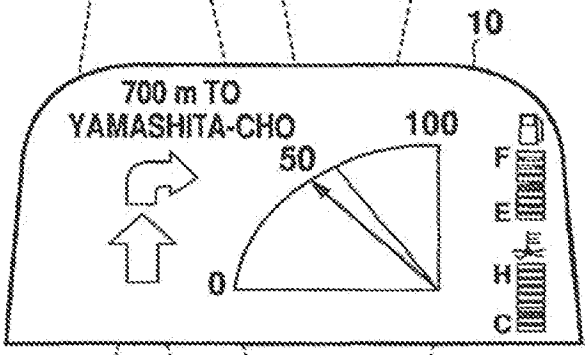
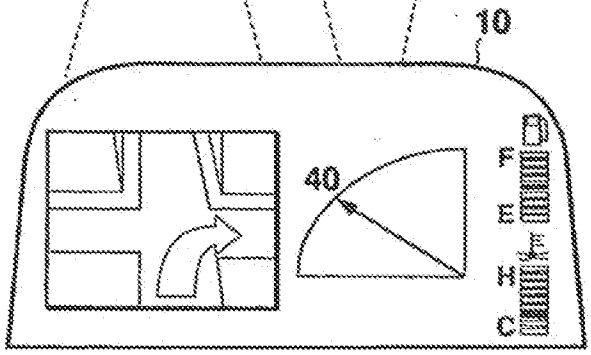


Fig. 10C



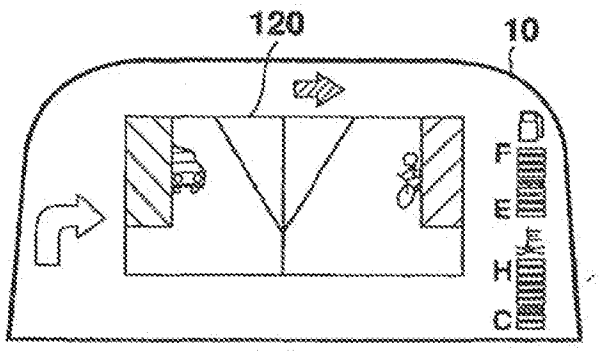


Fig. 11

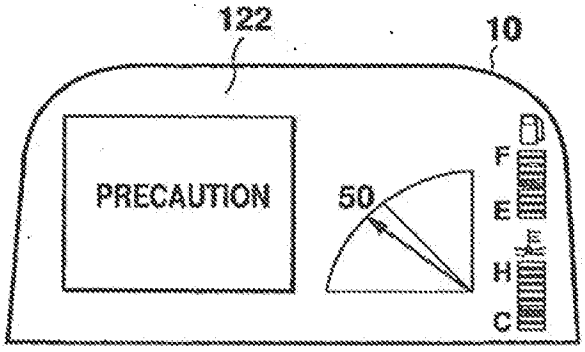


Fig. 12

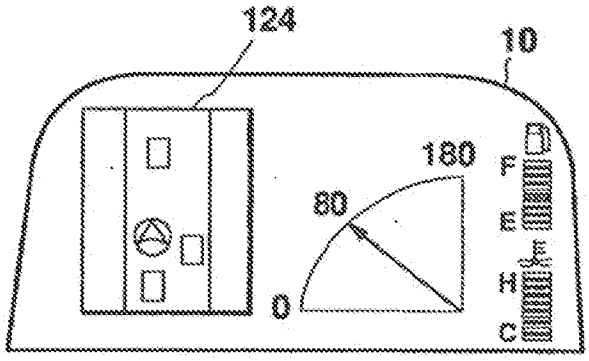


Fig. 13

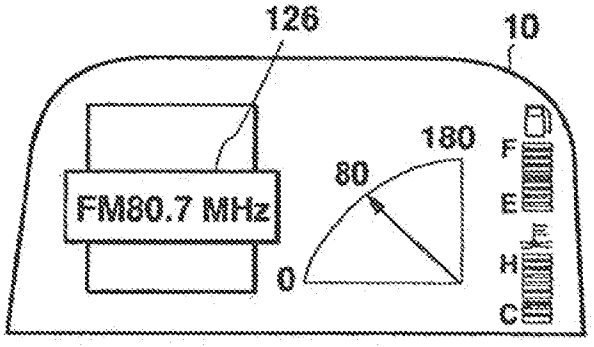


Fig. 14

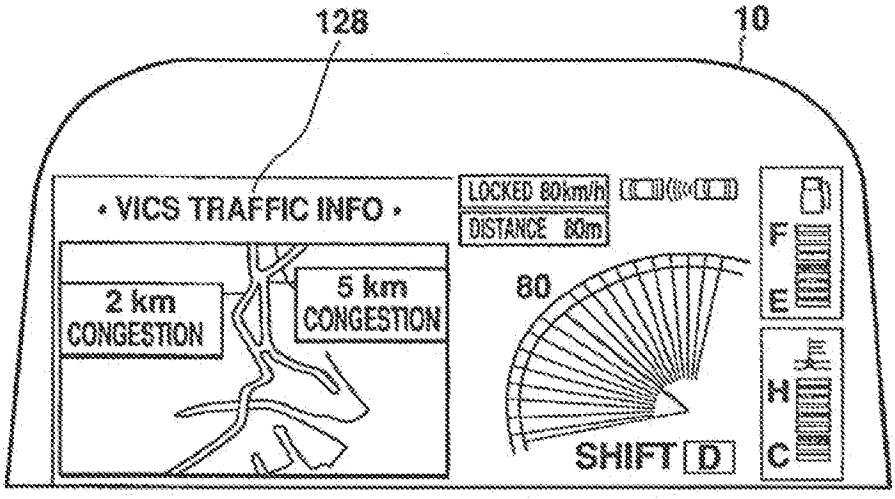


Fig. 15

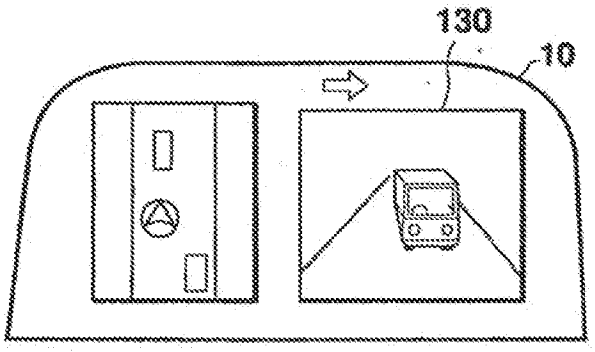


Fig. 16

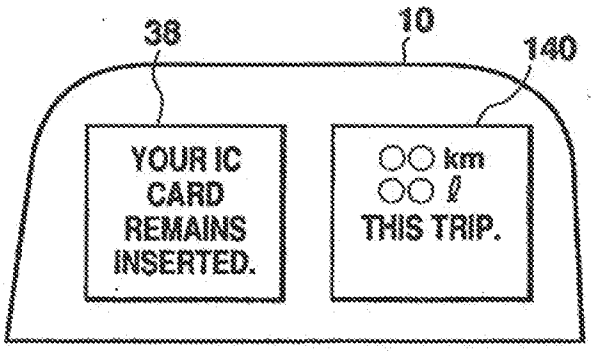


Fig. 19

⑲日本国特許庁（JP）　⑫特許出願公開

⑫公開特許公報（A）　平2−301330

⑤Int.Cl.⁵　識別記号　庁内整理番号　⑬公開　平成2年(1990)12月13日
H 04 B 1/16　M　6945−5K

審査請求　未請求　請求項の数 1　（全7頁）

⑭発明の名称　車載用ラジオ受信機

⑳特　願　平1−121686
㉒出　願　平1(1989)5月16日

㉑発明者　河野　繁　東京都品川区西五反田1丁目1番8号　アルパイン株式会社内
㉑出願人　アルパイン株式会社　東京都品川区西五反田1丁目1番8号

明　細　書

1.発明の名称

車載用ラジオ受信機

2.特許請求の範囲

ラジオデータシステムの送信データに含まれる番組内容識別コードPTYに基いて番組内容を識別する機能を有する車載用ラジオ受信機において、

受信局の信号レベルを監視する監視手段と、該監視手段により信号レベルが所定値以下になつた時PTYコードを送信しているPTY局をサーチするサーチ手段と、該サーチ手段により受信したPTY局の番組内容を判別する手段と、該判別手段により番組内容別にPTY局の周波数データを記憶する記憶手段と、該記憶手段に記憶した周波数データより所定の優先順位に従つてPTY局を呼び出して受信する制御部を備えたことを特徴とする車載用ラジオ受信機。

3.発明の詳細な説明

〈産業上の利用分野〉

本発明はRDS（ラジオデータシステム）の送信データに含まれる番組内容識別コードPTYに基いて番組内容を識別する車載用ラジオ受信機に係り、特にサーチ動作時において特定のPTYコードを送信しているPTY局が受信可能な車載用ラジオ受信機に関する。

〈従来技術〉

ヨーロッパでは、通常これを操作するのがドライバーであること、車が長距離を移動し受信局のサービスエリアを外れる場合そのたびに再選局が必要となることなどから、選局操作の簡便化が求められてきた。特に比較的サービスエリアの狭いFM放送をラジオ放送サービスの主体とし、カーラジオでの放送受信比率の高いヨーロッパでは、この要求が強かつた。この要求を満たすべくヨーロッパ放送連合により規格化されたデジタルデータ多重システムが、RDS（ラジオデータシステム）である。

RDSは、FMラジオ放送にデジタルの各種データ（最良受信局の自動選局、交通情報識別、放送局名表示などに利用できるデータ）を多重伝送

する方式であり、これらの送信データのなかにはAFコード、PIコード、PTYコードがある。

AFコードは代替周波数コードと呼ばれ、同一又は隣接受信地域で同一番組を放送している放送局（AF局）の周波数コードに相当し、かかるAFコードを参照することにより、同一番組放送局の周波数が全て分かるようになっている。また、PIコードはプログラム識別コードと呼ばれ、放送プログラム（番組）に与えられた固有のコードである。PTYコードはジャンル識別コードと呼ばれ、放送プログラムのジャンル（番組タイプ）を識別するためのコードで、クラシック、ロック、ポピュラー、ニュース等32種類のジャンル毎に識別のコードを有するものであり、表1に示すように定められている。

表 1

10	PTYコード	番組タイプ
0	00000	タイプなし
1	00001	ニュース
2	00010	時事
3	00011	マガジン
4	00100	スポーツ
5	00101	教育
6	00110	子供向け番組
7	00111	若人向け番組
8	01000	宗教番組
9	01001	ドラマ
10	01010	カントリーミュージック
11	01011	経音楽
12	01100	クラシック
13	01101	ジャズ
14	01110	フォークミュージック
15	01111	バラエティ
16～30		未定義
31	11111	緊急放送

これらのディジタルデータを利用すると受信状態が良好な同一放送内容の放送局を次々と受信する自動追従を行うことができる。例えば、同一プログラムの自動追従を行う場合、現在受信中の放送局の信号強度（例えば電界強度）と、メモリセットとりまのに同一番組を放送している放送局（AF局）の信号強度を比較し、自動的に現在の受信局より強い信号強度を比較し、自動的に現在の受信局より強い信号強度のAF局に次々と受信局が切り換わるようになっている。

＜発明が解決しようとする課題＞

同一プログラムの自動追従を行う場合、利用するディジタルデータは上述のAFコードの他にPIコードが用いられる。しかし、PIコードは全国一ワード、あるいは同一国内できえ完全に統一されているとは限らず、例えば西ドイツなどでは同一プログラムであっても放送エリアが違うと、送信されるPIコードが異なる場合があり、この結果、自局の放送エリアを離れてしまうと、同一のPIコードを検出することができず、従って自動追従が終了してしまう。そこで、受信可能なRDS局をサーチして受信しているが、受信できた局がユーザの所望するジャンルを放送している局であるとは限らず、その場合所望ジャンルの局を受信するまでユーザがアップ・ダウン選局キーを操作するなどして所望ジャンルの局を受信していた。しかし、上述の操作は大変煩しいものであり、走行中であれば大変危険である。

＜課題を解決するための手段＞

上記課題は本発明においては、ラジオデータシステムの送信データに含まれる番組内容識別コードPTYにおいて番組内容を識別する機能を有する車載用ラジオ受信機に、受信局の信号レベルを監視する監視手段と、該監視手段により信号レベルが所定値以下になった時PTYコードを送信しているPTY局をサーチするサーチ手段と、該サーチ手段により受信したPTY局の番組内容を判別する手段と、該判別手段により番組内容別にPTY局の周波数データを記憶する記憶手段と、該記憶手段に記憶した周波数データより所定の受

先順位に従ってＰＴＹ局を呼び出して受信する制御部を備えることで達成される。

＜作用＞

受信信号レベルが所定値以下になると、ＰＴＹ局をサーチし、受信したＰＴＹ局の番組内容を判別するとともに番組内容別に周波数データをメモリに記憶し、記憶した周波数データより所定の優先順位に従ってＰＴＹ局を呼び出して受信する。

＜実施例＞

第１図は本発明の一実施例を示す車載用ラジオ受信機のブロック図である。１はＡＬＣ回路であり、受信すべき局に応じた所定の電圧信号をフロントエンド２へ出力する。フロントエンド２は、電圧信号に基いてアンテナ（ＡＮＴ）から入力される放送局を受信し、所定の中間周波信号（ＩＦ）を発生する。３は中間周波増幅回路であり、前記中間周波信号を増幅する。４はＩＦ検波器であり、フロントエンド２により変換され中間周波増幅回路で増幅された中間周波信号を検波する。５はＡＭ復調回路であり、ＩＦ検波器４の検波出力をステレオ信号に復調する。６は増幅器であり、ステレオ信号を増幅する。７はスピーカであり、増幅器６により駆動され、復調ステレオ信号に応じた音声信号を出力する。

８はＲＤＳデコーダであり、所定の送信タイミングで送られてくるＰＴＹコード等を復調する。９はエラー訂正回路であり、ＲＤＳデコーダ８により復調されたＰＴＹコード等のＲＤＳデータの誤りをグループ毎に同期をとりながら検出し、その誤りを訂正する。

１０はシグナルメータであり、中間周波増幅器３から出力される中間周波信号の信号強度（例えば電界強度）を検知することにより受信局（ＰＴＹ局をさす）の受信状態のレベルを検出する。

１１はマイコン構成の制御部であり、ＲＤＳデコーダ８で復調されたＰＴＹコードなどのジャンルのコードであるか判別する判別手段１２と、ＰＴＹコードに応じた番組別周波数データとその受信電界強度に応じた信号を記憶しておくプリセットメモリ１３と、プリセットメモリ１３に既に記憶されているジャンル別の周波数データの受信電界強度に応じた信号と新たに受信したＰＴＹ局の受信電界強度に応じた信号を比較する比較手段１４を有している。制御部１１はサーチ動作を行うと共に、選局した放送局をプリセットメモリ１３に記憶する時の制御および処理等を行う。

１５は操作・表示部であり、周波数表示、ジャンル表示などを行うディスプレイ１６、受信周波数を増加または減少させるアップ・ダウンキー１７、放送局の自動選局を行う自動選局キー１８等を有している。

１９はジャンル選択キー（８）であり、ポップス、ロック＆ポピュラー、ニュース等のジャンルを１プッシュ毎に呼び出し、ディスプレイ１６に表示させる。なお、これらのジャンルはＲＤＳのＰＴＹ信号に準じている。２０はチューニングキー（ＴＵＮＥ）であり、ジャンル（ＰＴＹコード）をプリセットメモリ１３へ登録する際に使用する。

２１はプリセットメモリキー⑴～⑹であり、選局された放送局の周波数データをプリセットメモリ１３に記憶し、かつ呼び出して受信状態とするためのものである。尚、本実施例においては後述のように、プリセットメモリキー２１は周波数データのプリセット以外にジャンルに優先順位を設定するための操作キーとしても使用される。例えば⑴のキーはポップス、⑵のキーはロックというように設定するものである。以下に、第２図を参照しプリセットメモリキー２１⑴～⑹にジャンルとの関係を設定する時の操作・表示部１５の操作方法を説明する。

チューニングキー２０を押圧すると（ステップ100）、制御部１１ではＰＴＹコードナンバーＮ＝０がセットされ（ステップ101）、表示部１６にはＮ＝０のジャンル即ち「タイプなし」が表示される（ステップ102）。そこで、表示されたジャンルが不満であれば、ユーザはジャンル選択キー１９を押圧する（ステップ103）。制御部１１はＮ＝０のコードナンバーに１を加算し（ステップ104）、Ｎ＝１のジャンル、即ち「ニュース」を表示部に表示する（ステップ102）。表示され

たジャンルであればユーザはプリセットメモリキー⑪～⑳のキーの内、自分の希望する優先順位に相当するプリセットメモリキーを押圧する。具体的に言えば、ニュースのジャンルに最優先順位をつけたいと思えば⑪のキーを、９番目の順位にしたいと思えば⑲のキーを、というように、プリセットメモリキー２１のキー番号⑪～⑳をそのまま優先順位として、プリセットメモリキー２１を押圧すれば良い（ステップ105）。前述図１１はプリセットメモリ１３のなかのユーザが押圧したプリセットメモリキーの番号に対応するメモリ領域にＮ＝１のジャンルのコード（００００１）を書き込む（ステップ106）。尚、前述の表１に示したようにＰＴＹコードナンバー(N)は５ビットの２進データで構成され、Ｎ＝２であれば００００１０、Ｎ＝３であれば００００１１というように構成されている。上記のようにステップ103からステップ106の動作を繰り返すことによりプリセットメモリキー２１の⑪～⑳のキーにジャンルを設定することができる。そして、上記ジャンルのプリセットを終了しようと思えばユーザはチューニングキー２０を押圧すれば良い（ステップ107）。ステップ107においてチューニングキー２０が押されると、前述図１１は表示器１６に「OK」の表示を点滅させる（ステップ108）。その場合、上記プリセット内容をさらに修正したい時にはジャンル選択キー１９を押圧すれば再度ステップ101以降の過程を繰り返すことが可能になる（ステップ109）。ステップ109において、ジャンル選択キー１９を押圧しなければ所定時間「OK」表示を点滅させた後（ステップ110）、優先順位別ジャンル設定動作は終了する。

第３図は本発明のＰＴＹ用のサーチ動作処理のフロー図、第４図はプリセットメモリ１３にメモリされる周波数データの具体例を示す図である。以下、第３図、第４図を参照し本発明によるＰＴＹ用のサーチ動作を説明する。

同一プログラムの自動選局が行なわれている時に受信エリアが変化し、同一ＰＩコードが検出できなくなり、自動選局が終了してしまったとする

と、前述図１１は所定の周波数帯域をサーチして（ステップ200）、シグナルメータ１０より得られる電界強度が所定レベル以上の局をみつけると（ステップ201）、ＲＤＳデコーダ８、エラー訂正回路９を介してＰＴＹコード等のＲＤＳコードが受信放送局に送出されているかチェックする（ステップ202）。受信した局がＲＤＳ局であれば、記憶されていたＰＴＹコード、例えばコードナンバー００００１がプリセットメモリ１３にメモリされているか否か判別手段１２をして判別し、メモリされていれば前記ＰＴＹコードが送出されていた局の周波数情報、例えば９２３ＭＨｚをプリセットメモリ１３のＰＴＹコード００００１を示す所定のエリア（ⓐ参照）にメモリする。尚、シグナルメータ１０より得られる受信電界強度に応じた信号も周波数データとともに所定のエリアにメモリする（ステップ203）。このとき、メモリされた局が少なくとも１局以上あれば比較手段１４をしてシグナルメータ１３の検出結果を基に現在受信中のＰＴＹ局の受信電界強度に応じた信号と、メモリされている局の周波数データの受信電界強度に応じた信号を比較し（ステップ204）、信号強度の強い順に周波数情報データをならべかえる（ステップ205）。以上の過程を所定の周波数帯域のサーチが終了するまで続けると（ステップ206）、ⓐ～ⓘに示すような周波数データがプリセットメモリ１３にメモリされ、優先順位の１番高いジャンルの局、この例では９２３ＭＨｚ（ⓐ参照）で受信が開始される（ステップ207）。また、仮にⓐにメモリされた局がなければ、２番目の優先順位のジャンルの局として９８５ＭＨｚ（ⓑ参照）で受信が開始され、以下ⓒ～ⓘに示す優先順位で受信が可能になる。

尚、ⓐ～ⓘに示すプリセットメモリ１３のメモリ内容はプリセットメモリキー２１によっても呼び出しが可能であり、その場合１ブロック毎に周波数情報が呼び出され全部呼び出し終ったら、再度１番最初に呼び出した周波数を呼び出すサイクリックな構成になっている。また、プリセットメモリ１３にメモリされる周波数情報は実施例では

最大4個としたが、この数に限るものではない。

また、プリセットメモリーに各ジャンルを設定する際に、各プリセットメモリーに何のジャンルが設定されたかをディスプレイに表示するようにしてもよい。

<効果の効果>

以上本発明によれば、ラジオデータシステムの送信データに含まれる番組内容識別コードPTYにおいて番組内容を識別する機能を有する車載用ラジオ受信機に、受信局の信号レベルを検知する監視手段と、該監視手段により信号レベルが所定値以下になった時PTYコードを送信しているPTY局をサーチするサーチ手段と、該サーチ手段により受信したPTY局の番組内容を判別する手段と、該判別手段により番組内容別にPTY局の周波数データを記憶する記憶手段と、該記憶手段に記憶した周波数データより所望の番組内容に応じてPTY局を呼び出して受信する制御部を備えたので、サーチ時において、ユーザの所望するジャンルの局が自動的に受信でき、煩しい操作を行う必要がなくなり、操作の操作性も向上する。

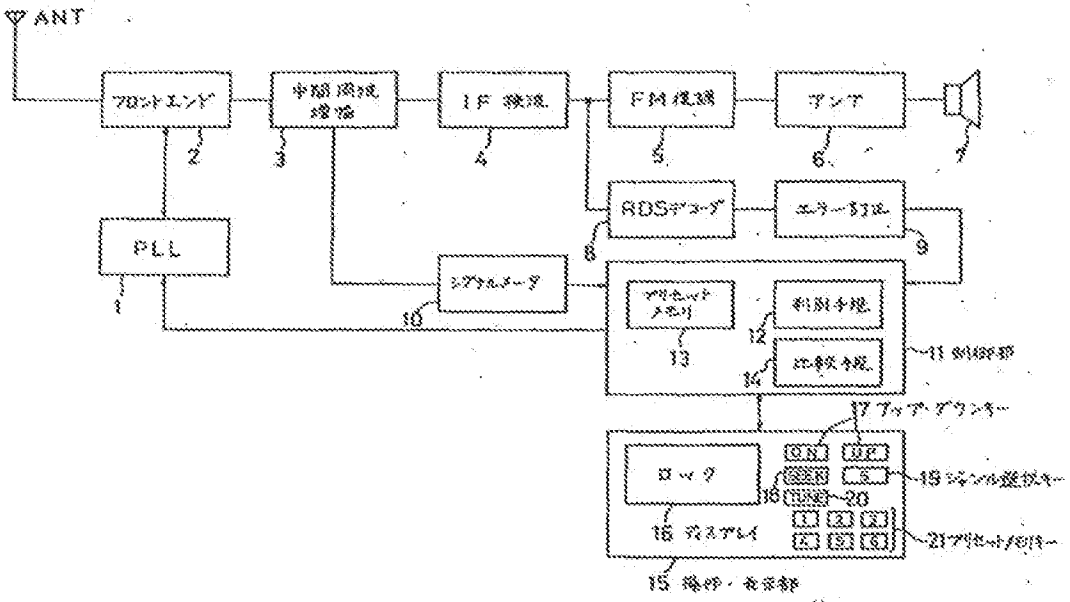
4.図面の簡単な説明

第1図～第4図は本発明の実施例を示し、第1図はブロック図、第2図はPTYコードのプリセットメモリへの登録方法の流れ図、第3図はPTY局のサーチ動作の処理の流れ図、第4図はプリセットメモリのメモリ内容の具体例を示す図である。

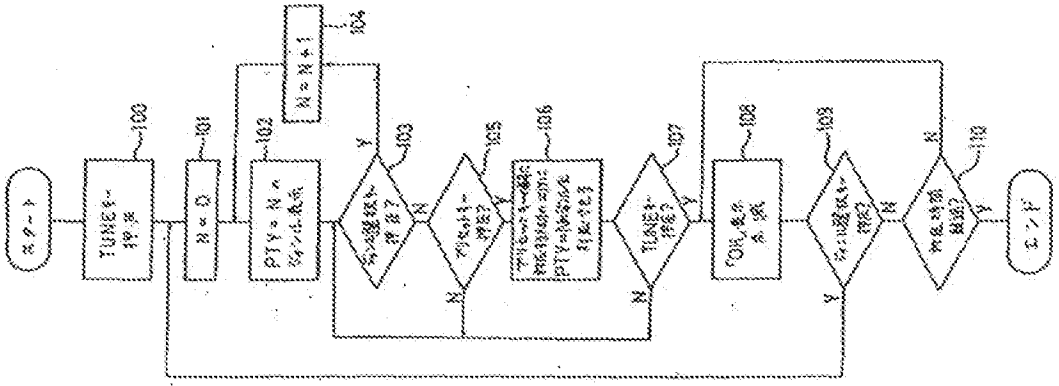
8…RDSデコーダ、9…エラー訂正回路、10…シグナルメータ、11…制御部、12…判別手段、13…プリセットメモリ、14…比較手段、15…操作・表示部、19…ジャンル選択キー、21…プリセットメモリキー。

特許出願人　アルパイン株式会社
代表者　岩　沢　建太郎

第1図



第2図



第3図

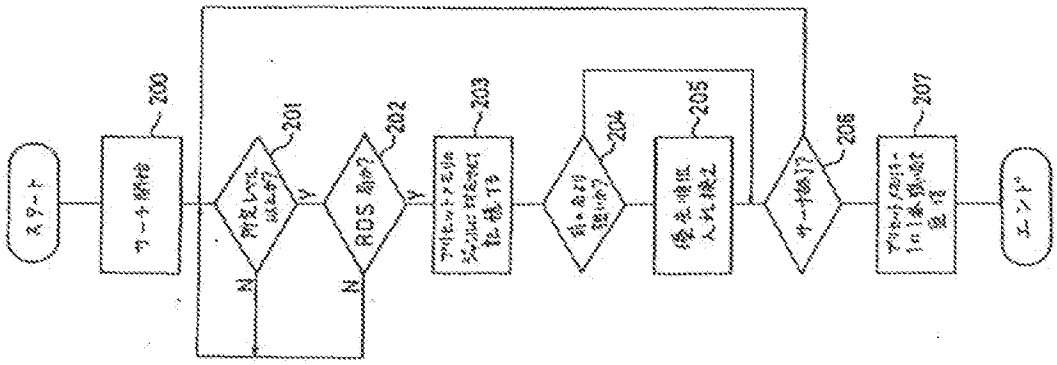


表 4

(a)	1	00001	92.3	101.6	97.1	
(b)	2	00011	96.5	87.5		
(c)	3	01101	89.5			
(d)	4	01000	102.3	91.2	90.7	93.5
(e)	5	01111	90.9	96.4	90.4	
(f)	6	00110	92.0			

(19) Japan Patent Office (JP)

(11) Unexamined Patent Application Publication No.
(12) Publication of Unexamined Patent Application (A) 3-301330
(43) Kokai Date: December 13, 1991

Technical display column

(51) Int.Cl.[5] Identification Symbol JPO File Number
H04B 1/18 A 6945-5K

Request for Examination: Not Requested, Number of Claims: 1 (7 Pages Total)

(54) Title of the Invention: A Radio Receiver Loaded on Automobiles
(21) Patent application No. 1-121586
(22) Application date: May 16, 1989

(72) Inventor: Shigeru Kohno
Alpine Company Limited
1-8 Nishigotanda 1-chome, Shinagawa-ku, Tokyo

71) Applicant: Alpine Company Limited
1-8 Nishigotanda 1-chome, Shinagawa-ku, Tokyo

Specification

1. Name of the Invention

A Radio Receiver Loaded on Automobiles

2. Claims

A radio receiver loaded on automobiles having a function that identifies the program content based on the program content identification code PTY contained in the transmitted data of the radio data system comprising:

a monitor that observes the signal level of the receiving stations,

a search unit that performs a search of PTY stations transmitting the PTY code when the signal level becomes at the fixed value or below by the monitor,

an evaluator that determines the program content of the PTY stations received by the search unit,

a memory that stores frequency data of the PTY station according to the program content of the PTY station obtained by the evaluator, and

a control area that receives the PTY station by calling according to the predetermined priorities based on frequency data stored in the memory.

3. Detailed Description of the Invention

<Field of Industrial Application>

The present invention relates to a radio receiver loaded on automobiles having a function that identifies program content based on the program content identification code PTY contained in the transmitted data of the RDS (radio data system). More specifically, the present invention relates to a radio receiver loaded on automobiles that is able to receive the PTY station transmitting the specified PTY code at the time of searching.

<Prior Art>

Sophistication of selection function with car radios has been sought for since the drivers normally operate the radios and have to reselect the stations every time the cars travel a long distance and leave a service area of the receiving stations.

Particularly, in Europe, where the main radio broadcasting service is the FM broadcast that has a comparatively small service area, making car radios more sophisticated has been in high demand. In order to meet this need, the digital data multi-system is regulated by the European broadcasting union. The digital data multi-system is referred to as RDS (radio data system).

RDS is a method of multi-transmitting, to the FM radio broadcast, each type of digital data (data utilized for automatic selection of the best receivable stations, traffic information identification and broadcasting station name display). The transmitted data includes AF code, PI code and PTY code.

AF code is referred to as a substitute frequency code. AF code corresponds to the frequency code of the broadcasting station (AF station) that broadcasts the same programs in the same or adjoining receiving regions. By referring to the AF code, the frequency of the same program broadcasting stations is all identified. PI code is referred to as a program identification code. In other words, PI code is a unique code provided to broadcasting programs. PTY code is referred to as a genre identification code. PTY code is a code to identify the genres of the broadcasting programs (program types). Each genre has an individual code for 32 different types such as classical music, rock music, popular music and news. Table 1 shows the program types.

[Table 1]

No.	PTY code	Program type
0	00000	No type
1	00001	News
2	00010	Current affairs
3	00011	Magazine
4	00100	Sports
5	00101	Education
6	00110	Programs for children
7	00111	Programs for young people
8	01000	Religious programs
9	01001	Drama
10	01010	Rock music
11	01011	Light music
12	01100	Classical music
13	01101	Jazz
14	01110	Folk music
15	01111	Variety
16-30		No definition
31	11111	Emergency broadcasting

By using this digital data, automatic tracking becomes available with which broadcasts that have a favorable reception with the same broadcasting content are continuously received. For example, when the automatic tracking of the same program is performed, the signal strength of the currently receiving broadcasting station (such as electric field strength) and that of the broadcasting station that broadcasts the same programs obtained from the AF list (AF station) are compared. A stronger signal is compared with the currently receiving station automatically and the receiving station switches successively and automatically to the AF station having a stronger signal than the currently receiving station.

<Problems to be Solved by the Invention>

When the automatic tracking for the same program is performed, the PI code is used as well as the above-described AF code for digital data. However, the PI code is not completely uniform in all Europe, not even in the same country. For example, in Western Germany if the same program has a different broadcasting area, the transmitted PI code could be different. As a result, when the user leaves the original broadcasting area, the same PI code cannot be detected and thus the automatic tracking ends.

When the receivable RDS station is searched for, the station that is received does not always broadcast the genre that the user desires. When this occurs, the user used to operate the up and down selection key until the station of the desired genre is received. The above-described operation is complicated and even dangerous when the vehicle is moving.

<Means for Solving the Problems>

According to the present invention, the above-described problem is solved by a radio receiver loaded on automobiles having a function that identifies the program content based on the program content identification code PTY contained in the transmitted data of the radio data system. The radio receiver includes a monitor that observes the signal level of the receiving stations and a search unit that performs a search of PTY stations transmitting the PTY code when the signal level becomes at the fixed value or below by the monitor. The radio receiver also includes an evaluator that determines the program content of the PTY stations received by the search unit. The radio receives further a memory that stores frequency data of the PTY station according to the program content of the PTY station obtained by the evaluator and a control area that receives the PTY station by calling according to the predetermined priorities based on frequency data stored in the memory.

<Effect>

When the reception signal level becomes at the fixed value or below, the radio receiver searches the PTY station and determines the program content of the received PTY station. The radio receiver also stores in the memory the frequency data according to the program content. Then, the radio receiver calls and receives the PTY station according to the predetermined priorities based on the stored frequency data.

<Embodiment>

Fig. 1 is a block diagram of a radio receiver loaded on an automobile illustrating one embodiment of the present invention. 1 is a PLL circuit. PLL circuit 1 outputs, to front end 2, the fixed voltage signal in response to the station that is to be received. Front end 2 receives the broadcasting station input from the antenna (ANT) based on the voltage signal and generates a fixed intermediate frequency signal (IF). Intermediate frequency amplifier circuit 3 amplifies the above-described intermediate frequency signal. IF detector 4 detects the intermediate frequency signal converted by front end 2 and amplified in the intermediate frequency amplifier circuit. FM recovery circuit 5 recovers the detected output of IF detector 4 to the stereo signal. Amplifier 6 amplifies the stereo signal. Speaker 7 outputs the sound signal driven by amplifier 6 corresponding to the stereo signal.

RDS decoder 8 recovers PTY codes, etc. transmitted by the fixed transmittance timing [phonetic]. Error correction circuit 9 detects the errors of RDS data of PTY codes recovered by RDS decoder 8 per group synchronically and corrects the errors.

Signal meter 10 detects the level of reception condition of the receiving stations (including the PTY station) by monitoring the signal strength (such as electric field strength) of the intermediate frequency signal output from intermediate frequency amplifier 3.

11 is a control area of the personal computer configuration. Control area 11 of the personal computer configuration has an evaluator 12 that determines which genre code the PTY code recovered by TDS decoder 8 is. Control area 11 also has preset memory 13 that stores the frequency data according to the programs corresponding to the PTY code and the signal corresponding to the receiving electric field strength. Control area 11 further has comparison unit 14 that compares the signal corresponding to the reception electric field strength of the frequency data according to the genre already stored in preset memory 13 with the signal corresponding to the reception electric field strength of newly received the PTY station. Control area 11 performs a search operation as well as the control and process when the selected broadcasting stations are stored in preset memory 13.

Operation display area 15 has display 16 that displays the frequency and genres, up down key 17 that increases or decreases the reception frequency and automatic selection key 18 that automatically selects broadcasting stations.

Genre selection key (s) 19 calls by each press genres such as classical, rock popular music and news and displays the genre in display 16. These genres comply with the PTY signal of RDS. Tuning key (TUNE) 20 is used when the genres (PTY code) are registered in preset memory 13.

21 shows preset memory keys 1 to 6. Preset memory keys store the frequency data of the selected broadcasting stations in preset memory 13 and call and set the data in a receivable condition. In this embodiment, as is described later, preset memory keys 21 are used as the operation keys to set the priority of the genres as well as functioning as a preset of the frequency data. For example, key 1 is set for pops, key 2 for rock and so forth. The following describes the operation method of operation display area 15 when the genres are set for preset memory keys 21 (1) to (6) with reference to Fig. 2.

When tuning key 20 is pressed (step 100), PTY code number (N) = 0 is set in control area 11 (step 101). The genre of N = 0, that is, "no type" is displayed in display area 16 (step 102). When the displayed genre is unsatisfactory, the user presses genre selection key 19 (step 103). Control area 11 adds "1" to the code number of N = 0 (step 104) and displays the genre of N = 1, that is, "news" (step 102). When the displayed genre is acceptable, the user presses the preset memory key(s) corresponding to his/her priorities among the preset memories 1 to 6.

More specifically, numbers of 1 to 6 of preset memory keys 21can be pressed according to the priority numbers such as when the news becomes the most priority genre, key 1 is pressed and when it becomes the sixth priority, key 6 is pressed (step 105). Control area 11 writes the genre code (00001) of N = 1 in the memory range corresponding to the number the preset memory key in preset memory 13 that the user has pressed (step 106). The PTY code number (N) is configured with 5 bit binary data as shown above in Table 1. The PTY code is configured as 00010 at N = 2 and 00011 at N = 3. As described above, by repeating the operation of step 103 through step 106, genres can be set for each of the memory keys 21 (1) to (6). In order to complete the presetting of the above genres, the user can press tuning key 20 (step 107). When tuning key 20 is pressed in step 107, control area 11 flashes the display indicating "OK" on and off in display area 16 (step 108). When this occurs and the above-described preset content needs to be changed, the user can repeat the process of step 101 and the following steps becomes possible by pressing genre selection key 19. In step 109, after flashing the "OK" display for a fixed amount of time (step 110), unless genre selection key 19 is pressed, the genre setting operation according to the priority ends.

Fig. 3 shows a flowchart of the search operation process of the PTY station according to the present invention. Fig. 4 shows an example of the frequency data stored in preset memory 13. The following describes the search operation of the PTY station according to the present invention with reference to Fig. 3 and Fig. 4.

When the reception area changes while automatic tracking is being performed for the same program and so the automatic tracking ends because the program cannot be detected by using the same PI code, control area 11 searches the fixed frequency band (step 200) and finds the stations that are obtained from signal meter 10 having an electric field strength at the fixed level or above (step 201). Then, control area 11 checks whether or not the RDS codes such as the PTY code are overlapped by the reception broadcasting waves via RDS decoder 8 and error correction circuit 9 (step 202). When the received station is an RDS station, evaluator 12 determines whether or not the overlapped PTY code, for example, code number 00001 is stored in preset memory 13. If stored, the frequency information of the broadcasting station with the above-described PTY code overlapped such as 92.3 MHz is stored in a predetermined area (refer to (a)) that indicates PTY code 00001 of preset memory 13. The signal obtained from signal meter 10 according to the reception electric field strength is also stored in the predetermined area with the frequency data (Step 203). When there is at least one or more stations that are stored, comparison unit 14 compares, based on the detection results of signal meter 10, the signal corresponding to the reception electric field strength of the currently receiving PTY station with that corresponding to the reception electric field strength of the frequency data of the stored station (step 204). Then, comparison unit 14 sorts the frequency information data by the strength of the single strength (step 205). When the above-described process is continued until the search of the fixed frequency band is completed (step 206), the frequency data shown in (a) to (f) are stored in preset memory 13. The reception starts with the station having the genre listed as a top priority, which is at 92.3MHz in the embodiment (refer to (a)) (step 207).

When there is no station stored in (a), for example, the reception starts with the station having the second top priority, which is at 98.5MHz (refer to (b)). The reception becomes available by the priority order shown in (c) to (f) likewise.

The memory content of preset memory 13 shown in (a) to (f) can also be called by preset memory key 21. When this occurs, it works as a cyclic configuration. The frequency information is called by each press. When all the calls are completed, the frequency called first is called again. Additionally, according to the embodiment, the frequency information stored in preset memory 13 is set for a maximum of 4, but the number is not limited to the embodiment.

When each genre is set for the preset memory key, the preset memory key can be configured to display what genre is set for each preset memory.

<Effect of the Invention>

According to the present invention, a radio receiver loaded on automobiles has a function that identifies the program content based on the program content identification code PTY contained in the transmitted data of the radio data system. The radio receiver includes a monitor that observes the signal level of the receiving stations and a search unit that performs a search of PTY stations transmitting the PTY code when the signal level becomes at the fixed value or below by the monitor. The radio receiver also includes an evaluator that determines the program content of the PTY stations received by the search unit and a memory that stores frequency data of the PTY station according to the program content of the PTY station obtained by the evaluator. The radio receiver further includes a control area that receives the PTY station by calling according to the predetermined priorities based on frequency data stored in the memory. Therefore, the user can automatically receive the stations with the desired genres and does not have to perform troublesome operations. This improves the operability of the device.

4. Brief Description of the Drawings

Fig. 1 through Fig. 4 show the embodiment of the present invention. Fig. 1 is a block diagram. Fig. 2 is a flowchart of the registration method for the PTY code into the preset memory. Fig. 3 is a flowchart of the process of the search operation of the PTY station. Fig. 4 shows an example of the memory content of the preset memory.

8...RDS decoder, 9...Error correction circuit, 10...Signal meter, 11 Control area, 12...Evaluator, 13 Preset memory, 14...Comparison unit, 15...Operation display area, 19...Genre selection key, 21...Preset memory key

Applicant: Alpine Company Limited
Representative: Kentaro Katsuzawa [seal]

Fig. 1

[See the original]

2. Front end, 3. Intermediate frequency amplifier, 4. IF detector, 5. FM recovery 6. Amplifier, 8. RDS decoder, 9. Error correction, 10. Signal meter, 11. Control area, 12. Evaluator, 13. Preset memory, 14. Comparison unit, 15. Operation display area, 16. Display, 17. Up down key, 19. Genre selection key, 21. Preset memory key

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開平5－294250
(43)公開日　平成5年(1993)11月9日

(51)Int.Cl.*	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｂ６２Ｄ　6/00		9034－3Ｄ		
Ｂ６０Ｋ　28/06		Ａ　7140－3Ｄ		
Ｂ６０Ｒ　21/00		Ｄ　8105－3Ｄ		
// Ｇ０５Ｄ　1/02		Ｓ　7828－3Ｈ		
		Ｋ　7828－3Ｈ		

審査請求　未請求　請求項の数7(全 11 頁)　最終頁に続く

(21)出願番号　特願平4－88836

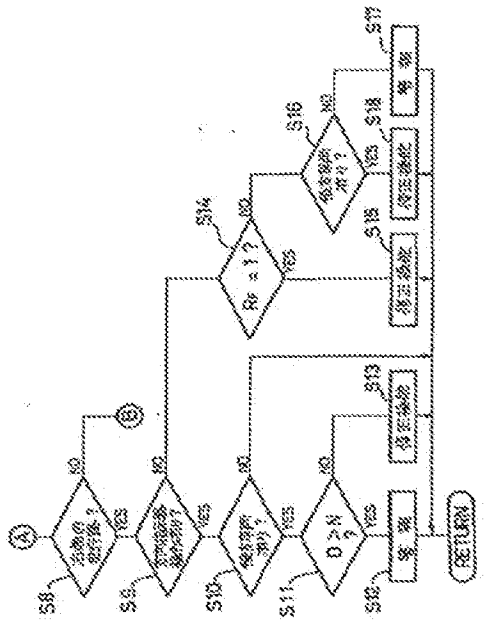
(22)出願日　平成4年(1992)4月20日

(71)出願人　000003137
マツダ株式会社
広島県安芸郡府中町新地３番１号
(72)発明者　上村　恭徳
広島県安芸郡府中町新地３番１号　マツダ株式会社内
(72)発明者　吉岡　透
広島県安芸郡府中町新地３番１号　マツダ株式会社内
(72)発明者　山本　康典
広島県安芸郡府中町新地３番１号　マツダ株式会社内
(74)代理人　弁理士　原　謙三

最終頁に続く

(54)【発明の名称】　車両の安全装置

(57)【要約】
【構成】　運転者の方向指示器操作があるときに（Ｓ９），走行路逸脱動作対応安全機構、即ち車両が現在走行する走行路からの逸脱動作により車両が移動する側における後方車両の有無を検知し（Ｓ１０），後方車両があるときに、警報動作を行う（Ｓ１２）機構を作動させ、運転者の方向指示器操作がないときに（Ｓ９），走行路維持機構、即ち車両が現在走行中の走行路を維持して走行するように、ステアリングアクチュエータに対し修正操舵を行う（Ｓ１５）機構を作動させる。
【効果】　運転者の意思に対応した安全確保動作が行える。



1

【特許請求の範囲】

【請求項1】車両が現在走行中の走行路を維持して走行するように、ステアリングアクチュエータを制御する走行路維持機構と、現在走行中の走行路からの車両の逸脱動作が行われるときに、この逸脱動作により車両が移動する側における障害物の有無を検知し、障害物があるときに、安全確保動作を行う走行路逸脱動作対応安全機構とを備えている車両の安全装置において、

上記の走行路維持機構と走行路逸脱動作対応安全機構とを運転者の所定動作に応じて切り換えて作動させることを特徴とする車両の安全装置。

【請求項2】上記の運転者の所定動作は、走行路変更あるいは右左折の意思を示すものであることを特徴とする請求項1に記載の車両の安全装置。

【請求項3】他の車両との近接状態を検出する他車近接状態検出手段を備え、上記の運転者の所定動作がないときには、走行路維持機構を作動させる一方、運転者の所定動作があるときには、上記の他車近接状態検出手段により、車両が移動する側の走行路における他の車両との近接状態が検出されたときに、走行路維持機構を作動させ、上記の近接状態が検出されないときに、走行路逸脱動作対応安全機構を作動させることを特徴とする請求項2に記載の車両の安全装置。

【請求項4】車両が現在走行している走行路の道路上における位置を検出する走行路位置検出手段と、他の車両との近接状態を検出する他車近接状態検出手段とを備え、上記の運転者の所定動作がないときに、上記の他車近接状態検出手段により、車両が移動する側の走行路における他の車両との近接状態が検出されないときには、走行路維持機構を解除することを特徴とする請求項2に記載の車両の安全装置。

【請求項5】車両が、現在走行中の走行路を維持して走行するように、ステアリングアクチュエータを制御する走行路維持機構と、車両の走行路逸脱動作が行われるときに、車両が移動する側の走行路における障害物の有無を検知し、障害物があるときに、安全確保動作を行う走行路逸脱動作対応安全機構とを備えている車両の安全装置において、

車両が現在走行している走行路の道路上における位置を検出する走行路位置検出手段を備え、車両が現在走行している走行路に隣接する走行路の種類に応じて走行路維持機構と走行路逸脱動作対応安全機構とを切り換えて作動させることを特徴とする車両の安全装置。

【請求項6】車両が現在走行している走行路に隣接する走行路が、反対走行方向の走行路であるときには走行路維持機構を作動させる一方、同一走行方向の走行路であるときには走行路逸脱動作対応安全機構を作動させることを特徴とする請求項5に記載の車両の安全装置。

【請求項7】車両が現在走行している走行路に隣接する走行路が反対走行方向の走行路であるときに、走行路変更あるいは右左折の意思を示す運転者の所定動作があったときには、走行路維持機構の作動を解除することを特徴とする請求項5に記載の車両の安全装置。

2

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は、車両が現在走行中の走行路を維持して走行するように制御する走行路維持機構と、現在走行中の走行路からの車両の逸脱動作が行われるときに安全確保動作を行う走行路逸脱動作対応安全機構とを備えている車両の安全装置に関するものである。

【０００２】

【従来の技術】従来、車両には、乗員の安全を確保するためにシートベルトおよびエアバッグ装置等が備えられている。一方、このような車両の衝突時に対応する装置に対して、事故を未然に防ぐための装置も開発されている。この種の装置としては、運転者のわき見や不注意等、運転者の意識的な操舵によらずに車両が所定の走行路から逸脱する場合の安全を確保するものと、運転者の意識的な操舵によって車両が所定の走行路から逸脱する場合、例えば意識的に走行路を変更する場合の安全を確保するものとがある。

【０００３】前者の装置としては、例えば、特開昭６３－２１４９００号公報に開示されているように、運転者の意識的な操舵によらずに車両が所定の走行路から逸脱する場合に運転者に警告を発して注意を促す装置が知られている。また、単に警告を発するのではなく、例えば運転者が居眠りをしているような場合でも所定走行路からの車両の逸脱を防止し得るものが提案されている。この装置としては、特開平２－２７０００５号公報に開示されているように、道路を各走行路に仕切る中央線、白線等の案内線を読み取る撮像装置と、この撮像装置から得られた信号を処理する画像処理装置とを備え、車両が走行路における上記の案内線間の一定位置、例えば中央位置を走行するように制御する装置が知られている。

【０００４】一方、後者の装置としては、特開平２－２８７７９９号公報に開示されているように、方向指示器の操作時、その方向の後方車両の有無を検知し、後方車両があるときには、警報を発するものが知られている。

【０００５】【発明が解決しようとする課題】上記のような、運転者の意識的な操舵によらずに車両が所定の走行路から逸脱する場合の安全を確保する装置と、運転者の意識的な操舵によって車両が所定の走行路から逸脱する場合の安全を確保する装置とを設けた場合、車両が所定の走行路から逸脱する動作に対して、高い安全性を備えることができる。しかしながら、従来、上記の両装置を備えた構成、およびこれら各装置をどのような状態で切り換えて使用するかという点については、全く考慮されておらず、その装置の開発が望まれていた。

【０００６】

【課題を解決するための手段】請求項1の発明の車両の安全装置は、上記の課題を解決するために、車両が現在走行中の走行路を維持して走行するように、ステアリングアクチュエータを制御する走行路維持機構と、現在走行中の走行路からの車両の逸脱動作が行われるときに、この逸脱動作により車両が移動する側における障害物、例えば対向車あるいは後方車両の有無を検知し、障害物があるときに、安全確保動作を行う走行路逸脱動作対応安全機構とを備えている車両の安全装置において、上記の走行路維持機構と走行路逸脱動作対応安全機構とを運転者の所定動作に応じて切り換えて作動させることを特徴としている。

【０００７】請求項2の発明の車両の安全装置は、上記の課題を解決するために、請求項1に記載の車両の安全装置において、上記の運転者の所定動作は、走行路変更あるいは右左折の意思を示すもの、例えば方向指示器の操作であることを特徴としている。

【０００８】請求項3の発明の車両の安全装置は、上記の課題を解決するために、請求項2に記載の車両の安全装置において、他の車両との近接状態を検出する他車近接状態検出手段を備え、上記の運転者の所定動作がないときには、走行路維持機構を作動させる一方、運転者の所定動作があるときには、上記の他車近接状態検出手段により、車両が移動する側の走行路における他の車両との近接状態が検出されたときに、走行路維持機構を作動させ、上記の近接状態が検出されないときに、走行路逸脱動作対応安全機構を作動させることを特徴としている。

【０００９】請求項4の発明の車両の安全装置は、上記の課題を解決するために、請求項2に記載の車両の安全装置において、車両が現在走行している走行路の道路上における位置を検出する走行路位置検出手段と、他の車両との近接状態を検出する他車近接状態検出手段とを備え、上記の運転者の所定動作がないときに、上記の他車近接状態検出手段により、車両が移動する側の走行路における他の車両との近接状態が検出されないときには、走行路維持機構を解除することを特徴としている。

【００１０】請求項5の発明の車両の安全装置は、上記の課題を解決するために、車両が、現在走行中の走行路を維持して走行するように、ステアリングアクチュエータを制御する走行路維持機構と、車両の走行路逸脱動作が行われるときに、車両が移動する側の走行路における障害物の有無を検知し、障害物があるときに、安全確保動作を行う走行路逸脱動作対応安全機構とを備えている車両の安全装置において、車両が現在走行している走行路の道路上における位置を検出する走行路位置検出手段を備え、車両が現在走行している走行路に隣接する走行路の種類に応じて走行路維持機構と走行路逸脱動作対応安全機構とを切り換えて作動させることを特徴としている。

【００１１】請求項6の発明の車両の安全装置は、上記の課題を解決するために、請求項5に記載の車両の安全装置において、車両が現在走行している走行路に隣接する走行路が、反対走行方向の走行路であるときには走行路維持機構を作動させる一方、同一走行方向の走行路であるときには走行路逸脱動作対応安全機構を作動させることを特徴としている。

【００１２】請求項7の発明の車両の安全装置は、上記の課題を解決するために、請求項5に記載の車両の安全装置において、車両が現在走行している走行路に隣接する走行路が反対走行方向の走行路であるときに、走行路変更あるいは右左折の意思を示す運転者の所定動作があったときには、走行路維持機構の作動を解除することを特徴としている。

【００１３】

【作用】請求項1の構成によれば、車両に対して所定の走行路を強制的に維持させる走行路維持機構と、運転者の意思による走行路の逸脱動作において、運転者の安全確認の不足を補って無理な逸脱動作を回避する走行路逸脱動作対応安全機構とが、運転者の所定動作に応じて切り換えられるので、運転者の意思に対応した安全確保動作を行うことができる。

【００１４】請求項2の構成によれば、請求項1の構成の作用に加えて、上記の運転者の所定動作は、走行路変更あるいは右左折の意思を示すもの、例えば方向指示器の操作である。従って、所定走行路から車両を逸脱させようとする運転者の一連の動作によって、運転者の所定動作を認識することができる。

【００１５】請求項3の構成によれば、請求項2の構成の作用に加えて、走行路変更あるいは右左折の意思を示す運転者の所定動作があるときであっても、所定走行路からの逸脱動作により車両が移動する側の走行路における他の車両との近接状態が検出されたときには、走行路維持機構が作動するので、運転者の不注意による他の車両との衝突が回避される。

【００１６】請求項4の構成によれば、請求項2の構成の作用に加えて、走行路変更あるいは右左折の意思を示す運転者の所定動作がないときであっても、所定走行路からの逸脱動作により車両が移動する側の走行路における他の車両との近接状態が検出されないときには、即ち安全が確認された場合には、走行路維持機構が解除される。従って、走行路維持機構による強制的な走行路維持制御の作動頻度が低減され、走行路維持制御の作動による運転時の違和感を低減することができる。

【００１７】請求項5の構成によれば、車両が現在走行している走行路に隣接する走行路の種類に応じて走行路維持機構と走行路逸脱動作対応安全機構とが切り換えられるので、車両が現在走行している走行路に隣接する走行路の種類に応じて走行路維持機構と走行路逸脱動作対応安全機構とを適切に作動させることができる。

【００１８】請求項６の構成によれば、車両が現在走行している走行路に隣接する走行路が、反対走行方向の走行路であるときには走行路維持機構が作動する一方、同一走行方向の走行路であるときには走行路逸脱動作対応安全機構が作動する。即ち、車両が走行している走行路における危険度に応じて走行路維持機構と走行路逸脱動作対応安全機構とが切り換えられるので、走行路における危険度に応じて安全性が確保され、また、一律に走行路維持機構が作動するように設定された場合と比較して、走行路維持機構の作動による運転時の違和感が低減される。

【００１９】請求項７の構成によれば、請求項５の構成の作用に加えて、車両が現在走行している走行路に隣接する走行路が反対走行方向の走行路であるときであっても、走行路変更あるいは右左折の意思を示す運転者の所定動作があったときには、走行路維持機構の作動が解除されるので、運転者の意思に対応した安全確保動作を行うことができる。

【００２０】

【実施例】本発明の一実施例を図１ないし図８に基づいて以下に説明する。

【００２１】本実施例の車両の安全装置は、図２に示す各手段によって構成されている。カメラ２は、図３に示すように、車両１の前端面に設けられ、車両１が走行している道路前方の各案内線２１、これら案内線２１によって仕切られる各走行路２４および走行路２４上における他の車両、例えば対向車等を撮像するものである。カメラ２から出力された映像信号は、信号処理ユニット３により、演算ユニット４において処理可能な信号に処理され、演算ユニット４へ供給される。演算ユニット４は、信号処理ユニット３からの入力信号に基づいて、後述のように、走行路２４を走行する車両１の現在位置y_s、、推定位置y_e、、目標位置y_t、、後方向移動速度v_y、および走行路幅h_y、等を演算するようになっている。さらに、演算ユニット４は、道路における同一走行方向の走行路２４の数、および車両１が走行している走行路２４を認識するとともに、車両１の逸脱方向を検出するようになっている。従って、上記のカメラ２、信号処理ユニット３および演算ユニット４により走行路位置検出手段が構成されている。

【００２２】前方検知超音波レーダユニット１０は、車両１の前端面に設けられ（図３には図示せず）、レーザレーダ波を発信部から車両１の前方へ送信するとともに、対向車等の前方障害物に当たって反射してくる反射波を受信部で受信するようになっている。演算ユニット４は、上記のレーダ受信波、および信号処理ユニット３からの入力に基づいて、前方障害物の有無を検出するとともに、前方障害物との距離および相対速度を演算するようになっている。これにより、演算ユニット４は、前方障害物が対向車であるか否かを識別するようになっている。従って、演算ユニット４および前方検知超音波レーダユニット１０により他車近接状態検出手段が構成されている。尚、演算ユニット４における前方障害物の識別は、信号処理ユニット３からの入力のみによって行うことも可能である。

【００２３】左レーダヘッドユニット１１と右レーダヘッドユニット１２は、図３に示すように、車両１の例えば左右のドアミラー１ａ・１ｂに設けられ、レーザレーダ波を発信部から車両１の後方へ送信するとともに、車両１後方の車両等の障害物に当たって反射してくる反射波を受信部で受信するものである。演算ユニット４は、これらレーダヘッドユニット１１・１２からの信号を信号処理ユニット１３を介して入力し、後方車両を検出するとともに、レーダ受信波の送信時点からの遅れ時間によって後方車両との距離および相対速度を演算するようになっている。従って、上記の左およびおよび右レーダヘッドユニット１１・１２、信号処理ユニット１３および演算ユニット４により別の他車近接状態検出手段が構成されている。

【００２４】上記の両レーダヘッドユニット１１・１２によるレーザレーダ波の送受信方向は、モータ１５にて両レーダヘッドユニット１１・１２が駆動されることにより変化し、モータ１５の作動は演算ユニット４により制御される。角度センサ１４は、モータ１５の回転角からレーザレーダ波の送受信方向を検出するものであり、演算ユニット４は、角度センサ１４から得られるレーザレーダ波の送受信方向を考慮して、後続車との距離および相対速度を演算するようになっている。

【００２５】制御ユニット５は、演算ユニット４から得られる演算結果、舵角センサ９からの入力、および方向指示器７の作動に基づいて、後述のように、ステアリングアクチュエータユニット６および警報ブザー８の作動を制御するようになっている。

【００２６】舵角センサ９は、操舵角を検出するものであり、ステアリングアクチュエータユニット６は、その作動により操舵角を変化させるものである。警報ブザー８は、車室内のインストルメントパネルに設けられ、運転者に警報を発するものである。

【００２７】上記の構成において、本安全装置の動作を図１および図４ないし図７のフローチャートに基づいて説明する。

【００２８】仮に、車両１、即ち自車が図３に示す道路を走行しているものとした場合において、先ず、図４に示すように、同一走行方向の走行路２４の数と、自車が走行している走行路２４とを認識する（Ｓ１）。このＳ１の動作は、演算ユニット４における走行路位置検出手段としての動作である。

【００２９】また、自車における走行路２４幅方向の現在位置y_sと後方向移動速度v_yとを検出する（Ｓ２）。この検出動作においては、信号処理ユニット３を

介して得られたカメラ2の出力に基づいて、図3に示す案内線21・21間の幅、即ち走行路幅b_iを読み取り、走行路幅b_i方向における左側の案内線21からの自車の現在位置y_iを検出し、また自車の位置の微分によって横方向移動速度v_iを検出する。

【0030】次に、現在位置y_iの認識後における自車位置を推定する（S3）。この際には、上記の現在位置y_iと横方向移動速度v_iとから、自車の推定位置y_iを、$y_i = y_i + v_i \cdot T_i$の演算によって求める。このT，は、修正操舵の開始タイミングを決定するための所定時間であり、自車の走行速度が早い程、小さい値に設定される。

【0031】次に、上記の推定位置y_iから自車が、図3に示す案内線21・21から逸脱するか否かを判定する（S4）。この判定動作においては、自車の車幅をWとすると、推定位置y_iが、$y_i > (b_i - W/2)$のときには自車が右側へ逸脱するものと判定し、フラグR_iを、$R_i = 1$とする。一方、推定位置y_iが、$y_i < W/2$のときには自車が左側へ逸脱するものと判定し、フラグL_iを、$L_i = 1$とする。また、推定位置y_iが、$W/2 \geq y_i \geq (b_i - W/2)$のときには、自車はその走行路から逸脱しないものと判定する。そして、自車が逸脱しないと判定したときには、S1へ戻る。

【0032】次に、S4で逸脱すると判定したときにおいて、同一走行方向の走行路数が1であれば（S5）、運転者の走行路変更あるいは右左折の意思を示す所定動作である方向指示器7の操作の有無を判定し（S6）、方向指示器7の操作があれば、S1へ戻る。一方、方向指示器7の操作がなければ、その走行路からの自車の逸脱を防止する修正操舵を行う（S7）。尚、このS7は、走行路維持機構としての動作である。

【0033】この修正操舵においては、図7に示すように、走行路24の右側方向への自車の逸脱を示すフラグR_iが1のとき（S41）、自車の目標位置y_iを、$y_i = b_i - W/2$に設定する（S42）。尚、この目標位置y_iは、自車を、その右側の側面が案内線21と一致する状態で走行させるものである。一方、走行路24の左側方向への自車の逸脱を示すフラグL_iが1のとき（S43）、自車の目標位置y_iを、$y_i = W/2$に設定する（S44）。尚、この目標位置y_iは、自車を、その左側の側面が案内線21と一致する状態で走行させるものである。

【0034】次に、偏差eを、$e = y_i - y_i$によって求め、さらに、補正舵角$\Delta\theta$を、$\Delta\theta = k_i \cdot e$によって求める（S45）。尚、$k_i$は偏差eから舵角を求めるための適当な係数である。次に、上記の補正舵角$\Delta\theta$によって舵角が補正されるようにステアリングアクチュエータユニット6を制御する（S46）。

【0035】その後、再度、現在位置y_iおよび横方向移動速度v_iから推定位置y_iを求め（S47）、偏差eの絶対値がしきい値e_iより小さいか否か、即ち偏差eの絶対値が許容範囲内にあるか否かを判定し（S48）、許容範囲内でなければS45へ戻る一方、許容範囲内であれば、この修正操舵を終了して、S1へ戻る。尚，上記の修正操舵により自車は、図8に示すような走行軌跡を描くことになる。

【0036】次に、上記のS5においてNOであれば、図1のS8へ進んで、自車が図3に示す右端の走行路を走行しているか否かを判定する。そして、YESであれば、方向指示器7の操作の有無を判定し（S9）、YESであれば，自車の逸脱方向における後方車両の有無を判定する（S10）。そして、NOであれば、S1へ戻る一方、YESであれば、自車と後方車両との距離Dと、しきい値Nとの大小を判定する（S11）。そして、D＞Nであれば、警報ブザー8により警報を発して（S12），S1へ戻る一方、D＞Nでなければ、上記の修正操舵を行って（S13），S1へ戻る。尚、上記のS10～S12は走行路逸脱動作対応安全機構としての動作であり、S12の警報動作は安全確保動作である。

【0037】また、上記の9において方向指示器7が操作されていないときに、フラグR_iが1であれば（S14）、これは運転者の意識的な操作によらない反対走行方向の走行路への逸脱動作であるから、上記の修正操舵を行って（S15），S1へ戻る。一方、S14において，フラグR_iが1でなければ，フラグL_iが1であり，これは図3に示す3本の同一走行方向の走行路24のうちの中央の走行路24への逸脱動作であるから、その走行路24に後方車両がなければ（S16），警報を発して（S17），S1へ戻る。一方、S16において後方車両があれば，上記の修正操舵を行って（S18），S1へ戻る。

【0038】次に，上記のS8においてNOであれば、図5のS19へ進んで、自車が図3に示す左端の走行路を走行しているか否かを判定する。そして，YESであれば、方向指示器7の操作の有無を判定し（S20），YESであればS1へ戻る。

【0039】一方、S20においてNOであり、フラグL_iが1であれば（S21），これは運転者の意識的な操作によらない路肩方向への逸脱動作であるから、上記の修正操舵を行って（S22），S1へ戻る。一方、S21において，フラグL_iが1でなければ，フラグR_iが1であり、これは図3に示す中央の走行路24への逸脱動作であるから、その走行路24に後方車両がなければ（S23），警報を発して（S24），S1へ戻る。一方，S23において後方車両があれば，上記の修正操舵を行って（S25），S1へ戻る。

【0040】次に、上記のS19においてNOであれば、自車は図3に示す中央の走行路24を走行している

ことになる。従って、図6のS26へ進んで、方向指示器7の操作の有無を判定し（S26）、YESであれば、自車の逸脱方向における後方車両の有無を判定する（S27）。そして、NOであれば、S1へ戻る一方、YESであれば、自車と後方車両との距離Dと、しきい値Nとの大小を判定する（S28）。そして、D>Nであれば、警報を発して（S29）、S1へ戻る一方、D>Nでなければ、上記の修正操舵を行って（S30）、S1へ戻る。

【0041】また、上記の26において方向指示器7が操作されていなければ、逸脱方向の走行路24における後方車両の有無を判定し（S31）、後方車両があれば、修正操舵を行って（S32）、S1へ戻る一方、後方車両がなければ、警報を発して（S33）、S1へ戻る。

【0042】尚、以上の動作をまとめると、下記の表1のようになる。

【0043】また、本実施例においては、意識的な運転者の所定動作を指示器7の操作としているが、これに限定されることなく、例えばブレーキ操作、ステアリングホイール操作、あるいはその他の操作であってもよい。

【0044】

【表1】

		移動する側の走行路の走行方向		
		同一方向		反対方向
		後方車 有	後方車 無	
方向指示器	操作無	修正操舵	警報または制御なし	修正操舵
	操作有	後方車接近→修正操舵 後方車近→警報	制御なし	制御なし、または対向車を検知

【0045】

【発明の効果】請求項1の発明の車両の安全装置は、以上のように、走行路維持機構と走行路逸脱動作対応安全機構とを運転者の所定動作に応じて切り換えて作動させる構成である。

【0046】これにより、運転者の意思に対応した安全確保動作を行うことができるという効果を奏する。

【0047】請求項2の発明の車両の安全装置は、以上のように、請求項1に記載の車両の安全装置において、運転者の所定動作は、走行路変更あるいは右左折の意思を示すものとなっている。

【0048】これにより、請求項1の発明の効果に加えて、所定走行路から車両を逸脱させようとする運転者の一連の動作によって、運転者の所定動作を認識することができるという効果を奏する。

【0049】請求項3の発明の車両の安全装置は、以上のように、請求項2に記載の車両の安全装置において、他の車両との近接状態を検出する他車近接状態検出手段を備え、上記の運転者の所定動作がないときには、走行路維持機構を作動させる一方、運転者の所定動作があるときには、上記の他車近接状態検出手段により、車両が移動する側の走行路における他の車両との近接状態が検出されたときに、走行路維持機構を作動させ、上記の近接状態が検出されないときに、走行路逸脱動作対応安全機構を作動させる構成である。

【0050】これにより、請求項2の発明の効果に加えて、運転者の不注意による他の車両との衝突を回避することができるという効果を奏する。

【0051】請求項4の発明の車両の安全装置は、以上のように、請求項2に記載の車両の安全装置において、車両が現在走行している走行路の道路上における位置を検出する走行路位置検出手段と、他の車両との近接状態を検出する他車近接状態検出手段とを備え、上記の運転者の所定動作がないときに、上記の他車近接状態検出手段により、車両が移動する側の走行路における他の車両との近接状態が検出されないときには、走行路維持機構を解除する構成である。

【0052】これにより、請求項2の発明の効果に加えて、走行路維持機構による強制的な走行路維持制御の作動頻度が低減され、走行路維持制御の作動による運転時の違和感を低減することができるという効果を奏する。

【0053】請求項5の発明の車両の安全装置は、以上のように、車両が現在走行している走行路の道路上における位置を検出する走行路位置検出手段を備え、車両が現在走行している走行路に隣接する走行路の種類に応じて走行路維持機構と走行路逸脱動作対応安全機構とを切り換えて作動させる構成である。

【0054】これにより、車両が現在走行している走行路に隣接する走行路の種類に応じて走行路維持機構と走行路逸脱動作対応安全機構とを適切に作動させることができる。

【0055】請求項6の発明の車両の安全装置は、以上のように、請求項5の発明の車両の安全装置において、車両が現在走行している走行路に隣接する走行路が、反対走行方向の走行路であるときには走行路維持機構を作動させる一方、同一走行方向の走行路であるときには走行路逸脱動作対応安全機構を作動させる構成である。

【0056】これにより、走行路における危険度に応じて安全性が確保され、また、一律に走行路維持機構が作動するように設定された場合と比較して、走行路維持機構の作動による運転時の違和感を低減することができるという効果を奏する。

【0057】請求項7の発明の車両の安全装置は、以上のように、請求項5に記載の車両の安全装置において、

車両が現在走行している走行路に隣接する走行路が反対走行方向の走行路であるときに、走行路変更あるいは右左折の意思を示す運転者の所定動作があったときには、走行路維持機能の作動を解除する構成である。

【0058】これにより、請求項5の発明の効果に加えて、運転者の意思に対応した安全維持動作を行うことができるという効果を奏する。

【図面の簡単な説明】

【図1】本発明の一実施例を示すものであって、図4に示した動作に続く、安全装置の動作を示すフローチャートである。

【図2】上記の安全装置の構成を示すブロック図である。

【図3】上記の安全装置を備えた車両とこの車両が走行する道路とを示す概略の平面図である。

【図4】上記の安全装置の動作を示すフローチャートである。

【図5】図1に示した動作に続く、安全装置の動作を示すフローチャートである。

【図6】図5に示した動作に続く、安全装置の動作を示すフローチャートである。

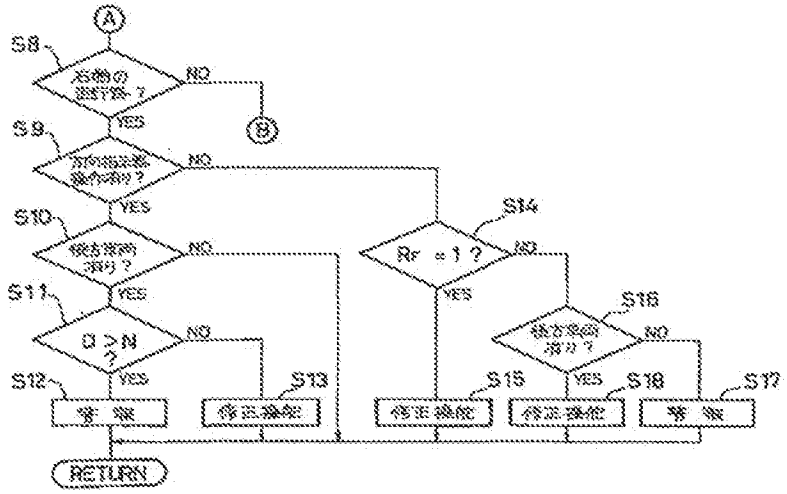
＊【図7】図4に示した修正操舵（S7）の内容を示すフローチャートである。

【図8】図4に示した修正操舵（S7）による動作の説明図である。

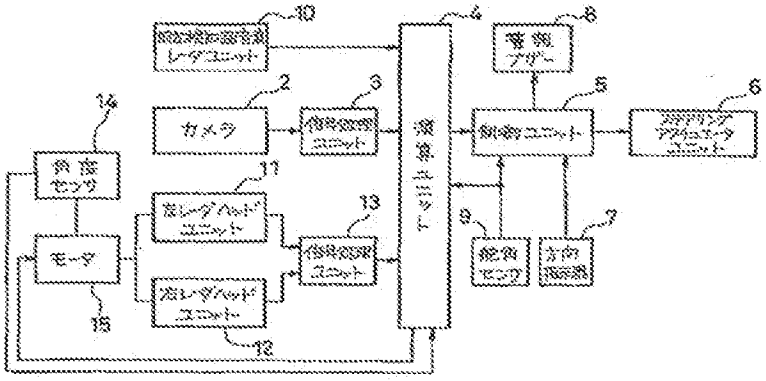
【符号の説明】

1　車両
2　カメラ（走行路位置検出手段）
3　信号処理ユニット（走行路位置検出手段）
4　演算ユニット（走行路位置検出手段他、車近接状態検出手段）
5　制御ユニット
6　ステアリングアクチュエータユニット
10　前方検知超音波レーダユニット（障害物検出手段、車近接状態検出手段）
11　左レーダヘッドユニット（他車近接状態検出手段）
12　右レーダヘッドユニット（他車近接状態検出手段）
13　信号処理ユニット（他車近接状態検出手段）
21　案内線
24　走行路

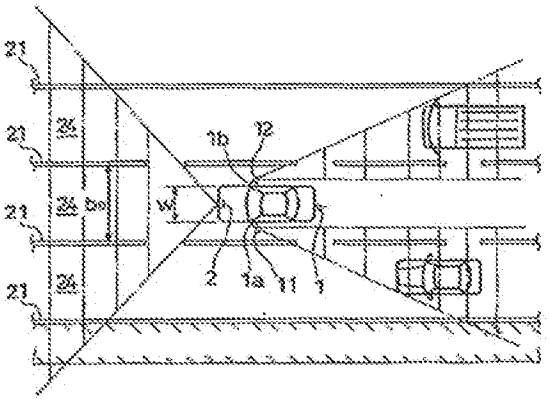
【図1】



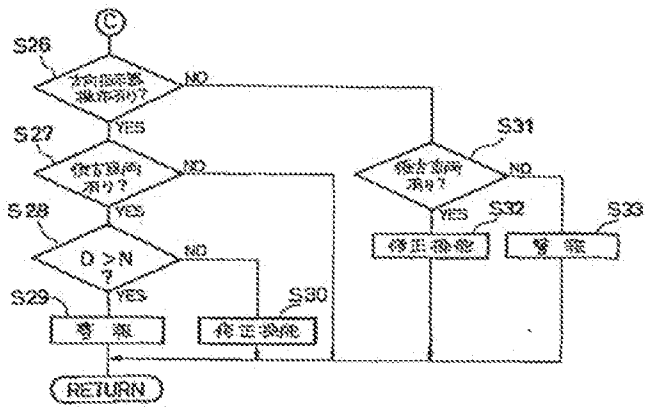
【図2】


10
4
8
2
3
5
6
14
11
13
9
7
15
12

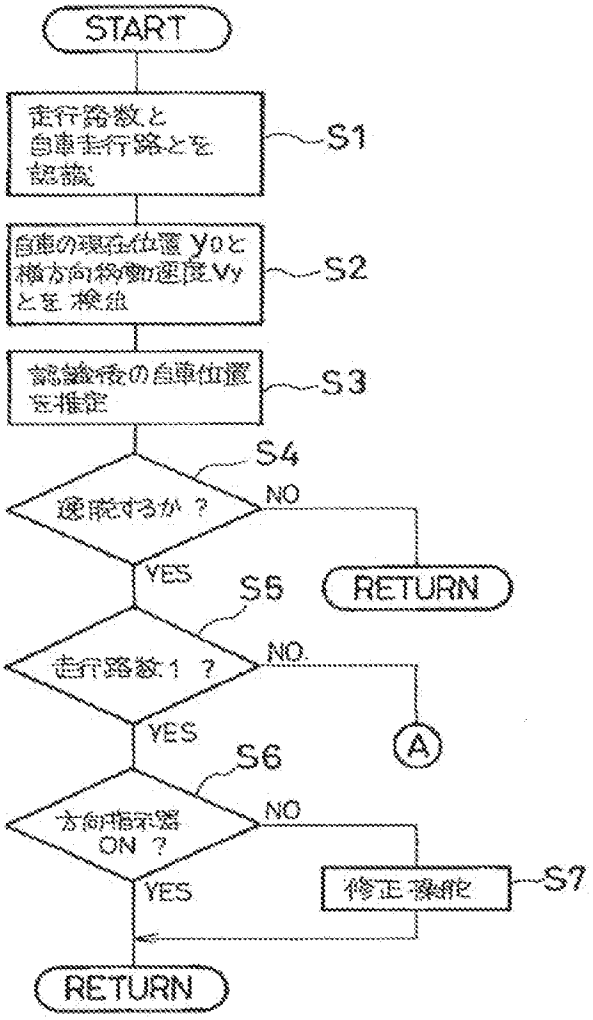
【図3】


21
21
21
21
1b
12
W
2
1a
11
1

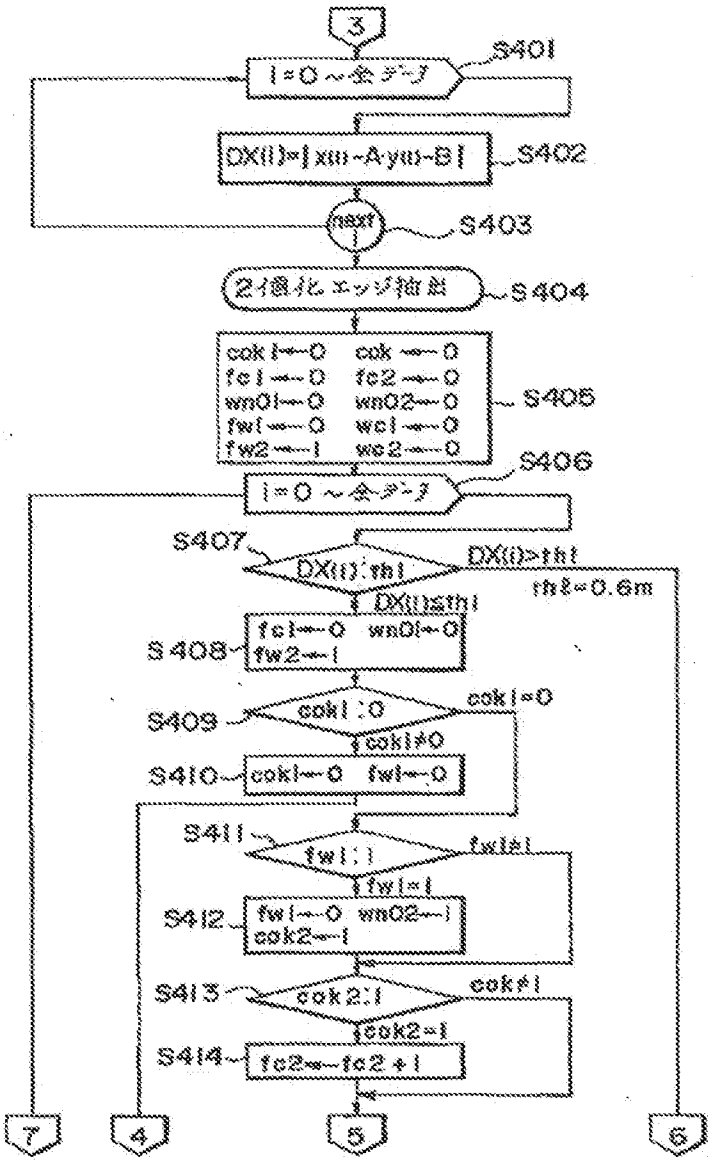
【図6】


S26
NO
YES
S27
NO
YES
S28
NO
YES
S29
S30
S31
NO
YES
S32
S33
RETURN

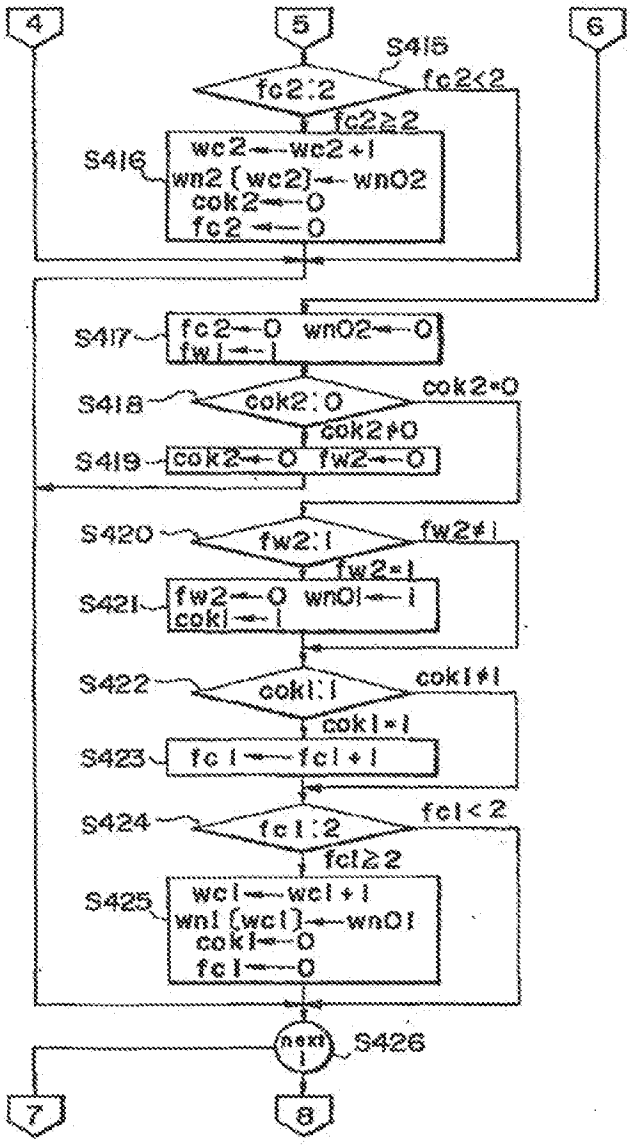
【図4】


START
走行路数と
自車走行路とを
認識
S1
自車の現在位置 y0と
横方向移動速度 Vy
とを検出
S2
認識後の自車位置
を推定
S3
S4
追越すか？
NO
YES
RETURN
S5
走行路数1？
NO
YES
A
S6
方向指示器
ON？
NO
YES
修正準備
S7
RETURN

[図6]


3
S401
I=0～全データ
DX(I)=|xm-A·ym-B|
S402
next
S403
2値化エッジ抽出
S404
cok1←0 cok←0
fc1←0 fc2←0
wm01←0 wm02←0
fw1←0 wc1←0
fw2←1 wc2←0
S405
S406
I=0～全データ
S407
DX(I):th1
DX(I)>th1
th2=0.6m
DX(I)≦th1
S408
fc1←0 wm01←0
fw2←1
S409
cok1:0
cok1=0
cok1≠0
S410
cok1←0 fw1←0
S411
fw1:1
fw1≠1
fw1=1
S412
fw1←0 wm02←1
cok2←1
S413
cok2:1
cok2≠1
cok2=1
S414
fc2←fc2+1
7
4
5
6

【図7】


4
5
6
S415
fc2:2
fc2<2
fc2≧2
S416
wc2←wc2+1
wn2[wc2]←wn02
cok2←0
fc2←0
S417
fc2←0 wn02←0
fw1←1
S418
cok2:0
cok2≠0
cok2=0
S419
cok2←0 fw2←0
S420
fw2:1
fw2≠1
fw2=1
S421
fw2←0 wn01←1
cok1←1
S422
cok1:1
cok1≠1
cok1=1
S423
fc1←fc1+1
S424
fc1:2
fc1<2
fc1≧2
S425
wc1←wc1+1
wn1[wc1]←wn01
cok1←0
fc1←0
next
S426
7
8

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-294250
(43)Date of publication of application : 09.11.1993

(51)Int.Cl. B62D 6/00
B60K 28/06
B60R 21/00
// G05D 1/02
B62D101:00
B62D109:00
B62D113:00
B62D137:00

(21)Application number : 04-099836
(22)Date of filing : 20.04.1992

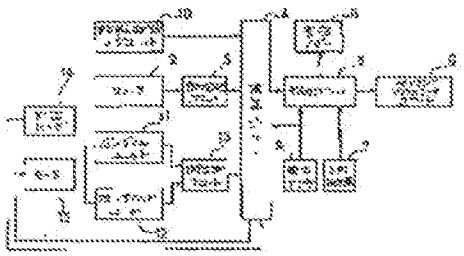
(71)Applicant : MAZDA MOTOR CORP
(72)Inventor : KAMIMURA HIROKI
YOSHIOKA TORU
YAMAMOTO YASUNORI
ADACHI TOMOHIKO
MASUDA YOSHITSUGU

(54) SAFETY DEVICE FOR VEHICLE

(57)Abstract:

JRPOSE: To take safety securing action corresponding to a driver's will by providing travel road maintaining mechanism and travel road deviating action corresponding safety mechanism, and switching both mechanisms according to the specified action of the driver.

CONSTITUTION: A travel road position detecting means is formed of a camera 2, a signal processing unit 3 and an arithmetic unit 4, and an other car approaching state detecting means is formed of lateral radar head units 11, 12, a signal processing unit 13 and the arithmetic unit 4. On the basis of information from the arithmetic unit 4 and a steering angle sensor 9, a control unit 5 controls travel road maintaining mechanism, that is, a steering actuator unit 6, to actuate mechanism for performing corrected steering when there is no operation of a direction indicator 7. When the direction indicator 7 is operated, the travel road maintaining mechanism is switched to travel road deviating action corresponding safety mechanism so as to detect the existence of an obstruction in the deviating direction. In the case of the



"obstruction existing, a buzzer 8 is actuated to call a driver' s attention to it.

JAPANESE [JP,05-294250,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] When deviation actuation of the car from the transit way maintenance device which controls a steering actuator, and the transit way under current transit is performed so that a car may maintain and run the transit way under current transit When the existence of the near obstruction which moves a car by this deviation actuation is detected and there is an obstruction The safety device of the car characterized by switching the above-mentioned transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to predetermined actuation of an operator in the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed.

[Claim 2] Predetermined actuation of the above-mentioned operator is the safety device of the car according to claim 1 characterized by being what shows the intention of transit way modification or a right and left chip box.

[Claim 3] When it has an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator While operating a transit way maintenance device, when there is predetermined actuation of an operator When a contiguity condition with other cars in the near transit way where a car moves is detected by the above-mentioned other vehicle contiguity condition detection means The safety device of the car according to claim 2 characterized by operating the insurance device corresponding to transit way deviation actuation when a transit way maintenance device is operated and the above-mentioned contiguity condition is not detected.

[Claim 4] When it has a transit way location detection means to detect the location of the transit way as for which the car is carrying out current transit path on the street, and an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator The safety device of the car according to claim 2 characterized by canceling a transit way maintenance device when a contiguity condition with other cars in the near transit way where a car moves is not detected by the above-mentioned other vehicle contiguity condition detection means.

[Claim 5] When transit way deviation actuation of the transit way maintenance device which controls a steering actuator, and a car is performed so that a car may maintain and run the transit way under current transit When the existence of the obstruction in the near transit way where a car moves is detected and there is an obstruction in the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed The safety device of the car which carries out [switching a transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to the class of transit way contiguous to the transit way as for which is equipped with a transit way location detection means detect the location of the transit way as for which the car is carrying out current transit path on the street, and the car is carrying out current transit, and] as the description.
[Claim 6] The safety device of the car according to claim 5 characterized by operating the insurance device corresponding to transit way deviation actuation when it is a transit way of the same transit direction, while it operates a transit way maintenance device, when the transit way contiguous to the transit way as for which the car is carrying out current transit is a transit way of the opposite transit direction.
[Claim 7] the time of the transit way contiguous to the transit way as for which the car is carrying out current transit being a transit way of the opposite transit direction — a transit way — subject to change — it is — the safety device of the car according to claim 5 characterized by canceling actuation of a transit way maintenance device when there is predetermined actuation of the operator who shows the intention of a right and left chip box.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed, when deviation actuation of the car from the transit way maintenance device controlled so that a car maintains and runs the transit way under current transit, and the transit way under current transit is performed.

[0002]
[Description of the Prior Art] Conventionally, the car is equipped with a seat belt, air bag equipment, etc. in order to secure crew's insurance. On the other hand, the equipment for preventing accident is also developed to the equipment corresponding to the time of the collision of such a car. When a car deviates from a predetermined transit way by what secures insurance in case a car deviates from a predetermined transit way, without being based on intentional steering of operators, such as an operator's looking aside, inattention, etc., as this kind of equipment, and intentional steering of an operator, there are some which secure the insurance in the case of changing a transit way intentionally.

[0003] When a car deviates from a predetermined transit way as former equipment, for example, without being based on intentional steering of an operator as indicated by JP,63-214900,A, the equipment which emits warning to an operator and demands cautions from him is known. Moreover, even when warning is not only emitted, for example, the operator is dozing, what can prevent deviation of the car from a predetermined transit way is proposed. It has the image pick-up equipment which reads information trunks which divide a road into each transit way, such as Chuo Line and a white line, and the image processing system which processes the signal acquired from this image pick-up equipment, and the equipment controlled so that a car runs the fixed location between the above-mentioned information trunks in a transit way, for example, a mid gear, is known as indicated by JP,2-270005,A as this equipment.

[0004] On the other hand, when the existence of the back car of the direction is detected and there is a back car as latter equipment at the time of actuation of a turn signal as indicated by JP,2-287799,A, what emits an alarm is known.

[0005]
[Problem(s) to be Solved by the Invention] When the equipment which secures insurance in case a car deviates from a predetermined transit way, without being based on intentional steering of the above operators, and the equipment which secures insurance in case a car deviates from a predetermined transit way by intentional steering of an operator are formed, a car can be equipped with high safety to the actuation which deviates from a predetermined transit way. However, conventionally, about the configuration equipped with both above equipments, and the point in what kind of condition to use it, switching each [these] equipment, it was not taken into consideration at all, but development of the equipment was desired.

[0006]

[Means for Solving the Problem] In order that the safety device of the car of invention of claim 1 may solve the above-mentioned technical problem When deviation actuation of the car from the transit way maintenance device which controls a steering actuator, and the transit way under current transit is performed so that a car may maintain and run the transit way under current transit When the existence of the near obstruction which moves a car by this deviation actuation, for example, an oncoming car, and a back car is detected and there is an obstruction in the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed, it is characterized by switching the above-mentioned transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to predetermined actuation of an operator.

[0007] In order that the safety device of the car of invention of claim 2 may solve the above-mentioned technical problem, in the safety device of a car according to claim 1, predetermined actuation of the above-mentioned operator is characterized by being actuation of what shows the intention of transit way modification or a right and left chip box, for example, a turn signal.

[0008] In order that the safety device of the car of invention of claim 3 may solve the above-mentioned technical problem When it has an other vehicle contiguity condition detection means to detect a contiguity condition with other cars, in the safety device of a car according to claim 2 and there is no predetermined actuation of the above-mentioned operator While operating a transit way maintenance device, when there is predetermined actuation of an operator it is characterized by operating a transit way maintenance device, when a contiguity condition with other cars in the near transit way where a car moves is detected by the above-mentioned other vehicle contiguity condition detection means, and operating the insurance device corresponding to transit way deviation actuation, when the above-mentioned contiguity condition is not detected.

[0009] In order that the safety device of the car of invention of claim 4 may solve the above-mentioned technical problem A transit way location detection means to detect the location of the transit way as for which the car is carrying out current transit path on the street in the safety device of a car according to claim 2, When it has an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator When a contiguity condition with other cars in the near transit way where a car moves is not detected by the above-mentioned other vehicle contiguity condition detection

means, it is characterized by canceling a transit way maintenance device.

[0010] In order that the safety device of the car of invention of claim 5 may solve the above-mentioned technical problem When transit way deviation actuation of the transit way maintenance device which controls a steering actuator, and a car is performed so that a car may maintain and run the transit way under current transit When the existence of the obstruction in the near transit way where a car moves is detected and there is an obstruction in the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed it has a transit way location detection means detect the location of the transit way as for which the car is carrying out current transit path on the street, and is carrying out [switching a transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to the class of transit way contiguous to the transit way as for which the car is carrying out current transit, and] as the description.

[0011] In order that the safety device of the car of invention of claim 6 may solve the above-mentioned technical problem The transit way which adjoins the transit way as for which the car is carrying out current transit in the safety device of a car according to claim 5 When it is the transit way of the opposite transit direction, while operating a transit way maintenance device, when it is the transit way of the same transit direction, it is characterized by operating the insurance device corresponding to transit way deviation actuation.

[0012] When there is predetermined actuation of the operator who shows the intention of transit way modification or a right and left chip box when the transit way which adjoins the transit way as for which the car is carrying out current transit in the safety device of a car according to claim 5 is a transit way of the opposite transit direction, in order that the safety device of the car of invention of claim 7 may solve the above-mentioned technical problem, it is carrying out canceling actuation of a transit way maintenance device as the description.

[0013]

[Function] Since the transit way maintenance device in which a predetermined transit way is compulsorily maintained to a car, and the insurance device corresponding to transit way deviation actuation in which compensate lack of an operator's safety check and impossible deviation actuation is avoided in deviation actuation of the transit way by an operator's intention are switched according to predetermined actuation of an operator according to the configuration of claim 1, the security actuation corresponding to an operator's intention can be carried out.

[0014] according to the configuration of claim 2 — an operation of the configuration of claim 1 — in addition, predetermined actuation of the above-mentioned operator — a transit way — subject to change — it is — it is actuation of what shows the intention of a right and left chip box, for example, a turn signal. Therefore, predetermined actuation of an operator can be recognized from a predetermined transit way by a series of actuation of the operator who is going to make it deviate from a car.

[0015] Even if it is a time of there being predetermined actuation of the operator who shows the intention of transit way modification or a right and left chip box in addition to an operation of the configuration of claim 2 according to the configuration of claim 3 Since a transit way maintenance device operates when a contiguity condition with other cars in the near transit way where a car moves by deviation actuation from a predetermined transit way is detected, the collision with other cars by an operator's inattention is avoided.

[0016] according to the configuration of claim 4 — an operation of the configuration of claim 2 — in addition, a transit way — subject to change — it is — when insurance is checked even if it was a time of there being no predetermined actuation of the operator who shows the intention of a right and left chip box when a contiguity condition with other cars in the near transit way where a car moves by deviation actuation from a predetermined transit way is not detected namely, a transit way maintenance device is canceled. Therefore, the actuation frequency of the compulsory transit way maintenance control by the transit way maintenance device is reduced, and the sense of incongruity at the time of operation by actuation of transit way maintenance control can be reduced.

[0017] Since a transit way maintenance device and the insurance device corresponding to transit way deviation actuation are switched according to the class of transit way contiguous to the transit way the car is running now according to the configuration of claim 5, a transit way maintenance device and the insurance device corresponding to transit way deviation actuation can operate appropriately according to the class of adjoining transit way on the transit way a car is running now.

[0018] When the transit way contiguous to the transit way as for which the car is carrying out current transit is a transit way of the opposite transit direction, while a transit way maintenance device operates according to the configuration of claim 6, when it is the transit way of the same transit direction, the insurance device corresponding to transit way deviation actuation operates. That is, since a transit way maintenance device and the insurance device corresponding to transit way deviation

actuation are switched according to the danger in the transit way the car is running, as compared with the case where it is set up so that safety may be secured according to the danger in a transit way and a transit way maintenance device may operate uniformly, the sense of incongruity at the time of operation by actuation of a transit way maintenance device is reduced.

[0019] according to the configuration of claim 7 — an operation of the configuration of claim 5 — in addition — even if it is a time of the transit way contiguous to the transit way the car is running now being a transit way of the opposite transit direction — a transit way — subject to change — it is — since actuation of a transit way maintenance device is canceled when there is predetermined actuation of the operator who shows the intention of a right and left chip box, the security actuation corresponding to an operator's intention can carry out.

[0020]

[Example] One example of this invention is explained below based on drawing 1 thru/or drawing 8 .

[0021] The safety device of the car of this example is constituted by each means shown in drawing 2 . As shown in drawing 3 , a camera 2 is formed in the front end side of a car 1, and picturizes other cars on each transit way 24 divided by each information trunk 21 ahead of the road the car 1 is running, and these information trunks 21, and the transit way 24, for example, an oncoming car etc. The video signal outputted from the camera 2 is processed in an arithmetic unit 4 by the signal which can be processed, and is supplied to an arithmetic unit 4 by the signal-processing unit 3. the current position y0 of the car 1 with which an arithmetic unit 4 runs the transit way 24 like the after-mentioned based on the input signal from the signal-processing unit 3, an estimated position y1, a target position y2, and longitudinal direction passing speed vy And transit road width b0 etc. — it calculates. Furthermore, an arithmetic unit 4 detects the deviation direction of a car 1 while recognizing the number of the transit ways 24 of the same transit direction in a road, and the transit way 24 the car 1 is running. Therefore, the transit way location detection means is constituted by a camera 2, the above-mentioned signal-processing unit 3, and an above-mentioned arithmetic unit 4.

[0022] The front detection supersonic-wave radar unit 10 receives the reflected wave reflected in forward cardiac failure theory objects, such as an oncoming car, in a receive section while it is formed in the front end side of a car 1 (not shown to drawing 3) and transmits a laser radar wave ahead of a car 1 from the dispatch section. An arithmetic unit 4 calculates distance and relative velocity with a forward cardiac

failure theory object while detecting the existence of a forward cardiac failure theory object based on the input from an above-mentioned radar received wave and the above-mentioned signal-processing unit 3. Thereby, an arithmetic unit 4 identifies whether a forward cardiac failure theory object is an oncoming car. Therefore, the other vehicle contiguity condition detection means is constituted by the arithmetic unit 4 and the front detection supersonic-wave radar unit 10. In addition, it is also possible to perform discernment of the forward cardiac failure theory object in an arithmetic unit 4 only by the input from the signal-processing unit 3.

[0023] As shown in drawing 3, the left radar head unit 11 and the right radar head unit 12 receive a car 1, for example, the reflected wave reflected in obstructions, such as a car of car 1 back, in a receive section while being prepared in door mirror 1a and 1b on either side and transmitting a laser radar wave behind a car 1 from the dispatch section. While an arithmetic unit 4 inputs the signal from the these radar head unit 11-12 through the signal-processing unit 13 and detecting a back car, distance and relative velocity with a back car are calculated by the time delay from the transmitting point in time of a radar received wave. Therefore, another other vehicle contiguity condition detection means is constituted by the left and the right radar head unit 11-12, the above-mentioned signal-processing unit 13, and an above-mentioned arithmetic unit 4.

[0024] The transceiver direction of the laser radar wave by the above-mentioned both radar head unit 11-12 changes, when the both radar head unit 11-12 drives by the motor 15, and actuation of a motor 15 is controlled by the arithmetic unit 4. An angle sensor 14 detects the transceiver direction of a laser radar wave from the angle of rotation of a motor 15, and an arithmetic unit 4 calculates distance and relative velocity with a consecutiveness vehicle in consideration of the transceiver direction of the laser radar wave obtained from an angle sensor 14.

[0025] A control unit 5 controls actuation of the steering actuator unit 6 and a warning buzzer 8 like the after-mentioned based on the input from the result of an operation obtained from an arithmetic unit 4, and the rudder angle sensor 9, and actuation of a turn signal 7.

[0026] The rudder angle sensor 9 detects a steering angle, and the steering actuator unit 6 changes a steering angle by the actuation. A warning buzzer 8 is formed in the instrument panel of the vehicle interior of a room, and emits an alarm to an operator.

[0027] In the above-mentioned configuration, actuation of this safety device is explained based on the flow chart of drawing 1 and drawing 4 thru/or drawing 7.

[0028] When the car 1, i.e., a self-vehicle, shall run the road shown in drawing 3

temporarily, as shown in drawing 4 , the number of the transit ways 24 of the same transit direction and the transit way 24 the self-vehicle is running are recognized first (S1). This actuation of S1 is actuation as a transit way location detection means in an arithmetic unit 4.

[0029] Moreover, the current position y0 of the transit way 24 cross direction in a self-vehicle Longitudinal direction passing speed vy It detects (S2). (The width of face b0, i.e., the transit road width, between the information trunks 21.21 shown in drawing 3 in this detection actuation based on the output of the camera 2 obtained through the signal-processing unit 3 It reads and is the transit road width b0. The current position y0 of the self-vehicle from the information trunk 21 of the left-hand side in a direction It detects and is the longitudinal direction passing speed vy by the differential of the location of a self-vehicle. It detects.)

[0030] Next, the current position y0 The self-vehicle location after recognition is presumed (S3). in this case, the above-mentioned current position y0 Longitudinal direction passing speed vy from -- estimated position y1 of a self-vehicle y1 =y0+vy and T1 It asks by the operation. This T1 It is the predetermined time for determining the initiation timing of correction steering, and it is set as a small value, so that the travel speed of a self-vehicle is early.

[0031] next, the above-mentioned estimated position y1 from -- (S4) which judges whether a self-vehicle deviates from the information trunk 21-21 shown in drawing 3 . When breadth of a car of a self-vehicle is set to W in this judgment actuation, it is an estimated position y1. At the time of $y1 > (b0-W/2)$, it judges with that from which a self-vehicle deviates to right-hand side, and is Flag RF. It is referred to as RF =1. On the other hand, it is an estimated position y1. At the time of $y1 < W/2$, it judges with that from which a self-vehicle deviates to left-hand side, and is Flag LF. It is referred to as LF =1. Moreover, estimated position y1 At the time of $W/2 \geq y1 \geq (b0-W/2)$, a self-vehicle is judged to be what does not deviate from the transit way. And when it judges with a self-vehicle not deviating, it returns to S1.

[0032] next -- if the number of transit ways of the same transit direction is 1 when it judges with deviating by S4 (S5) -- an operator's transit way -- subject to change -- it is -- if the existence of actuation of the turn signal 7 which is the predetermined actuation which shows the intention of a right and left chip box is judged (S6) and there is actuation of a turn signal 7, it will return to S1. On the other hand, if there is no actuation of a turn signal 7, correction steering which prevents deviation of the self-vehicle from the transit way will be performed (S7). In addition, these S7 is actuation as a transit way maintenance device.

[0033] Flag RF which shows deviation of the self-vehicle to the direction of right-hand side of the transit way 24 in this correction steering as shown in drawing 7 When it is 1 (S41), it is the target position y2 of a self-vehicle. It is set as y2 =b0-W/2 (S42). In addition, this target position y2 The side face of that right-hand side makes it run a self-vehicle in the condition of being in agreement with an information trunk 21. Flag LF which, on the other hand, shows deviation of the self-vehicle to the left lateral of the transit way 24 When it is 1 (S43), it is the target position y2 of a self-vehicle. It is set as y2 =W/2 (S44). In addition, this target position y2 The side face of that left-hand side makes it run a self-vehicle in the condition of being in agreement with an information trunk 21.

[0034] Next, it is deflection e e=y1-y2 It asks and is delta theta=kf about amendment rudder angle deltatheta further. It asks by -e (S45). In addition, kf It is a suitable multiplier for asking for a rudder angle from deflection e. Next, the steering actuator unit 6 is controlled so that a rudder angle is amended by above-mentioned amendment rudder angle deltatheta (S46).

[0035] then -- again -- the current position y0 And longitudinal direction passing speed vy from -- estimated position y1 asking (S47) -- the absolute value of deflection e -- threshold e0 If it is in tolerance while judging whether the absolute value of whether to be small and or not deflection e is in tolerance (S48), and returning to S45, if it is not in tolerance, this correction steering will be ended and it will return to S1. In addition, a transit locus as shows a self-vehicle to drawing 8 by the above-mentioned correction steering will be drawn.

[0036] Next, if it is NO in above S5, it will judge whether it progresses to S8 of drawing 1 , and the self-vehicle is running the transit way of the right end shown in drawing 3 . And if it is YES, the existence of actuation of a turn signal 7 will be judged, and if it is (S9) and YES, the existence of the back car in the deviation direction of a self-vehicle will be judged (S10). And if it is YES while returning to S1, if it is NO, the size of the distance D of a self-vehicle and a back car and threshold N will be judged (S11). And if it is not D≫N while emitting an alarm with a warning buzzer 8 (S12) and returning to S1, if it is D≫N, the above-mentioned correction steering will be performed (S13), and it will return to S1. In addition, above S10-S12 are actuation as an insurance device corresponding to transit way deviation actuation, and alarm actuation of S12 is security actuation.

[0037] Moreover, if Flag RF is 1 when the turn signal 7 is not operated in above 9 (S14), since this is deviation actuation to the transit way of the opposite transit direction by intentional actuation of an operator, it will perform the above-mentioned

correction steering (S15), and will return to S1. On the other hand, it sets to S14 and is Flag RF. It is Flag LF if it is not 1. It is 1, and since it is deviation actuation to the transit way 24 of the center of the three transit ways 24 of the same transit direction shown in drawing 3 , if there is no back car in the transit way 24 (S16), this will emit an alarm (S17) and will return to S1. On the other hand, if there is a back car in S16, the above-mentioned correction steering will be performed (S18), and it will return to S1.

[0038] Next, if it is NO in above S8, it will judge whether it progresses to S19 of drawing 5 , and the self-vehicle is running the transit way of the left end shown in drawing 3 . And if it is YES, the existence of actuation of a turn signal 7 will be judged (S20), and if it is YES, it will return to S1.

[0039] On the other hand, in S20, it is NO and is Flag LF. If it is 1 (S21), since this is deviation actuation to the direction of the road shoulder by intentional actuation of an operator, it will perform the above-mentioned correction steering (S22), and will return to S1. On the other hand, it sets to S21 and is Flag LF. It is Flag RF if it is not 1. It is 1, and since it is deviation actuation to the transit way 24 of the center shown in drawing 3 , if there is no back car in the transit way 24 (S23), this will emit an alarm (S24) and will return to S1. On the other hand, if there is a back car in S23, the above-mentioned correction steering will be performed (S25), and it will return to S1.

[0040] Next, if it is NO in above S19, the self-vehicle will run the transit way 24 of the center shown in drawing 3 . Therefore, it progresses to S26 of drawing 6 , and the existence of actuation of a turn signal 7 is judged (S26), and if it is YES, the existence of the back car in the deviation direction of a self-vehicle will be judged (S27). And if it is YES while returning to S1, if it is NO, the size of the distance D of a self-vehicle and a back car and threshold N will be judged (S28). And if it is not $D \geqslant N$ while emitting an alarm (S29) and returning to S1, if it is $D \geqslant N$, the above-mentioned correction steering will be performed (S30), and it will return to S1.

[0041] Moreover, if there is no back car while performing correction steering (S32) and returning to S1, if the turn signal 7 is not operated in above 26, the existence of the back car in the transit way 24 of the deviation direction is judged (S31) and there is a back car, an alarm will be emitted (S33) and it will return to S1.

[0042] In addition, if the above actuation is summarized, it will become as it is shown in the following table 1.

[0043] Moreover, in this example, although predetermined actuation of an intentional operator is considered as actuation of an indicator 7, you may be brakes operation, steering wheel actuation, or other actuation, for example, without being limited to this.

[0044]

[Table 1]

[0045]
[Effect of the invention] The safety device of the car of invention of claim 1 is the configuration of switching a transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to predetermined actuation of an operator, as mentioned above.
[0046] This does so the effectiveness that security actuation corresponding to an operator's intention can be performed.
[0047] As for the safety device of the car of invention of claim 2, in the safety device of a car according to claim 1, predetermined actuation of an operator shows the intention of transit way modification or a right and left chip box as mentioned above.
[0048] In addition to the effect of the invention of claim 1, this does so the effectiveness that predetermined actuation of an operator can be recognized, by a series of actuation of the operator who is going to deviate a car from a predetermined transit way.
[0049] The safety device of the car of invention of claim 3 is set to the safety device of a car according to claim 2 as mentioned above. When it has an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator While operating a transit way maintenance device, when there is predetermined actuation of an operator It is the configuration of operating a transit way maintenance device when a contiguity condition with other cars in the near transit way where a car moves is detected by the above-mentioned other vehicle contiguity condition detection means, and operating the insurance device corresponding to transit way deviation actuation when the above-mentioned contiguity condition is not detected.

[0050] In addition to the effect of the invention of claim 2, this does so the effectiveness that the collision with other cars by an operator's inattention is avoidable.

[0051] The safety device of the car of invention of claim 4 is set to the safety device of a car according to claim 2 as mentioned above. When it has a transit way location detection means to detect the location of the transit way as for which the car is carrying out current transit path on the street, and an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator When a contiguity condition with other cars in the near transit way where a car moves is not detected by the above-mentioned other vehicle contiguity condition detection means, it is the configuration of canceling a transit way maintenance device.

[0052] The effectiveness that the actuation frequency of the compulsory transit way maintenance control by the transit way maintenance device is reduced, and the sense of incongruity at the time of operation by actuation of transit way maintenance control can be reduced in addition to the effect of the invention of claim 2 by this is done so.

[0053] It is the configuration of switching and operating a transit way maintenance device and the insurance device corresponding to transit way deviation actuation according to the class of transit way contiguous to the transit way as for which the safety device of the car of invention of claim 5 is equipped with a transit way location detection means detect the location of the transit way as for which the car is carrying out current transit path on the street as mentioned above, and the car is carrying out current transit.

[0054] According to the class of transit way which adjoins by this the transit way the car is running now, a transit way maintenance device and the insurance device corresponding to transit way deviation actuation can be operated appropriately.

[0055] The safety device of the car of invention of claim 6 is the configuration of operating the insurance device corresponding to transit way deviation actuation, when it is a transit way of the same transit direction, while it operates a transit way maintenance device, when the transit way which adjoins the transit way as for which the car is carrying out current transit in the safety device of the car of invention of claim 5 as mentioned above is a transit way of the opposite transit direction.

[0056] As compared with the case where it is set up so that safety may be secured according to the danger in a transit way and a transit way maintenance device may operate uniformly by this, the effectiveness that the sense of incongruity at the time

of operation by actuation of a transit way maintenance device can be reduced is done so.

[0057] the time of the transit way where the safety device of the car of invention of claim 7 adjoins the transit way as for which the car is carrying out current transit in the safety device of a car according to claim 6 as mentioned above being a transit way of the opposite transit direction — a transit way — subject to change — it is — when there is predetermined actuation of the operator who shows the intention of a right and left chip box, it is the configuration of canceling actuation of a transit way maintenance device.

[0058] in addition to the effect of the invention of claim 5, this does so the effectiveness that security actuation corresponding to an operator's intention can be performed.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] This invention relates to the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed, when deviation actuation of the car from the transit way maintenance device controlled so that a car maintains and runs the transit way under current transit, and the transit way under current transit is performed.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Conventionally, the car is equipped with a seat belt, air bag equipment, etc. in order to secure crew's insurance. On the other hand, the equipment for preventing accident is also developed to the equipment corresponding to the time of the collision of such a car. When a car deviates from a predetermined transit way by what secures insurance in case a car deviates from a predetermined

transit way, without being based on intentional steering of operators, such as an operator's looking aside, inattention, etc., as this kind of equipment, and intentional steering of an operator, there are some which secure the insurance in the case of changing a transit way intentionally.

[0003] When a car deviates from a predetermined transit way as former equipment, for example, without being based on intentional steering of an operator as indicated by JP,63-214900,A, the equipment which emits warning to an operator and demands cautions from him is known. Moreover, even when warning is not only emitted, for example, the operator is dozing, what can prevent deviation of the car from a predetermined transit way is proposed. It has the image pick-up equipment which reads information trunks which divide a road into each transit way, such as Chuo Line and a white line, and the image processing system which processes the signal acquired from this image pick-up equipment, and the equipment controlled so that a car runs the fixed location between the above-mentioned information trunks in a transit way, for example, a mid gear, is known as indicated by JP,2-270005,A as this equipment.

[0004] On the other hand, when the existence of the back car of the direction is detected and there is a back car as latter equipment at the time of actuation of a turn signal as indicated by JP,2-287799,A, what emits an alarm is known.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] The safety device of the car of invention of claim 1 is the configuration of switching a transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to predetermined actuation of an operator, as mentioned above.

[0046] This does so the effectiveness that security actuation corresponding to an operator's intention can be performed.

[0047] As for the safety device of the car of invention of claim 2, in the safety device of a car according to claim 1, predetermined actuation of an operator shows the intention of transit way modification or a right and left chip box as mentioned above.

[0048] In addition to the effect of the invention of claim 1, this does so the

effectiveness that predetermined actuation of an operator can be recognized, by a series of actuation of the operator who is going to deviate a car from a predetermined transit way.

[0049] The safety device of the car of invention of claim 3 is set to the safety device of a car according to claim 2 as mentioned above. When it has an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator While operating a transit way maintenance device, when there is predetermined actuation of an operator it is the configuration of operating a transit way maintenance device when a contiguity condition with other cars in the near transit way where a car moves is detected by the above-mentioned other vehicle contiguity condition detection means, and operating the insurance device corresponding to transit way deviation actuation when the above-mentioned contiguity condition is not detected.

[0050] In addition to the effect of the invention of claim 2, this does so the effectiveness that the collision with other cars by an operator's inattention is avoidable.

[0051] The safety device of the car of invention of claim 4 is set to the safety device of a car according to claim 2 as mentioned above. When it has a transit way location detection means to detect the location of the transit way as for which the car is carrying out current transit path on the street, and an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator When a contiguity condition with other cars in the near transit way where a car moves is not detected by the above-mentioned other vehicle contiguity condition detection means, it is the configuration of canceling a transit way maintenance device.

[0052] The effectiveness that the actuation frequency of the compulsory transit way maintenance control by the transit way maintenance device is reduced, and the sense of incongruity at the time of operation by actuation of transit way maintenance control can be reduced in addition to the effect of the invention of claim 2 by this is done so.

[0053] It is the configuration of switching and operating a transit way maintenance device and the insurance device corresponding to transit way deviation actuation according to the class of transit way contiguous to the transit way as for which the safety device of the car of invention of claim 5 is equipped with a transit way location detection means detect the location of the transit way as for which the car is carrying out current transit path on the street as mentioned above, and the car is carrying out

current transit.

[0054] According to the class of transit way which adjoins by this the transit way the car is running now, a transit way maintenance device and the insurance device corresponding to transit way deviation actuation can be operated appropriately.

[0055] The safety device of the car of invention of claim 6 is the configuration of operating the insurance device corresponding to transit way deviation actuation, when it is a transit way of the same transit direction, while it operates a transit way maintenance device, when the transit way which adjoins the transit way as for which the car is carrying out current transit in the safety device of the car of invention of claim 5 as mentioned above is a transit way of the opposite transit direction.

[0056] As compared with the case where it is set up so that safety may be secured according to the danger in a transit way and a transit way maintenance device may operate uniformly by this, the effectiveness that the sense of incongruity at the time of operation by actuation of a transit way maintenance device can be reduced is done so.

[0057] the time of the transit way where the safety device of the car of invention of claim 7 adjoins the transit way as for which the car is carrying out current transit in the safety device of a car according to claim 5 as mentioned above being a transit way of the opposite transit direction — a transit way — subject to change — it is — when there is predetermined actuation of the operator who shows the intention of a right and left chip box, it is the configuration of canceling actuation of a transit way maintenance device.

[0058] In addition to the effect of the invention of claim 5, this does so the effectiveness that security actuation corresponding to an operator's intention can be performed.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] When the equipment which secures insurance in case a car deviates from a predetermined transit way, without being based on intentional steering of the above operators, and the equipment which secures insurance in case a car deviates from a predetermined transit way by

intentional steering of an operator are formed, a car can be equipped with high safety to the actuation which deviates from a predetermined transit way. However, conventionally, about the configuration equipped with both above equipments, and the point in what kind of condition to use it, switching each [these] equipment, it was not taken into consideration at all, but development of the equipment was desired.
[0006]

[Translation done.]

MEANS

[Means for Solving the Problem] In order that the safety device of the car of invention of claim 1 may solve the above-mentioned technical problem When deviation actuation of the car from the transit way maintenance device which controls a steering actuator, and the transit way under current transit is performed so that a car may maintain and run the transit way under current transit When the existence of the near obstruction which moves a car by this deviation actuation, for example, an oncoming car, and a back car is detected and there is an obstruction in the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed, it is characterized by switching the above-mentioned transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to predetermined actuation of an operator.
[0007] In order that the safety device of the car of invention of claim 2 may solve the above-mentioned technical problem, in the safety device of a car according to claim 1, predetermined actuation of the above-mentioned operator is characterized by being actuation of what shows the intention of transit way modification or a right and left chip box, for example, a turn signal.
[0008] In order that the safety device of the car of invention of claim 3 may solve the above-mentioned technical problem When it has an other vehicle contiguity condition detection means to detect a contiguity condition with other cars, in the safety device of a car according to claim 2 and there is no predetermined actuation of the above-mentioned operator While operating a transit way maintenance device, when there is predetermined actuation of an operator it is characterized by operating a

transit way maintenance device, when a contiguity condition with other cars in the near transit way where a car moves is detected by the above-mentioned other vehicle contiguity condition detection means, and operating the insurance device corresponding to transit way deviation actuation, when the above-mentioned contiguity condition is not detected.

[0009] In order that the safety device of the car of invention of claim 4 may solve the above-mentioned technical problem A transit way location detection means to detect the location of the transit way as for which the car is carrying out current transit path on the street in the safety device of a car according to claim 2, When it has an other vehicle contiguity condition detection means to detect a contiguity condition with other cars and there is no predetermined actuation of the above-mentioned operator When a contiguity condition with other cars in the near transit way where a car moves is not detected by the above-mentioned other vehicle contiguity condition detection means, it is characterized by canceling a transit way maintenance device.

[0010] In order that the safety device of the car of invention of claim 5 may solve the above-mentioned technical problem When transit way deviation actuation of the transit way maintenance device which controls a steering actuator, and a car is performed so that a car may maintain and run the transit way under current transit When the existence of the obstruction in the near transit way where a car moves is detected and there is an obstruction in the safety device of a car equipped with the insurance device corresponding to transit way deviation actuation in which security actuation is performed It has a transit way location detection means detect the location of the transit way as for which the car is carrying out current transit path on the street, and is carrying out [switching a transit way maintenance device and the insurance device corresponding to transit way deviation actuation, and operating them according to the class of transit way contiguous to the transit way as for which the car is carrying out current transit, and] as the description.

[0011] In order that the safety device of the car of invention of claim 6 may solve the above-mentioned technical problem The transit way which adjoins the transit way as for which the car is carrying out current transit in the safety device of a car according to claim 5 When it is the transit way of the opposite transit direction, while operating a transit way maintenance device, when it is the transit way of the same transit direction, it is characterized by operating the insurance device corresponding to transit way deviation actuation.

[0012] When there is predetermined actuation of the operator who shows the intention of transit way modification or a right and left chip box when the transit way

which adjoins the transit way as for which the car is carrying out current transit in the safety device of a car according to claim 5 is a transit way of the opposite transit direction, in order that the safety device of the car of invention of claim 7 may solve the above-mentioned technical problem, it is carrying out canceling actuation of a transit way maintenance device as the description.

[Translation done.]

OPERATION

[Function] Since the transit way maintenance device in which a predetermined transit way is compulsorily maintained to a car, and the insurance device corresponding to transit way deviation actuation in which compensate lack of an operator's safety check and impossible deviation actuation is avoided in deviation actuation of the transit way by an operator's intention are switched according to predetermined actuation of an operator according to the configuration of claim 1, the security actuation corresponding to an operator's intention can be carried out.

[0014] according to the configuration of claim 2 — an operation of the configuration of claim 1 — in addition, predetermined actuation of the above-mentioned operator — a transit way — subject to change — it is — it is actuation of what shows the intention of a right and left chip box, for example, a turn signal. Therefore, predetermined actuation of an operator can be recognized from a predetermined transit way by a series of actuation of the operator who is going to make it deviate from a car.

[0015] Even if it is a time of there being predetermined actuation of the operator who shows the intention of transit way modification or a right and left chip box in addition to an operation of the configuration of claim 2 according to the configuration of claim 3 Since a transit way maintenance device operates when a contiguity condition with other cars in the near transit way where a car moves by deviation actuation from a predetermined transit way is detected, the collision with other cars by an operator's inattention is avoided.

[0016] according to the configuration of claim 4 — an operation of the configuration of claim 2 — in addition, a transit way — subject to change — it is — when insurance is checked even if it was a time of there being no predetermined actuation of the

operator who shows the intention of a right and left chip box when a contiguity condition with other cars in the near transit way where a car moves by deviation actuation from a predetermined transit way is not detected namely, a transit way maintenance device is canceled. Therefore, the actuation frequency of the compulsory transit way maintenance control by the transit way maintenance device is reduced, and the sense of incongruity at the time of operation by actuation of transit way maintenance control can be reduced.

[0017] Since a transit way maintenance device and the insurance device corresponding to transit way deviation actuation are switched according to the class of transit way contiguous to the transit way the car is running now according to the configuration of claim 5, a transit way maintenance device and the insurance device corresponding to transit way deviation actuation can operate appropriately according to the class of adjoining transit way on the transit way a car is running now.

[0018] When the transit way contiguous to the transit way as for which the car is carrying out current transit is a transit way of the opposite transit direction, while a transit way maintenance device operates according to the configuration of claim 6, when it is the transit way of the same transit direction, the insurance device corresponding to transit way deviation actuation operates. That is, since a transit way maintenance device and the insurance device corresponding to transit way deviation actuation are switched according to the danger in the transit way the car is running, as compared with the case where it is set up so that safety may be secured according to the danger in a transit way and a transit way maintenance device may operate uniformly, the sense of incongruity at the time of operation by actuation of a transit way maintenance device is reduced.

[0019] according to the configuration of claim 7 — an operation of the configuration of claim 5 — in addition — even if it is a time of the transit way contiguous to the transit way the car is running now being a transit way of the opposite transit direction — a transit way — subject to change — it is — since actuation of a transit way maintenance device is canceled when there is predetermined actuation of the operator who shows the intention of a right and left chip box, the security actuation corresponding to an operator's intention can carry out.

[Translation done.]

EXAMPLE

[Example] One example of this invention is explained below based on drawing 1 thru/or drawing 8 .

[0021] The safety device of the car of this example is constituted by each means shown in drawing 2 . As shown in drawing 3 , a camera 2 is formed in the front end side of a car 1, and picturizes other cars on each transit way 24 divided by each information trunk 21 ahead of the road the car 1 is running, and these information trunks 21, and the transit way 24, for example, an oncoming car etc. The video signal outputted from the camera 2 is processed in an arithmetic unit 4 by the signal which can be processed, and is supplied to an arithmetic unit 4 by the signal-processing unit 3. the current position y0 of the car 1 with which an arithmetic unit 4 runs the transit way 24 like the after-mentioned based on the input signal from the signal-processing unit 3, an estimated position y1, a target position y2, and longitudinal direction passing speed vy And transit road width b0 etc. -- it calculates. Furthermore, an arithmetic unit 4 detects the deviation direction of a car 1 while recognizing the number of the transit ways 24 of the same transit direction in a road, and the transit way 24 the car 1 is running. Therefore, the transit way location detection means is constituted by a camera 2, the above-mentioned signal-processing unit 3, and an above-mentioned arithmetic unit 4.

[0022] The front detection supersonic-wave radar unit 10 receives the reflected wave reflected in forward cardiac failure theory objects, such as an oncoming car, in a receive section while it is formed in the front end side of a car 1 (not shown to drawing 3) and transmits a laser radar wave ahead of a car 1 from the dispatch section. An arithmetic unit 4 calculates distance and relative velocity with a forward cardiac failure theory object while detecting the existence of a forward cardiac failure theory object based on the input from an above-mentioned radar received wave and the above-mentioned signal-processing unit 3. Thereby, an arithmetic unit 4 identifies whether a forward cardiac failure theory object is an oncoming car. Therefore, the other vehicle contiguity condition detection means is constituted by the arithmetic unit 4 and the front detection supersonic-wave radar unit 10. In addition, it is also possible to perform discernment of the forward cardiac failure theory object in an arithmetic unit 4 only by the input from the signal-processing unit 3.

[0023] As shown in drawing 3 , the left radar head unit 11 and the right radar head unit 12 receive a car 1, for example, the reflected wave reflected in obstructions, such as a car of car 1 back, in a receive section while being prepared in door mirror 1a and 1b on

either side and transmitting a laser radar wave behind a car 1 from the dispatch section. While an arithmetic unit 4 inputs the signal from the these radar head unit 11-12 through the signal-processing unit 13 and detecting a back car, distance and relative velocity with a back car are calculated by the time delay from the transmitting point in time of a radar received wave. Therefore, another other vehicle contiguity condition detection means is constituted by the left and the right radar head unit 11-12, the above-mentioned signal-processing unit 13, and an above-mentioned arithmetic unit 4.

[0024] The transceiver direction of the laser radar wave by the above-mentioned both radar head unit 11-12 changes, when the both radar head unit 11-12 drives by the motor 15, and actuation of a motor 15 is controlled by the arithmetic unit 4. An angle sensor 14 detects the transceiver direction of a laser radar wave from the angle of rotation of a motor 15, and an arithmetic unit 4 calculates distance and relative velocity with a consecutiveness vehicle in consideration of the transceiver direction of the laser radar wave obtained from an angle sensor 14.

[0025] A control unit 5 controls actuation of the steering actuator unit 6 and a warning buzzer 8 like the after-mentioned based on the input from the result of an operation obtained from an arithmetic unit 4, and the rudder angle sensor 9, and actuation of a turn signal 7.

[0026] The rudder angle sensor 9 detects a steering angle, and the steering actuator unit 6 changes a steering angle by the actuation. A warning buzzer 8 is formed in the instrument panel of the vehicle interior of a room, and emits an alarm to an operator.

[0027] In the above-mentioned configuration, actuation of this safety device is explained based on the flow chart of drawing 1 and drawing 4 thru/or drawing 7 .

[0028] When the car 1, i.e., a self-vehicle, shall run the road shown in drawing 3 temporarily, as shown in drawing 4 , the number of the transit ways 24 of the same transit direction and the transit way 24 the self-vehicle is running are recognized first (S1). This actuation of S1 is actuation as a transit way location detection means in an arithmetic unit 4.

[0029] Moreover, the current position y0 of the transit way 24 cross direction in a self-vehicle Longitudinal direction passing speed vy It detects (S2). (The width of face b0, i.e., the transit road width, between the information trunks 21.21 shown in drawing 3 in this detection actuation based on the output of the camera 2 obtained through the signal-processing unit 3 It reads and is the transit road width b0. The current position y0 of the self-vehicle from the information trunk 21 of the left-hand side in a direction It detects and is the longitudinal direction passing speed vy by the

differential of the location of a self-vehicle. It detects.)

[0030] Next, the current position y0 The self-vehicle location after recognition is presumed (S3). In this case, the above-mentioned current position y0 Longitudinal direction passing speed vy from — estimated position y1 of a self-vehicle y1 =y0+vy and T1 It asks by the operation. This T1 it is the predetermined time for determining the initiation timing of correction steering, and it is set as a small value, so that the travel speed of a self-vehicle is early.

[0031] next, the above-mentioned estimated position y1 from — (S4) which judges whether a self-vehicle deviates from the information trunk 21-21 shown in drawing 3. When breadth of a car of a self-vehicle is set to W in this judgment actuation, it is an estimated position y1. At the time of y1 >(b0-W/2), it judges with that from which a self-vehicle deviates to right-hand side, and is Flag RF. It is referred to as RF =1. On the other hand, it is an estimated position y1. At the time of y1<W/2, it judges with that from which a self-vehicle deviates to left-hand side, and is Flag LF. It is referred to as LF =1. Moreover, estimated position y1 At the time of W /2 >=y1 >= (b0-W/2), a self-vehicle is judged to be what does not deviate from the transit way. And when it judges with a self-vehicle not deviating, it returns to S1.

[0032] next — if the number of transit ways of the same transit direction is 1 when it judges with deviating by S4 (S5) — an operator's transit way — subject to change — it is — if the existence of actuation of the turn signal 7 which is the predetermined actuation which shows the intention of a right and left chip box is judged (S6) and there is actuation of a turn signal 7, it will return to S1. On the other hand, if there is no actuation of a turn signal 7, correction steering which prevents deviation of the self-vehicle from the transit way will be performed (S7). In addition, these S7 is actuation as a transit way maintenance device.

[0033] Flag RF which shows deviation of the self-vehicle to the direction of right-hand side of the transit way 24 in this correction steering as shown in drawing 7 When it is 1 (S41), it is the target position y2 of a self-vehicle. It is set as y2 =b0-W/2 (S42). In addition, this target position y2 The side face of that right-hand side makes it run a self-vehicle in the condition of being in agreement with an information trunk 21. Flag LF which, on the other hand, shows deviation of the self-vehicle to the left lateral of the transit way 24 When it is 1 (S43), it is the target position y2 of a self-vehicle. It is set as y2 =W/2 (S44). In addition, this target position y2 The side face of that left-hand side makes it run a self-vehicle in the condition of being in agreement with an information trunk 21.

[0034] Next, it is deflection e e=y1-y2 It asks and is delta theta=kf about amendment

rudder angle deltatheta further. It asks by -e (S45). In addition, kf it is a suitable multiplier for asking for a rudder angle from deflection e. Next, the steering actuator unit 6 is controlled so that a rudder angle is amended by above-mentioned amendment rudder angle deltatheta (S46).

[0035] then — again — the current position y0 And longitudinal direction passing speed vy from — estimated position y1 asking (S47) — the absolute value of deflection e — threshold e0 If it is in tolerance while judging whether the absolute value of whether to be small and or not deflection e is in tolerance (S48), and returning to S45, if it is not in tolerance, this correction steering will be ended and it will return to S1. In addition, a transit locus as shows a self-vehicle to drawing 8 by the above-mentioned correction steering will be drawn.

[0036] Next, if it is NO in above S5, it will judge whether it progresses to S8 of drawing 1, and the self-vehicle is running the transit way of the right end shown in drawing 3. And if it is YES, the existence of actuation of a turn signal 7 will be judged, and if it is (S9) and YES, the existence of the back car in the deviation direction of a self-vehicle will be judged (S10). And if it is YES while returning to S1, if it is NO, the size of the distance D of a self-vehicle and a back car and threshold N will be judged (S11). And if it is not $D \geqslant N$ while emitting an alarm with a warning buzzer 8 (S12) and returning to S1, if it is $D \geqslant N$, the above-mentioned correction steering will be performed (S13), and it will return to S1. In addition, above S10-S12 are actuation as an insurance device corresponding to transit way deviation actuation, and alarm actuation of S12 is security actuation.

[0037] Moreover, if Flag RF is 1 when the turn signal 7 is not operated in above 9 (S14), since this is deviation actuation to the transit way of the opposite transit direction by intentional actuation of an operator, it will perform the above-mentioned correction steering (S15), and will return to S1. On the other hand, it sets to S14 and is Flag RF. It is Flag LF if it is not 1. It is 1, and since it is deviation actuation to the transit way 24 of the center of the three transit ways 24 of the same transit direction shown in drawing 3, if there is no back car in the transit way 24 (S16), this will emit an alarm (S17) and will return to S1. On the other hand, if there is a back car in S16, the above-mentioned correction steering will be performed (S18), and it will return to S1.

[0038] Next, if it is NO in above S8, it will judge whether it progresses to S19 of drawing 5, and the self-vehicle is running the transit way of the left end shown in drawing 3. And if it is YES, the existence of actuation of a turn signal 7 will be judged (S20), and if it is YES, it will return to S1.

[0039] On the other hand, in S20, it is NO and is Flag LF. If it is 1 (S21), since this is

deviation actuation to the direction of the road shoulder by intentional actuation of an operator, it will perform the above-mentioned correction steering (S22), and will return to S1. On the other hand, it sets to S21 and is Flag LF. It is Flag RF if it is not 1. It is 1, and since it is deviation actuation to the transit way 24 of the center shown in drawing 3 , if there is no back car in the transit way 24 (S23), this will emit an alarm (S24) and will return to S1. On the other hand, if there is a back car in S23, the above-mentioned correction steering will be performed (S25), and it will return to S1.

[0040] Next, if it is NO in above S19, the self-vehicle will run the transit way 24 of the center shown in drawing 3 . Therefore, it progresses to S26 of drawing 6 , and the existence of actuation of a turn signal 7 is judged (S26), and if it is YES, the existence of the back car in the deviation direction of a self-vehicle will be judged (S27). And if it is YES while returning to S1, if it is NO, the size of the distance D of a self-vehicle and a back car and threshold N will be judged (S28). And if it is not D≫N while emitting an alarm (S29) and returning to S1, if it is D≫N, the above-mentioned correction steering will be performed (S30), and it will return to S1.

[0041] Moreover, if there is no back car while performing correction steering (S32) and returning to S1, if the turn signal 7 is not operated in above 26, the existence of the back car in the transit way 24 of the deviation direction is judged (S31) and there is a back car, an alarm will be emitted (S33) and it will return to S1.

[0042] In addition, if the above actuation is summarized, it will become as it is shown in the following table 1.

[0043] Moreover, in this example, although predetermined actuation of an intentional operator is considered as actuation of an indicator 7, you may be brakes operation, steering wheel actuation, or other actuation, for example, without being limited to this.

[0044]

[Table 1]

		移動する側の走行路の走行方向		
		同一方向		反対方向
		後方車 有	後方車 無	
方向指示器	操作無	修正操舵	警報または制御なし	修正操舵
	操作有	後方車遠→修正操舵 後方車近→警報	制御なし	制御なし、または対向車を検知

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the flow chart following the actuation which shows one example of this invention and was shown in drawing 4 which shows actuation of a safety device.

[Drawing 2] It is the block diagram showing the configuration of the above-mentioned safety device.

[Drawing 3] It is the top view of an outline showing the road the car equipped with the above-mentioned safety device and this car run.

[Drawing 4] It is the flow chart which shows actuation of the above-mentioned safety device.

[Drawing 5] It is the flow chart following the actuation shown in drawing 1 which shows actuation of a safety device.

[Drawing 6] It is the flow chart following the actuation shown in drawing 5 which shows actuation of a safety device.

[Drawing 7] It is the flow chart which shows the contents of correction steering (S7) shown in drawing 4 .

[Drawing 8] It is the explanatory view of actuation by correction steering (S7) shown in drawing 4 .

[Description of Notations]

1 Car

2 Camera (Transit Way Location Detection Means)

3 Signal-Processing Unit (Transit Way Location Detection Means)

4 Arithmetic Unit (Vehicle Contiguity Condition Detection Means besides Transit Way Location Detection Means)

5 Control Unit

6 Steering Actuator Unit

10 Front Detection Supersonic-Wave Radar Unit (Obstruction Detection Means, Vehicle Contiguity Condition Detection Means)

11 Left Radar Head Unit (Other Vehicle Contiguity Condition Detection Means)

12 Right Radar Head Unit (Other Vehicle Contiguity Condition Detection Means)
13 Signal-Processing Unit (Other Vehicle Contiguity Condition Detection Means)
21 Information Trunk
24 Transit Way

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開平6－187597
(43)公開日　平成6年(1994)7月8日

(51)Int.Cl.⁵		識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｇ０８Ｇ	1/16	Ｃ	2105－3Ｈ		
Ｂ６０Ｒ	21/00	Ｚ	8812－3Ｄ		
Ｇ０１Ｃ	3/06	Ｖ	9008－2Ｆ		
	21/00	Ｎ			

審査請求　未請求　請求項の数2(全 17 頁)

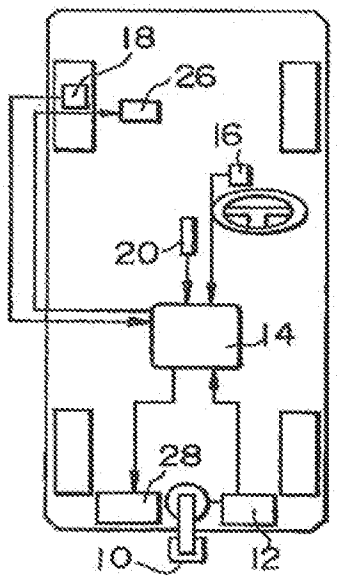
(21)出願番号　特願平4－338208

(22)出願日　平成4年(1992)12月16日

(71)出願人　000003207
トヨタ自動車株式会社
愛知県豊田市トヨタ町1番地
(72)発明者　美尾　昌宏
愛知県豊田市トヨタ町1番地　トヨタ自動車株式会社内
(74)代理人　弁理士　吉田　研二　(外2名)

(54)【発明の名称】　駐車補助装置

(57)【要約】
【目的】　検出された駐車空間は複数個ある場合に最適の駐車空間を表示して運転者の駐車操作を補助する。
【構成】　ＣＣＤエリアセンサ１０で駐車空間を含む所定領域を撮影する。得られた画像データから測距用ＥＣＵ１２が物体までの距離を算出し、方位毎の距離データとして自動駐車制御用ＥＣＵ１４に供給する。自動駐車制御用ＥＣＵ１４は距離データをＣＣＤエリアセンサを原点とする直交座標系に変換し、駐車空間を検出する。駐車空間が複数個存在する場合にはシミュレーションを行って接触の可能性及び操舵回数を評価し、接触なく、かつ操舵回数が最小の駐車空間を選択して表示する。



1

【特許請求の範囲】

【請求項1】　車両に搭載され、車両周囲の駐車空間を検出する駐車空間検出手段と、
検出された駐車空間が複数ある場合に各駐車空間への誘導経路を演算する演算手段と、
演算された誘導経路において自車と障害物との接触の有無及び操舵回数を評価する評価手段と、
前記評価結果に基づき、障害物と接触がなく、かつ操舵回数が最小の誘導経路を選択する選択手段と、
選択された誘導経路を運転者に表示する表示手段と、
を有することを特徴とする駐車補助装置。

【請求項2】　請求項1記載の駐車補助装置であって、前記評価手段は運転者固有の操舵ずれ量に基づき前記接触の有無及び操舵回数を評価することを特徴とする駐車補助装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は駐車空間検出装置、特に車両に搭載されたCCDエリアセンサにて得られた駐車空間に関する距離データの処理に関する。

【0002】

【従来の技術】車両の車庫入れ操作は、ステアリング操作やアクセルペダルの操作、ブレーキペダルの操作、さらにはマニュアルトランスミッション車両においてはクラッチ操作が加わり極めて煩雑な操作となる。しかも、車両後方から車庫入れを行う際には後方目視するために運転者は不自然な姿勢で上記操作を行わなければならず、熟練を要する操作となっている。一方、このような操作は車両と車庫との相対位置が決定されれば一義的に決定される軌跡に基づく機械的操作で置き換えることが可能である。そこで、このような煩雑な車庫入れ操作を自動化し、運転者の負担を軽減するための自動駐車装置が提案されている。

【0003】このような自動駐車装置では、いうまでもなくいかに正確に車両と車庫との相対位置関係を検出するかが重要技術であり、このため測距センサの改善や得られた距離データの処理の改善などが試みられている。例えば、本願出願人が先に提案した特願平2－312339号では、駐車位置の四隅にバーコード付き標識を予め設置しておき、車両後部に設けられたCCDエリアセンサでこのバーコード付き標識位置を検出することにより車両を車庫に誘導する構成が示されている。また、このような特別の標識が設置されていない、あるいは設置不可能な駐車空間にも対応可能とするために、本願出願人はさらに特願平3－309475号にてCCDエリアセンサで複数の所定方位に存在する車庫などの物体の位置を検出し、隣接する物体の位置を始点と終点とするベクトルの変化から駐車位置を算出する構成を提案した。駐車空間ではこのベクトルの向きが急激に変化するため、駐車位置を標識に頼ることなく検出することが可能となる。

2

【0004】

【発明が解決しようとする課題】しかしながら、車両後部に設けられたCCDエリアセンサで得られる物体までの距離データは常に正確な値を示すとは限らず、駐車空間周囲の環境変化、例えば天候や時刻などにより周囲環境の明暗度が変化した場合にはCCDエリアセンサに結像する物体のコントラスト量が十分でない場合が生じ、CCDエリアセンサで検出する距離データにばらつきが生じてしまう可能性がある。このように距離データ自体にばらつきが生じてしまうと、例えば上述したベクトルの変化量に基づき駐車位置を検出する場合には駐車位置以外のところでもベクトルの変化が生じてしまい、駐車位置を正確に検出するためには特別な処理が必要となってしまうなど、駐車位置検出が十分でない可能性がある。

【0005】そこで、本願出願人は先に特願平4－73851号にて、最小2乗法を2回用いて駐車空間を検出する装置を提案した。

【0006】すなわち、CCDセンサ等で得られた距離データのうち、1回目の最小2乗法で駐車空間の前面境界線を示しているであろう距離データと他の距離データを分離するための関係式を算出し、さらにこれら前面境界線距離データに対して2回目の最小2乗法を適用することにより正確な前面境界線を算出する。そして、この前面境界線と各距離データとの関係から駐車空間の入口位置を検出するものである。

【0007】このような駐車空間検出装置を用いることにより駐車空間を正確に検出する事ができるが、例えば図16に示されるように自車周囲の状況によっては駐車空間が複数検出される場合がある。一般に、運転者はこれから駐車を行おうとする場合、駐車予定空間に近い所に自車を停車させる傾向がある。図17は駐車空間に対し、複数の運転者がどのような位置に自車を停止させるかを調査した結果である。図中丸印は切り返し無しで駐車した場合の後輪軸中心位置を示し、図中四角は切り返し有りで駐車した場合の後輪軸中心位置を示している。いずれの場合も目標駐車空間に近い位置に自車を停止することがわかる。

【0008】従って、駐車空間が複数検出された場合には、自車にいちばん近い駐車空間への誘導を行うことが運転者の希望に合致する場合が多いことになり、例えば図16に示されるように検出された駐車空間までの距離L1、L2を算出し、いずれか小さい方の駐車空間に誘導すればよいことになる。

【0009】しかしながら、駐車補助装置が必要となるような運転操作に習熟していない運転者にとっては、直近の駐車空間に誘導されても、操舵手数が多かったり、切り返しを必要としたり、あるいは初期停止位置が一旦前進をする必要がある場合には、教示どおりに自車を操

作することが困難で、結局駐車不能となってしまう可能性がある。

【0010】本発明は上記従来技術の有する課題に鑑みなされたものであり、その目的は検出された駐車空間が複数存在する場合にも最適な駐車空間を運転者に教示することが可能な駐車補助装置を提供することにある。

【0011】

【課題を解決するための手段】上記目的を達成するために、請求項1記載の駐車補助装置は、車両に搭載され、車両周囲の駐車空間を検出する駐車空間検出手段と、検出された駐車空間が複数ある場合に各駐車空間への誘導経路を演算する演算手段と、演算された誘導経路において自車と障害物との接触の有無及び操舵回数を評価する評価手段と、前記評価結果に基づき、障害物と接触がなく、かつ操舵回数が最小の誘導経路を選択する選択手段と、選択された誘導経路を運転者に教示する教示手段とを有することを特徴とする。

【0012】また、上記目的を達成するために、請求項2記載の駐車補助装置は、前記評価手段は運転者固有の操舵ずれ量に基づき前記接触の有無及び操舵回数を評価することを特徴とする。

【0013】

【作用】このように、本発明の駐車補助装置は、駐車空間検出装置により検出された駐車空間が複数ある場合に、誘導経路をシミュレーションし、他車などの障害物と自車との接触の有無及び操舵回数を評価する。そして、接触があり、または操舵回数が多い場合はたとえそれが直近の駐車空間であっても選択せず、接触がなく、かつ操舵回数が最も少ない駐車空間を教示する。

【0014】これにより、最も楽な経路をたどって駐車空間に誘導されるため、種々の運転技能を有する運転者でも確実に駐車することが可能となる。

【0015】さらに、請求項2記載の駐車補助装置では、経路誘導のシミュレーションに運転者固有の操舵ずれ量を導入し、このずれ量を含んだシミュレーションにより接触の有無及び操舵回数を評価する。

【0016】これにより、運転者の運転技能が反映した評価が行われることになり、その運転者にとって最適な駐車空間に誘導されることになる。

【0017】

【実施例】以下、図面を用いながら本発明の駐車補助装置の好適な実施例を説明する。

【0018】第1実施例

図1には本実施例の構成が示されている。車両後部にはCCDエリアセンサ10が設けられており、図示しない駐車空間を含む所定領域を撮影する。このCCDエリアセンサは、図2に示されるように一対のCCDカメラ10a，10bを鉛直軸回りに回動可能に所定距離離間させて配置することにより構成される。そして、CCDエリアセンサ10にて得られた画像データ、すなわちCCDカメラ10aとCCDカメラ10bによる画像データは測距用コンピュータである測距用ECU12に供給され、両画像データの比較（位相差）から駐車空間などの物体までの距離データが方位毎に算出される。算出された距離データ、すなわち距離Rと方位θのデータ（R，θ）は自動駐車制御用コンピュータである自動駐車制御用ECU14に供給される。図3にはこのようにして得られた距離データ（R，θ）の一例が示されており、図中黒丸が距離データを示している。

【0019】自動駐車制御用ECU14は測距用ECU12からの距離データ（R，θ）に対し後述する処理を行って駐車空間を検出すると共に、操舵角センサ16や車速センサ18並びにシフトポジションセンサ20から出力される検出信号に基づき車両を駐車空間に誘導するための操舵信号を操舵アクチュエータ26に供給すると共にブレーキアクチュエータ28に制動信号を出力して車両を駐車空間に停止させる構成である。

【0020】以下、自動駐車制御用ECU14にて行われる駐車空間検出処理を詳細に説明する。なお、この処理の基礎となるのは、前述した本願出願人既提出の特願平4－73851号である。

【0021】まず、図4に示されるようにCCDエリアセンサ10にて得られた画像データに基づき測距用ECU12が算出した距離データ（R，θ）を順次読み込む（S101）。そして、得られた距離データ（R，θ）をCCDエリアセンサ10の画角中心をX軸、このX軸に垂直な軸をY軸とするx－y直交座標系に変換する（S102－S103）。x－y座標系に変換した後、検出距離Rが所定距離20m以上の距離データは誤検出として除外しつつ、1回目の最小2乗法を適用する（S104－S108）。

【0022】1回目の最小2乗法の適用が終了した後、次に具体的な前面境界線を決定すべく、2回目の最小2乗法適用処理に移行する。すなわち、図5に示されるように距離データのx座標xiと1回目の最小2乗法により算出された関係式Ayi＋bとの大小比較が行われ、xiがAyi＋Bより小さい点、すなわち関係式に対しCCDエリアセンサ側に位置する距離データ群に対し2回目の最小2乗法が適用される。この2回目の最小2乗法も前述した1回目の最小2乗法と同様の処理で行われ、距離データ（xi，yi）に対してx＝Ay＋BとなるA，Bを最小2乗法により算出する（S301～S303）。

【0023】2回目の最小2乗法により駐車空間の前面境界線が算出された後、次に駐車入口位置の検出処理に移行する。この駐車入口検出は、前面境界線と各距離データ（xi，yi）との距離に基づき算出され、具体的なフローチャートが図6以降に示されている。

【0024】まず、図6に示されるように前面境界線x＝Ay＋Bと各距離データとの距離DX（i）を算出す

る（Ｓ４０２）。ここで、前面境界線と各距離データとの距離Ｌは、幾何学的考察から容易に
Ｌ＝Δｘ・Δｙ／｛（Δｘ２＋Δｙ２）０．５｝
但し、Δｘ＝｜ｘｉ－Ａｙｉ－Ｂ｜
Δｙ＝｜ｙｉ－（ｘｉ＋Ｂ）／Ａ｜
となるが、本願出願人は実際にこの距離を算出したところ、Δｘとの間に大きな相違がないことを見いだしている。本実施例では前述したように、算出が容易なΔｘを用いて駐車入口を検出することとしている。

【００２５】しかし、単に所定のしきい値を用いて二値化、すなわち駐車空間入口位置座標と他の座標とを区別する方法では距離データのばらつきに対応できない。そこで、本実施例では本願出願人が先に提案した特願平３－６４９７０号に開示されている二値化、エッジ検出処理を利用して駐車入口位置を検出する（Ｓ４０４）。すなわち、次のようにある変数に初期値をセットする（Ｓ４０５）。第１継続カウント許可フラグｃｏｋ１＝０，第２継続カウント許可フラグｃｏｋ２＝０，第１継続カウンタｆｃ１＝０，第２継続カウンタｆｃ２＝０，左エッジ候補座標ｗｎ０１＝０，右エッジ候補座標ｗｎ０２＝０，第１検出フラグｆｗ１＝０，右エッジカウンタｗｃ１＝０，第２検出フラグｆｗ２＝１，左エッジカウンタｗｃ３＝０の如くである。

【００２６】そして、距離ＤＸ（ｉ）と所定のしきい値ｔｈ１（本実施例では０．６ｍ）を比較する（Ｓ４０７）。ＤＸ（ｉ）≦ｔｈ１の場合にはその距離データは前面境界線を示すデータであるため、ｆｃ１＝０，ｗｎ０１＝０，ｆｗ２＝１にセットする（Ｓ４０８）。

【００２７】また、ｃｏｋ１が０であるかを判定する（Ｓ４０９）。ｃｏｋ１は、後述するようにＤＸ（ｉ）≦ｔｈ１→ＤＸ（ｉ）＞ｔｈ１に変化した場合に１となるフラグである。このため、ＤＸ（ｉ）≦ｔｈ１にｃｏｋ１が０でないということは、何らかの異常が発生したと考えられ、この時に左エッジを検出すべきではない。そこで、Ｓ４１０においてｃｏｋ１が０でなかった場合にはｃｏｋ１＝０，ｆｗ１＝０とする。

【００２８】一方、ｃｏｋ１＝０であった場合には、前回の検出結果が上述のような異常な状態でなかったため、次のようにして右エッジを検出する。まず、ｆｗ１＝１か否かを判定する（Ｓ４１１）。ｆｗ１は初期設定としては０にセットされており、ＤＸ（ｉ）＞ｔｈ１の場合に１にセットされるものである。従って、Ｓ４０７においてデータがＤＸ（ｉ）≦ｔｈ１であり、Ｓ４１１においてｆｗ１が１であるということは、右エッジを検出したことを意味している。そこで、Ｓ４１１においてｆｗ１＝１であれば、ｆｗ１＝０とするとともに、右エッジの検出位置を示す変数ｗｎ０２＝ｉ（距離データ番号），ｃｏｋ２＝１とする（Ｓ４１２）。

【００２９】ここで、エッジを検出した場合にその ｉ 値をそのままエッジ位置として記憶してもよいが、この例においては、右エッジを検出した後、次のデータもエッジでない場合にのみその位置を右エッジと判定し、誤判定の発生を抑制する。このために、ｃｏｋ２＝１としている。

【００３０】次に、ｃｏｋ２が１かあかを判定する（Ｓ４１３）。ｃｏｋ２が１であった場合には、ｆｃ２に１を加算し（Ｓ４１４）、ｃｏｋ２が１でなかった場合には、この加算は行わず、次にｆｃ２が２であるか否かを判定する。このｆｃ２はＳ４１４を２回続けて通った場合、すなわちしきい値ｔｈ１以下のデータが２つ続いた場合に２となっている。そこで、ｆｃ２が２である場合には、右エッジカウンタｗｃ２で特定される右エッジ座標を示す配列変数ｗｎ２［ｗｃ２］に上述のＳ４１２でセットされた右エッジ候補座標ｗｎ０２の値を記憶する。また、変数ｃｏｋ２，ｆｃ２を０にリセットすると共に、右エッジカウンタｗｃ２に１を加算する（Ｓ４１６）。従って、次回の右エッジ検出の場合には、ｗｃ２が１多い数となっている。このため、配列変数ｗｎ２に次の右エッジの位置が記憶できることとなる。Ｓ４１５においてｆｃ２＜２の場合及びＳ４１６の処理を終了した場合には、右エッジについての処理が終了したため、Ｓ４０６に戻る。

【００３１】一方、Ｓ２０６においてＤＸ（ｉ）＞ｔｈ１と判定され、駐車空間を検出した場合には、次のようにして左エッジの検出を行う。

【００３２】まず、ｆｃ２，ｗｎ０２を０にリセットし、フラグｆｗ１を１にセットする（Ｓ４１７）。また、ｃｏｋ２が０であるかを判定する（Ｓ４１８）。ｃｏｋ２は、前述したようにＤＸ（ｉ）＞ｔｈ１→ＤＸ（ｉ）≦ｔｈ１に変化した場合に１となる（Ｓ４１２）。このため、Ｓ４０７においてＤＸ（ｉ）＞ｔｈ１となった際にｃｏｋ２が０でないということは、何らかの異常が発生したことを意味している。そこで、Ｓ４１９において、ｃｏｋ２が０でなかった場合にはｃｏｋ２＝０，ｆｗ２＝０とする。

【００３３】一方、ｃｏｋ２＝０であった場合には、前回の検出結果が上述のような異常な状態でなかったため、次のようにして左エッジを検出する。まず、ｆｗ２＝１か否かを判定する（Ｓ４２０）。ｆｗ２＝１の場合には左エッジを認識したことを意味し、ｆｗ２を０にリセットし、左エッジ候補座標ｗｎ０１にｉの値を入力し、ｃｏｋ１を１にセットする（Ｓ４２１）。そして、ｃｏｋ１が１であるかを判定し（Ｓ４２３）、ｃｏｋ１が１であれば、左エッジを検出したため、ｆｃ１に１を加算する（Ｓ４２３）。次に、ｆｃ１が２であるか否かを判定し（Ｓ４２４）、２であれば、候補座標ｗｎ０１の値をｗｃ１で特定される配列変数ｗｎ１［ｗｃ１］に入力する。これによって、検出された左エッジの位置が記憶される。また、この入力がなされたため、フラグｃｏｋ１＝１，ｆｃ１＝０にリセットすると共に、左エッ

ジの数を示す変数ｗｃ１に１を加算する（Ｓ４２５）。

【００３４】このような動作を全距離データ数１について繰り返し、右エッジ及び左エッジの位置を検出した数だけ記憶することができる。また、その検出した数は、ｗｃ１，ｗｃ２に記憶されることになる。そして、次に、これら検出エッジの補正処理が行われる（Ｓ４２７）。

【００３５】すなわち、図８に示されるように、まずｗｃ１とｗｃ２を比較する（Ｓ４２８）。ｗｃ１＜ｗｃ２の場合には，左エッジの数が右エッジの数より小さいことを意味しており、ＣＣＤエリアセンサ１０の画像の左端に駐車空間入口がかかっていることを意味している。このため、この左端に左エッジを挿入することで，画面の左端にかかった入口を認識することができる。

【００３６】このため，Ｓ４２９～４３０にてｗｎ１［ｉ］の値をｗｎ１［ｉ＋１］の値に変換する。即ち、ｗｎ１の値としてｎ個の値があり、これがｗｎ１［１］～ｗｎ１［ｎ］の値として記憶されていた場合、この処理によりｗｎ１［２］～ｗｎ１［ｎ＋１］の値に変換される。そして，ｗｎ１［１］に０の値を代入するとともにｗｃ１に１を加算する（Ｓ４３２）。これによって、配列変数ｗｎ１の値として１つ強制的に挿入され，左エッジが検出できなかった場合にも、これが挿入される。

【００３７】一方、Ｓ４２８においてｗｃ１≧ｗｃ２であった場合には、右エッジが欠けているか、両者が同数であることを意味している。そこで、次にｗｃ２とｗｃ１を比較する（Ｓ４２３）。ここで、ｗｃ２＝ｗｃ１であった場合には両者が等しいことを意味しており，補正処理は不要である。

【００３８】一方、ｗｃ２の方がｗｃ１より小さかった場合には、右エッジ挿入の補正を行わねばならない。そこで，ｗｃ２に１を加算し、このｗｃ３によって特定される配列変数ｗｎ２［ｗｃ２］にデータ個数を強制挿入する（Ｓ４３４）。これによって右エッジとして，視野の右端の値が挿入されることとなる。

【００３９】そして、これらの補正処理後再びｗｃ１とｗｃ２を比較し、両値が等しくない場合にはエッジ数の対応が補正によってもとれないことを意味し、駐車区間検出に失敗したとして再スタートする（Ｓ４３６）。

【００４０】以上のようにしてエッジ補正が終了した後、最終的な駐車空間入口位置を検出する処理に移行する。これまでの処理で検出された座標は、左右のエッジ座標，すなわち駐車入口の最も近い距離データの座標である。そこで、これら抽出された距離データから真の駐車空間入口座標を算出するための処理が必要であり。この処理を示したのが図９のフローチャートである。すなわち，まずＳ４３８にて，２回目の最小２乗法適用により得られた駐車空間前画像境界線への左右エッジ座標の射影座標を算出している。図９において、（ＧＸ１（ｉ），ＧＹ１（ｉ））が左エッジ座標の射影座標を表し、（ＧＸ２（ｉ），ＧＹ２（ｉ））が右エッジ座標の射影座標を表している。そして、本実施例ではさらに，駐車空間に車両を誘導するためのアシストパラメータとして，駐車空間の中心及び駐車空間の幅を算出している。このため，前述のＳ４３８にて求めた駐車空間入口座標（ＧＸ１（ｉ），ＧＹ１（ｉ））、（ＧＸ２（ｉ），ＧＹ２（ｉ））を用いてその中心座標（ＧＸ（ｉ），ＧＹ（ｉ））及び幅ｗ（ｉ）を算出する（Ｓ４４１）。

【００４１】こうして駐車空間の入口座標、中心座標及び駐車空間の幅が算出されたことにより、駐車空間検出は事実上終了するが、実際に車両をこの検出された駐車空間に誘導するためには、駐車空間と車両とのなす角を算出する必要がある。また，前述の処理により算出された駐車空間の幅が車両が実際に駐車するのに適当な幅を有するか否かを判定する必要がある。

【００４２】そこで，本実施例では算出された幅ｗ（ｉ）と車幅＋α（αはドアを開く場合を想定して決定される余裕分）との大小比較を行い（Ｓ４４５）、この条件を満たす入口座標（ＧＸ１（ＩＩ），ＧＹ１（ＩＩ））、（ＧＸ２（ＩＩ），ＧＹ２（ＩＩ））を抽出する（Ｓ４４６～Ｓ４４８）。一方、この条件を満たさない場合には駐車空間が検出不能として再スタート，または終了する（Ｓ４４９）。

【００４３】そして，車両と駐車空間とのなす姿勢角（車両中心線と駐車空間前画像境界線とのなす角）を算出する（Ｓ４５０）。車両中心線の方向を表すベクトルａは，

ａ＝（ｘ（ｃｅｎｔ），ｙ（ｃｅｎｔ））

但し、ｃｅｎｔはＣＣＤセンサの撮像画角中心

で表される。従って，姿勢角ξはＳ４５１及びＳ４５２で示される計算式により算出される。

【００４４】このようにして検出された駐車空間が複数個（Ｊが２以上）である場合，本実施例では、この中から最適の駐車空間を選択し、運転者に表示する。すなわち、検出されたＧ（ＩＩ（ｉ）），ＧＸ（ＩＩ（ｉ）），ＧＹ（ＩＩ（ｉ））を入力とし、この駐車空間までの誘導経路を演算して，この誘導経路を走行したときの障害物との接触の有無ＳＣ（ｉ）及び接触回数ｔｕｃｈ（ｉ）を評価する。このシミュレーションは、公知の誘導経路算出法及び自車と障害物（既に駐車している他車等）との位置関係から求めることができる。本実施例では、本願出願人が特願平３－１８３５６０号にて提案した現代制御理論を用いたシミュレーションを行っている。すなわち、特願平３－１５３６６０号に記載された車両の状態方程式（４）を用いて駐車空間までの誘導経路を演算し、ＳＣ（ｉ）及びｔｕｃｈ（ｉ）をそれぞれの駐車空間について評価する（Ｓ４５３）。

【００４５】そして，接触数ｔｕｃｈ（ｉ）が０（すなわち接触せずに駐車することが可能）であり，かつ操

絶回数ＳＣ（ｉ）が最小の駐車空間を選択し（Ｓ４５４）、駐車操作を運転者に音声教示する（Ｓ４５５）。なお、選択された駐車空間が直近の駐車空間でない場合には、運転者にその旨も同時に教示する。また、複数の駐車空間の接触の有無及び接触回数に差がない場合には、直近の駐車空間を教示すればよい。

【００４６】第２実施例

上記第１実施例では、自車と駐車空間との相対位置関係からシミュレーションを行ったが、本第２実施例ではさらに、運転者の運転技能をも考慮にいれ、より適切なシミュレーションを行うことを特徴としている。

【００４７】運転者の運転技能は教示された操舵量と実際の運転者の操舵量とのずれから客観的に把握することができる。従って、前回までの教示操舵量と実際の操舵量とのずれ量をメモリに格納しておき、この操舵ずれ量を見込んでシミュレーションを行えば、運転操作に不慣れな運転者の場合は接触の可能性や操舵回数が高く評価されることになり、より確実な駐車空間に教示されることになる。図１５には操舵ずれ量を考慮したシミュレーションの概念図が示されている。図中実線が操舵ずれ量ゼロの場合のシミュレーション軌跡であり、破線が操舵ずれ量を考慮した場合のシミュレーション軌跡である。操舵ずれ量がある分だけ、より大きく舵行することになる。

【００４８】図１２乃至図１４には第２実施例の処理フローチャートが示されている。図１２乃至図１４は上記第１実施例のＳ４５０以下の処理に対応するものであり、Ｓ４５０以前の処理は第１実施例と同様である。なお、全体構成もほぼ第１実施例と同様であるが、本第２実施例では運転者の過去の操舵ずれ量がメモリに格納されており、この操舵ずれ量は後述の如く駐車操作を行う毎に順次更新される。

【００４９】図１２において、まず、第１実施例と同様にして駐車空間が検出された後（Ｓ５００－Ｓ５０２）、Ｇ（ＩＩ（ｉ））、ＧＸ（ＩＩ（ｉ））、ＧＹ（ＩＩ（ｉ）及び運転者の操舵ずれ量（誤差量）学習値ＳＴＧを用いてシミュレーションを行う。シミュレーションは第１実施例と同様に状態方程式に基づき行われるが、操舵ずれ量を絶対値で格納している場合には得られた誘導経路に対して左右に操舵がずれた誘導経路を算出し、ＳＣ（ｉ）及びｔｕｃｈ（ｉ）を評価する（Ｓ５０３）。操舵ずれ量を符号付き（右操舵の場合にはプラス等）で格納している場合には、得られた経路の右操舵及び左操舵それぞれに学習ずれ量を加算し、ずれた経路を算出する。

【００５０】そして、操舵ずれ量を考慮した誘導経路のｔｕｃｈ（ｉ）が全て１か否かを判定し（Ｓ５０５）、全て１ではない、すなわち接触しない経路が存在する場合にはこのｔｕｃｈ（ｉ）＝０の中でさらにＳＣ（ｉ）が最小の駐車空間を選択し（Ｓ５０６）、運転者に教示する（Ｓ５０７）。なお、直近の駐車空間が選択されなかった場合に運転者にその旨報知するのは第１実施例と同様である。

【００５１】一方、ｔｕｃｈ（ｉ）が全て１である、すなわち全ての経路で接触してしまう場合には、さらに操舵ずれ量ＳＴＧを０とした場合のシミュレーションを実行する（Ｓ５０８）。これは、操舵ずれ量を考慮して接触の可能性ありと評価された経路でも、これが原理的に、すなわち操舵ずれ量がゼロであっても接触してしまうのか、あるいは操舵ずれ量がゼロである場合には接触せずに駐車することが可能なのかを判別するための処理である。

【００５２】そして、操舵ずれ量をゼロにしてもなお全ての経路でｔｕｃｈ（ｉ）＝１である場合には（Ｓ５０９）、駐車不能であるので運転者にその旨音声教示して処理を終了する。また、ｔｕｃｈ（ｉ）が１でない経路が存在する場合には、この経路のなかでＳＴ（ｉ）が最小の経路を選択し（Ｓ５１０）、運転者に接触のおそれがあることを教示した上で選択した駐車経路に音声教示する（図１４におけるＳ５１３）。なお、接触の可能性があるので、経路誘導を継続するか否かを運転者に選択させることもできる（Ｓ５１２）。

【００５３】教示が終了した後、今回の目標操舵角と実際の操舵角との絶対値を算出してＳＴＧｉ に格納し、重み付け演算

ＳＴＧ＝（αＳＴＧ＋βＳＴＧｉ）／（α＋β）

により操舵ずれ量を更新していく。これにより、操舵ずれ量を常に運転者固有の最適値とすることができる。

【００５４】

【発明の効果】以上説明したように、請求項１記載の駐車補助装置によれば、検出された駐車空間が複数存在する場合にも最適な駐車空間を運転者に教示することができる。また、請求項２記載の駐車補助装置によれば、運転者の運転技能に対応した駐車空間を教示して確実に駐車を行うことができる。

【図面の簡単な説明】

【図１】本発明の一実施例における自動駐車システムの構成図である。

【図２】同実施例におけるＣＣＤエリアセンサの構成図である。

【図３】同実施例の動作説明図である。

【図４】同実施例の処理フローチャートである。

【図５】同実施例の処理フローチャートである。

【図６】同実施例の処理フローチャートである。

【図７】同実施例の処理フローチャートである。

【図８】同実施例の処理フローチャートである。

【図９】同実施例の処理フローチャートである。

【図１０】同実施例の処理フローチャートである。

【図１１】同実施例の処理フローチャートである。

【図１２】本発明の他の実施例の処理フローチャートで

ある。

【図１３】同実施例の処理フローチャートである。

【図１４】同実施例の処理フローチャートである。

【図１５】同実施例のシミュレーション例の概念図である。

【図１６】駐車空間検出説明図である。

＊【図１７】駐車空間と自車の停止位置との関係を示す図である。

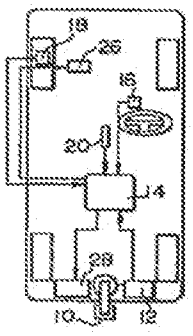
【符号の説明】

１０　ＣＣＤエリアセンサ

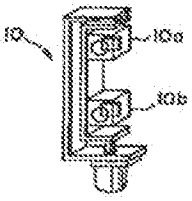
１２　測距用ＥＣＵ

１４　自動駐車制御用ＥＣＵ

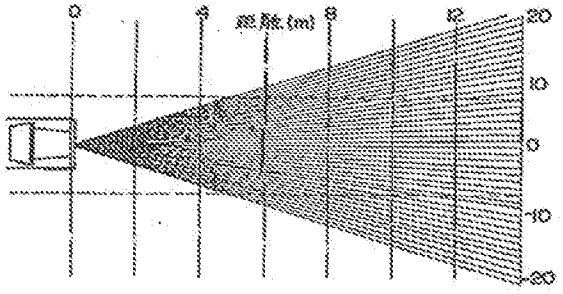
【図１】



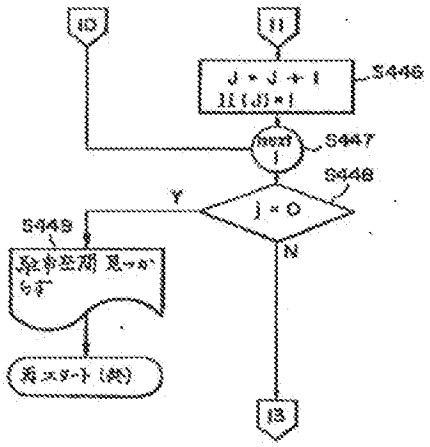
【図２】



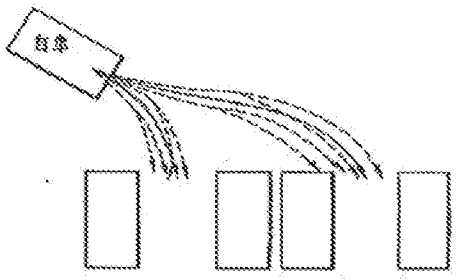
【図３】



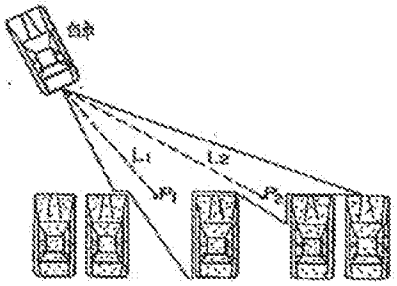
【図１０】



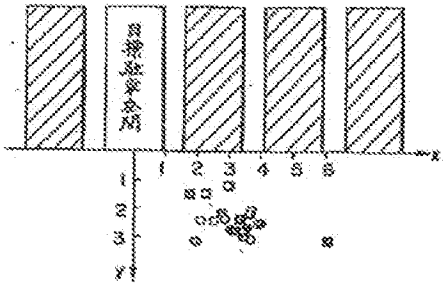
【図１５】



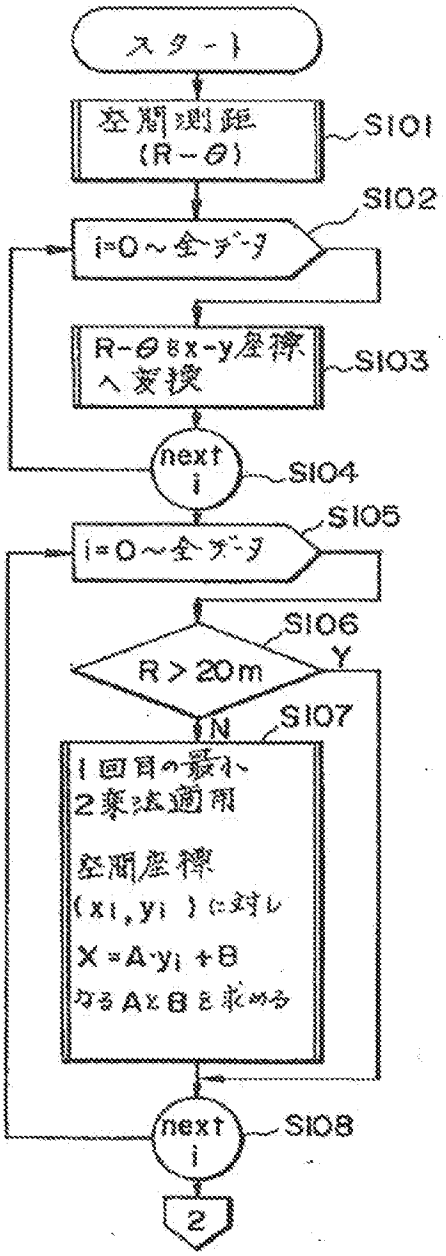
【図１６】



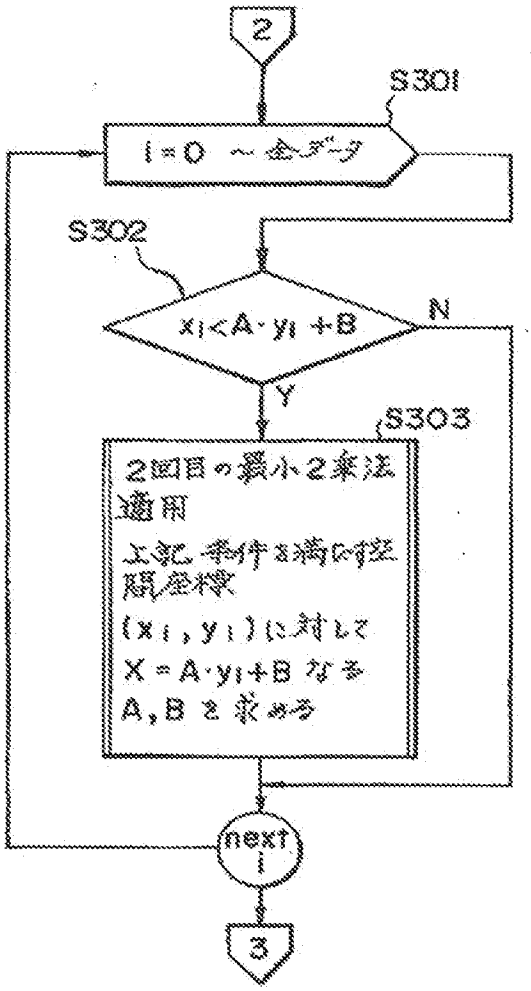
【図１７】



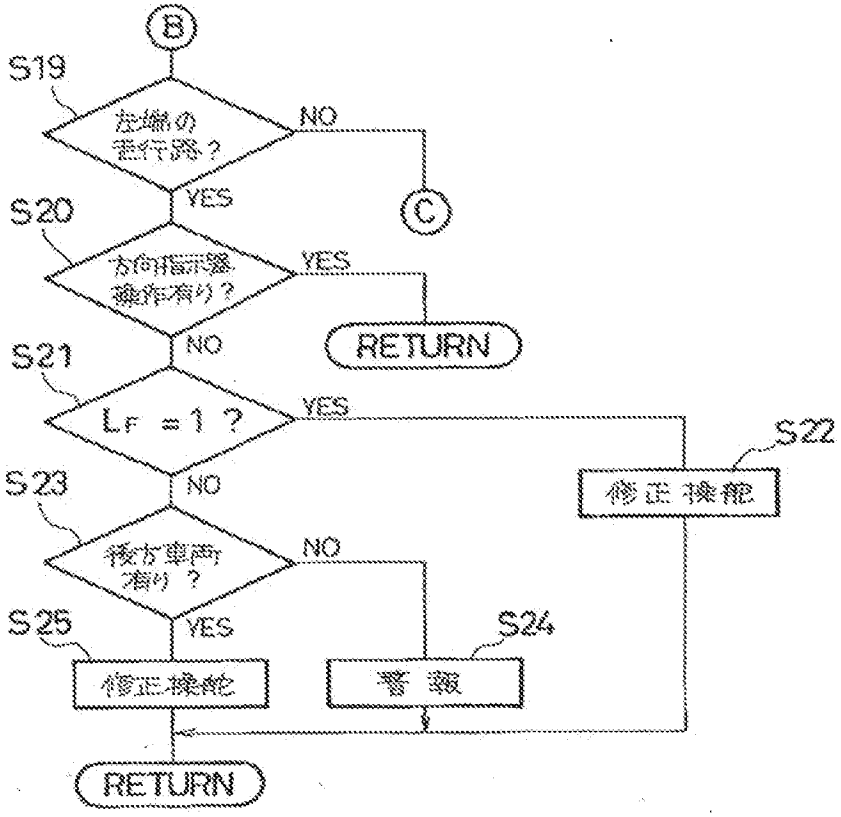
【図4】


スタート
全周測距 (R－θ)
S101
S102
i=0～全データ
R－θをx－y座標へ変換
S103
next i
S104
S105
i=0～全データ
S106
R＞20m
Y
N
S107
1回目の最小二乗法適用
全周座標 (x1, y1) に対し
X＝A・y1＋B
なるA, Bを求める
next i
S108
2

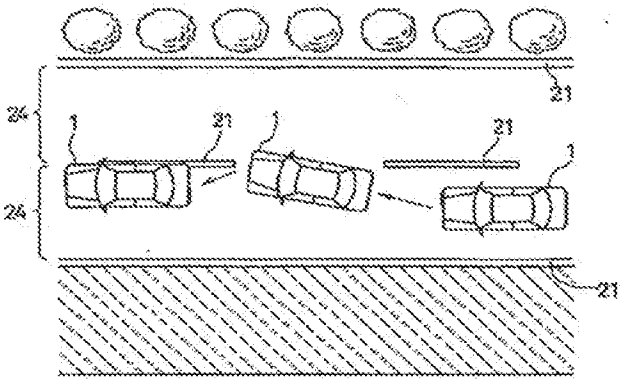
[図5]


2
S301
i=0 ～全データ
S302
$x_i < A \cdot y_i + B$
N
Y
S303
2回目の最小2乗法適用
上記条件を満たす近傍探索
(x_i, y_i) に対して
$X = A \cdot y_i + B$ なる
A, B を求める
next i
3

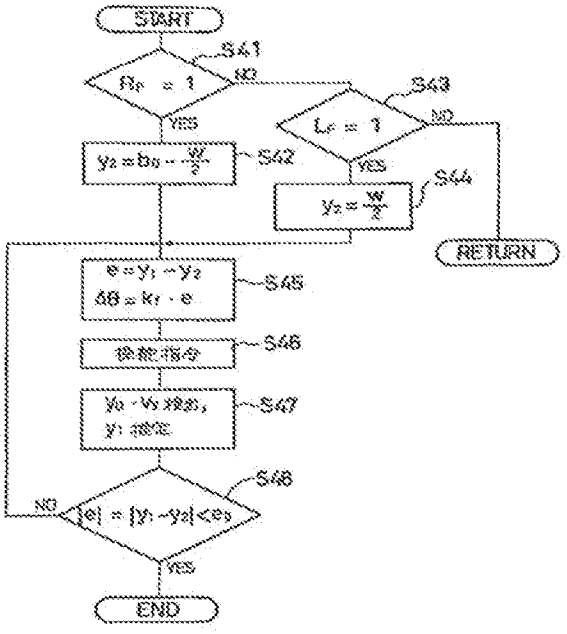
【図5】


B
S19
左端の走行路？
NO
YES
C
S20
方向指示器操作有り？
YES
RETURN
NO
S21
LF =1 ？
YES
S22
修正機能
NO
S23
後方車両有り？
NO
YES
S25
修正機能
S24
警報
RETURN

【図6】


21
24
24
21
21
21

【図7】



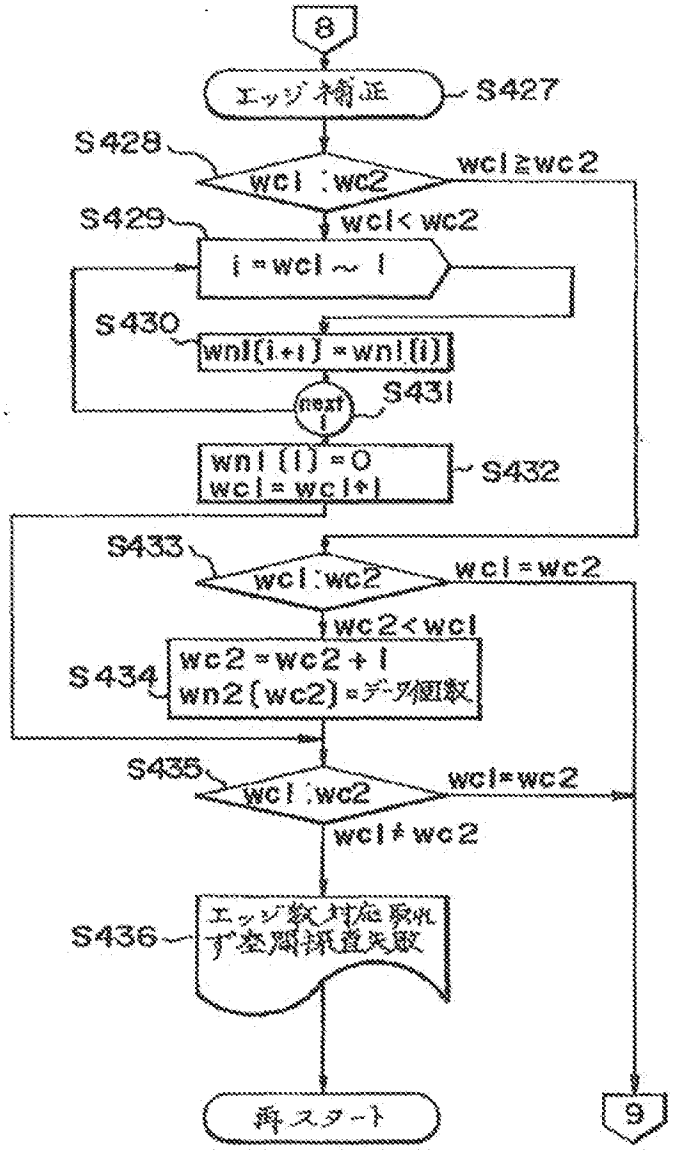
フロントページの続き

(51) Int.Cl.[5]	識別記号	庁内整理番号	F I	技術表示箇所
B 6 2 D	101:00			
	109:00			
	113:00			
	137:00			

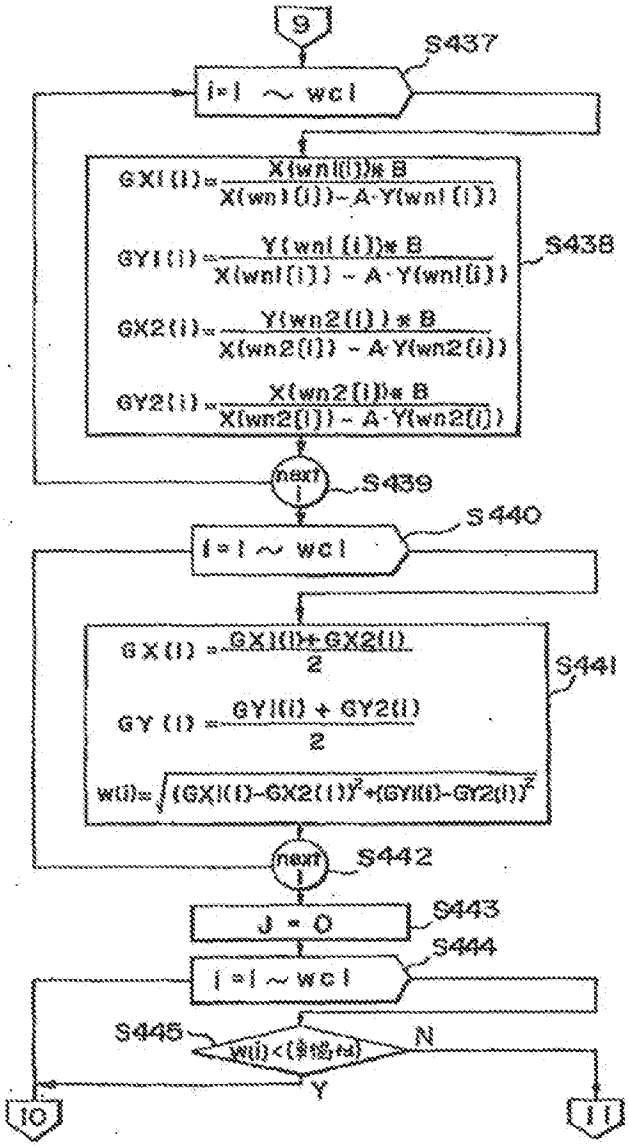
(72)発明者　足立　智彦
広島県安芸郡府中町新地３番１号　マツダ株式会社内

(72)発明者　増田　尚嗣
広島県安芸郡府中町新地３番１号　マツダ株式会社内

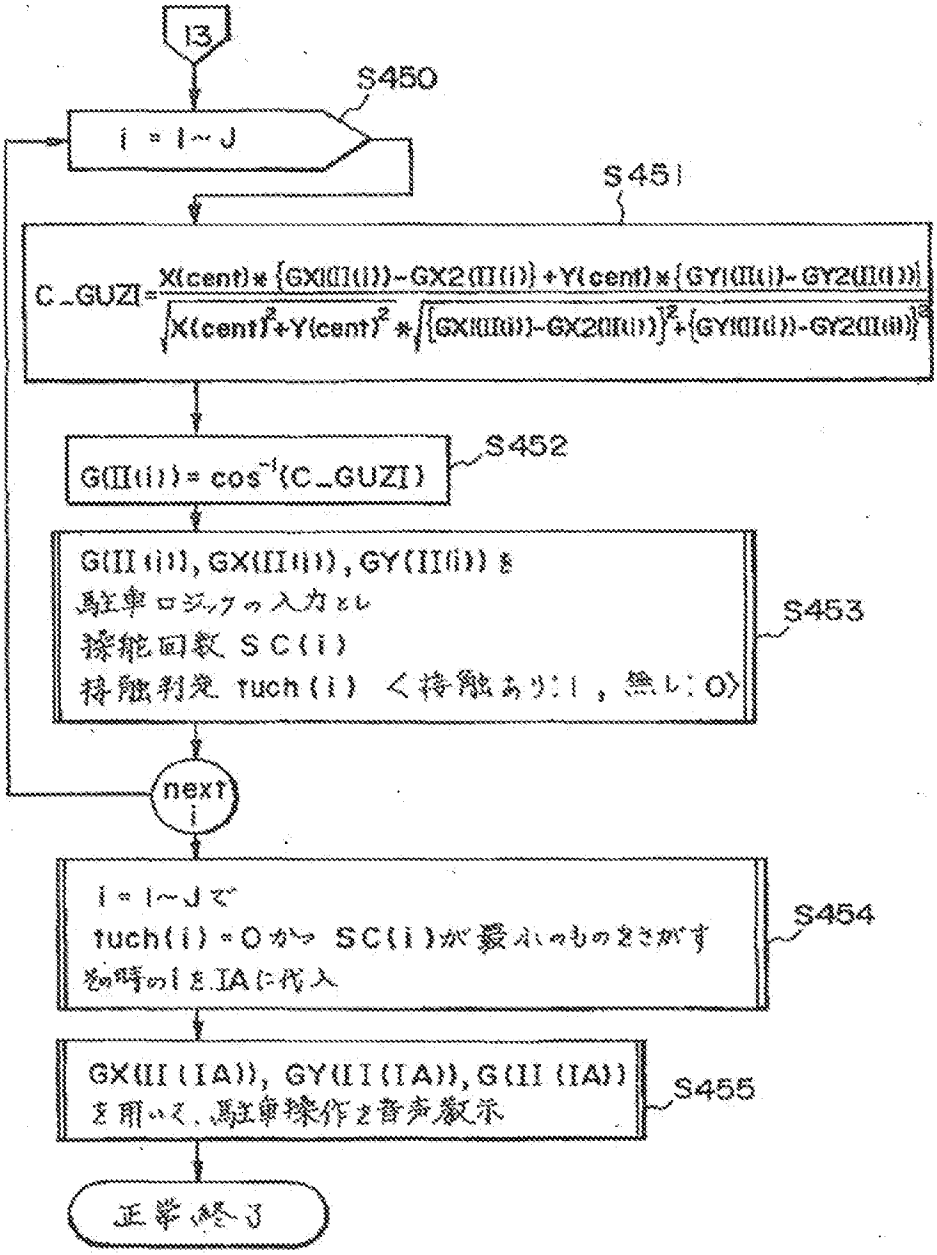
(図8)


8
エッジ補正
S427
S428
wc1 : wc2
wc1≧wc2
wc1＜wc2
S429
i＝wc1～1
S430
wn1(i+1)＝wn1(i)
next i
S431
wn1(1)＝0
wc1＝wc1+1
S432
S433
wc1 : wc2
wc1＝wc2
wc2＜wc1
S434
wc2＝wc2＋1
wn2(wc2)＝データ個数
S435
wc1 : wc2
wc1＝wc2
wc1≠wc2
S436
エッジ数対応原稿
データ周辺画素数
再スタート
9

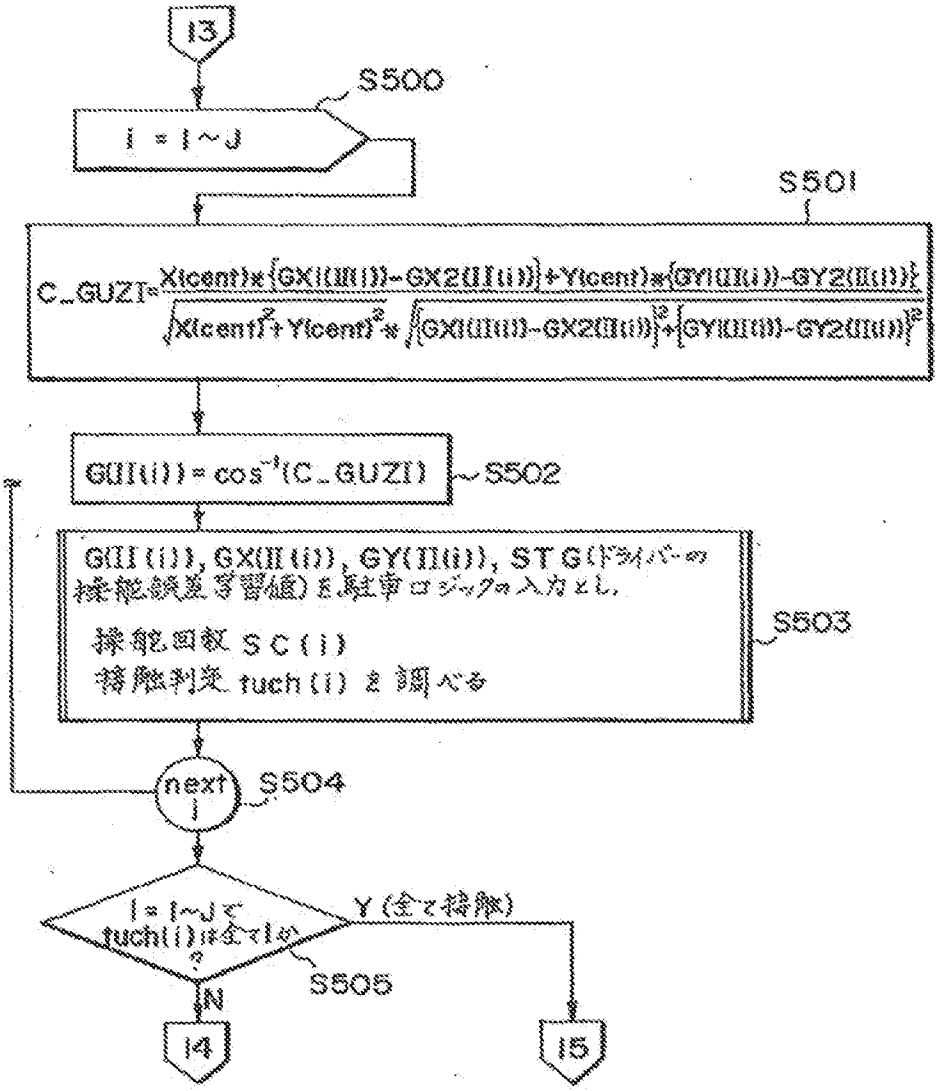
[図9]


9
S437
i=1 ～ wc1
GX1(i)=X(wn1(i))*B / X(wn1(i))-A·Y(wn1(i))
GY1(i)=Y(wn1(i))*B / X(wn1(i))-A·Y(wn1(i))
GX2(i)=Y(wn2(i))*B / X(wn2(i))-A·Y(wn2(i))
GY2(i)=X(wn2(i))*B / X(wn2(i))-A·Y(wn2(i))
S438
next i
S439
S440
i=1 ～ wc1
GX(i)=(GX1(i)+GX2(i))/2
GY(i)=(GY1(i)+GY2(i))/2
w(i)=√((GX1(i)-GX2(i))²+(GY1(i)-GY2(i))²)
S441
next i
S442
J=0
S443
S444
i=1 ～ wc1
S445
w(i)<(許容値)
N
Y
10
11

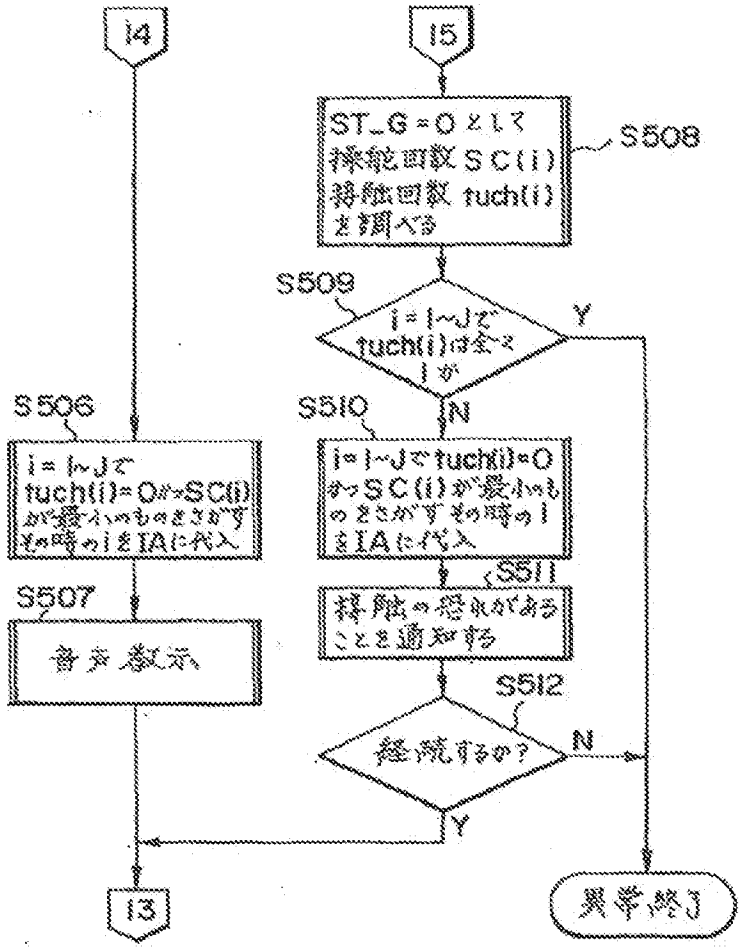
[図11]


13
S450
i = 1～J
S451
C_GUZI=X(cent)*{GX(II(i))-GX2(II(i))}+Y(cent)*{GY(II(i))-GY2(II(i))} / √(X(cent)²+Y(cent)²) * √({GX(II(i))-GX2(II(i))}²+{GY(II(i))-GY2(II(i))}²)
G(II(i)) = cos⁻¹(C_GUZI)
S452
G(II(i)), GX(II(i)), GY(II(i)) を
駐車ロジックの入力とし
操舵回数 SC(i)
接触判定 tuch(i) <接触あり:1, 無し:0>
S453
next i
i = 1～Jで
tuch(i) = 0かつ SC(i)が最小のものをさがす
その時のiをIAに代入
S454
GX(II(IA)), GY(II(IA)), G(II(IA))
を用いて、駐車操作を音声表示
S455
正常終了

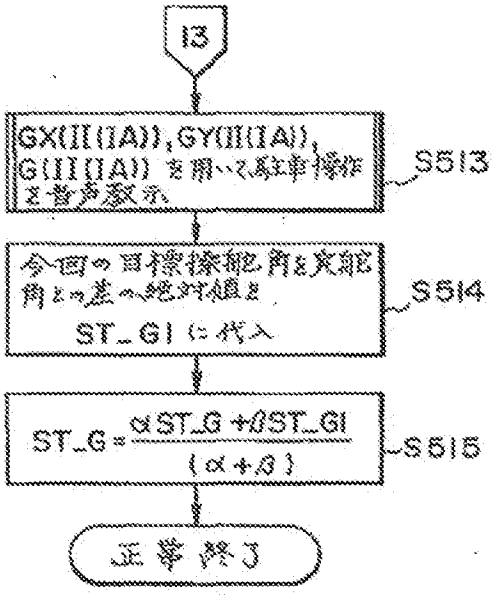
【図12】


13
S500
i = 1～J
S501
C_GUZI=Xicent)×{GX1(III(i))-GX2(II(i))}+Yicent)×{GY1(III(i))-GY2(II(i))} / √(Xicent)²+Yicent)²)×√({GX1(III(i))-GX2(II(i))}²+{GY1(III(i))-GY2(II(i))}²)
GII(i) = cos⁻¹(C_GUZI)
S502
GII(i), GX(II(i)), GY(II(i)), STG(ドライバーの操舵誤差許容値)を駐車ロジックへ入力とし,
操舵回数 SC(i)
接触判定 tuch(i) を調べる
S503
next i
S504
i = 1～J で tuch(i)は全て1か?
S505
Y(全て接触)
N
14
15

【図13】


I4
I5
ST_G＝0として
探触回数 SC(i)
接触回数 tuch(i)
を調べる
S508
S509
i＝1～Jで
tuch(i)は全て
1が
Y
N
S506
S510
i＝1～Jで tuch(i)＝0
かつSC(i)が最小もの
ときがすその時のi
をIAに代入
i＝1～Jで
tuch(i)＝0かつSC(i)
が最小ものときがす
その時のiをIAに代入
S511
探触の恐れがある
ことを通知する
S507
音声表示
S512
継続するか？
N
Y
I3
異常終了

【図14】


13
GX(II(IA)),GY(II(IA)),
G(II(IA)) を用いて運転操作
を音声表示
S513
今回の目標操舵角と実舵
角との差の絶対値を
ST_G1 に代入
S514
ST_G = (αST_G + βST_G1) / (α + β)
S515
正常終了

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-187597

(43)Date of publication of application : 08.07.1994

(51)Int.Cl. G08G 1/16
B60R 21/00
G01C 3/06
G01C 21/00

(21)Application number : 04-336206

(22)Date of filing : 16.12.1992

(71)Applicant : TOYOTA MOTOR CORP

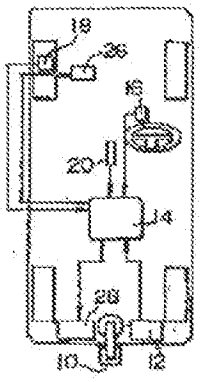
(72)Inventor : MIO MASAHIRO

(54) PARKING ASSISTANCE DEVICE

(57)Abstract:

PURPOSE: To help the parking operation of a driver by teaching the best parking space when plural candidate spaces are detected.

CONSTITUTION: A CCD area sensor 10 takes the photograph of the prescribed area including the parking space. Based on the obtained picture data, an ECU 12 for measuring distance calculates the distance to an object, supplying it as distance data by directions to an ECU 14 for automatic parking control. The ECU 14 converts the distance data into an orthogonal coordinate system which takes the CCD area sensor 10 as an origin and detects the parking space. When there are plural parking spaces, the simulation is performed to evaluate the contact possibility and the number of steering wheels, selecting and teaching the parking space which requires no contact and the minimum number of steering wheels.



JAPANESE [JP,06-187597,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION TECHNICAL PROBLEM MEANS OPERATION EXAMPLE DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

CLAIMS

[Claim(s)]

[Claim 1] A parking space detection means for it to be carried in a car and to detect the parking space of the perimeter of a car, An operation means to calculate the induction path to each parking space when there is two or more detected parking space, An assessment means to evaluate the existence and the count of steering of contact in the calculated induction path, [obstruction /a self-vehicle and] The parking auxiliary device characterized by having a selection means by which there are not an obstruction and contact and the count of steering chooses the minimum induction path, and an instruction means to teach an operator the selected induction path, based on said assessment result.

[Claim 2] It is the parking auxiliary device characterized by being a parking auxiliary device according to claim 1, and said assessment means evaluating the existence and the count of steering of said contact based on the amount of steering gaps of an operator proper.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to processing of the distance data about the parking space obtained in the CCD area sensor carried in parking space detection equipment, especially a car.

[0002]

[Description of the Prior Art] In a manual transmission car, clutch operation joins steering actuation, actuation of an accelerator pedal, actuation of a brake pedal, and a pan, and vehicle warehousing actuation of a car turns into very complicated actuation. And in case car back empty vehicle warehousing is performed, in order to carry out back viewing, an operator has to perform the above-mentioned actuation with an unnatural position, and has become actuation of requiring skill. On the other hand,

such actuation can be replaced by the routine based on the locus determined uniquely, if the relative position of a car and a car barn is determined. Then, such complicated vehicle warehousing actuation is automated and the automatic parking equipment for mitigating an operator's burden is proposed.

[0003] With such automatic parking equipment, it is an important technique how needless to say, the relative-position relation between a car and a car barn is detected to accuracy, and, for this reason, the improvement of a ranging sensor, the obtained improvement of processing of distance data are tried. For example, by Japanese Patent Application No. No. 312339 [two to] which the applicant for this patent proposed previously, the indicator with a bar code is beforehand installed in the four corners of a parking location, and the configuration which guides a car to a car barn is shown by detecting this indicator location with a bar code by the CCD area sensor prepared in the car back. Moreover, such a special indicator was not installed, or in order to enable a response also to the parking space which cannot be installed, the applicant for this patent proposed the configuration which computes a parking location from change of the vector which detects the location of bodies, such as a car barn which exists in two or more predetermined bearings by the CCD area sensor by Japanese Patent Application No. No. 309475 [three to] further, and makes the location of an adjoining body the starting point and a terminal point. In parking space, since the sense of this vector changes rapidly, it becomes possible to detect without depending for a parking location on an indicator.

[0004]

[Problem(s) to be Solved by the Invention] However, it may not restrict that an always exact value is shown, but when the intensity of a perimeter environment changes with environmental variations, for example, the weather, time of day, etc. of the perimeter of parking space, the case where the amount of contrast of the body which carries out image formation to a CCD area sensor is not enough may arise, and dispersion may produce the distance data to the body obtained by the CCD area sensor prepared in the car back to the distance data detected by the CCD area sensor. Thus, if dispersion arises to the distance data itself, in detecting a parking location based on the variation of the vector mentioned above, for example, in order for change of a vector to arise even in places other than a parking location and to detect a parking location to accuracy, parking location detection may not be enough [that special processing will be needed etc.].

[0005] Then, the applicant for this patent proposed previously the equipment which detects parking space by Japanese Patent Application No. No. 73851 [four to], using

the least square method twice.

[0006] That is, the relational expression for separating the distance data in which the front borderline of parking space is probably shown with the 1st least square method among the distance data obtained by the CCD sensor etc., and other distance data is computed, and an exact front borderline is computed by applying the 2nd least square method to these front borderline distance data further. And the inlet-port location of parking space is detected from the relation between this front borderline and each distance data.

[0007] Although parking space is detectable to accuracy by using such parking space detection equipment, as shown, for example in drawing 16 , depending on the situation of the perimeter of a self-vehicle, two or more detection of the parking space may be carried out. Generally, an operator has the inclination to stop a self-vehicle in the place near parking schedule space, when it is going to park a car from now on. Drawing 17 is the result of investigating what kind of location two or more operators make stop a self-vehicle to parking space. The drawing Nakamaru mark shows the rear wheel shaft center location at the time of parking a car without a cut, and the rectangular head in drawing shows the rear wheel shaft center location at the time of parking a car with a cut. In any case, it turns out that a self-vehicle is stopped in the location near target parking space.

[0008] Therefore, the distance L1 to the parking space detected as performing induction to the parking space nearest to a self-vehicle when two or more detection of the parking space is carried out would agree with an operator's hope in many cases, for example, it was shown in drawing 16 and L2 It computes, and the direction [it is small either] should just guide to parking space.

[0009] However, for the operator who is not skilled in operation for which a parking auxiliary device is needed, even if guided to the latest parking space, when there need to be many steersmen or it is necessary to need a cut or to once move forward in an initial halt location, it may be difficult to operate a self-vehicle as instruction, and it may become impossible after all parking a car it.

[0010] This invention is made in view of the technical problem which the above-mentioned conventional technique has, and the object is in offering the parking auxiliary device which can teach an operator the optimal parking space, also when two or more detected parking space exists.

[0011]

[Means for Solving the Problem] In order to attain the above-mentioned object, a parking auxiliary device according to claim 1 A parking space detection means for it to

be carried in a car and to detect the parking space of the perimeter of a car, An operation means to calculate the induction path to each parking space when there is two or more detected parking space, An assessment means to evaluate the existence and the count of steering of contact in the calculated induction path, [obstruction /a self-vehicle and] It is characterized by having a selection means by which there are not an obstruction and contact and the count of steering chooses the minimum induction path, and an instruction means to teach an operator the selected induction path, based on said assessment result.

[0012] Moreover, in order to attain the above-mentioned object, as for said assessment means, a parking auxiliary device according to claim 2 is characterized by evaluating the existence and the count of steering of said contact based on the amount of steering gaps of an operator proper.

[0013]

[Function] Thus, when there is two or more parking space detected by parking space detection equipment, the parking auxiliary device of this invention carries out simulation of the induction path, and evaluates the existence and the count of steering of contact. [vehicle /obstructions, such as other vehicle, and /self-] And there is contact, or when there are many counts of steering, even if it is the latest parking space, it will not choose, but there is no contact and the count of steering teaches the fewest parking space.

[0014] Since the thereby easiest path is followed and it is guided to parking space, it also enables the operator who has various operation skill to park a car certainly.

[0015] Furthermore, the amount of steering gaps of an operator proper is introduced into the simulation of a course guidance, and a parking auxiliary device according to claim 2 estimates the existence and the count of steering of contact by the simulation containing this amount of gaps.

[0016] Assessment which an operator's operation skill reflected will be performed by this, and it will be guided to the optimal parking space for the operator.

[0017]

[Example] Hereafter, the suitable example of the parking auxiliary device of this invention is explained, using a drawing.

[0018] The configuration of this example is shown in 1st example drawing 1 . The CCD area sensor 10 is formed in the car back, and a predetermined field including the parking space which is not illustrated is photoed. This CCD area sensor is constituted by carrying out predetermined distance alienation rotatable at the circumference of a vertical axis, and arranging CCD cameras 10a and 10b of a couple, as shown in drawing

2 . And the image data obtained by the CCD area sensor 10, i.e., the image data based on CCD camera 10a and CCD camera 10b, is supplied to ECU12 for ranging which is a computer for ranging, and the distance data from the comparison (phase contrast) of both image data to bodies, such as parking space, are computed for every bearing. The computed distance data, i.e., the data of distance R and Bearing theta, (R, theta) are supplied to ECU14 for automatic parking control which is a computer for automatic parking control. An example of the distance data (R, theta) obtained by doing in this way is shown in drawing 3 , and the drawing bullet round head shows distance data.

[0019] ECU 14 for automatic parking control is the configuration of outputting a braking signal to the brake actuator 28, and making parking space suspending a car, while supplying the steering signal for guiding a car to parking space based on the detecting signal outputted to the steering angle sensor 16 or speed sensor 18 list from the shift position sensor 20 while performing processing later mentioned to the distance data (R, theta) from ECU12 for ranging and detecting parking space to a steering actuator 26.

[0020] Hereafter, the parking space detection processing performed by ECU14 for automatic parking control is explained to a detail. In addition, Japanese Patent Application No. No. 73851 [four to] applicant-for-this-patent submitted [which was mentioned above] serves as a foundation of this processing.

[0021] First, the distance data (R, theta) which ECU12 for ranging computed based on the image data obtained by the CCD area sensor 10 as shown in drawing 4 are read one by one (S101). And the obtained distance data (R, theta) are changed into the x-y rectangular coordinate system which sets a Y-axis as the X-axis and a shaft vertical to this X-axis for the field angle core of the CCD area sensor 10 (S102-S103). The 1st least square method is applied, the detection distance R excepting distance data with a predetermined distance of 20m or more as incorrect detection, after changing into x-y system of coordinates (S104-S108).

[0022] After application of the 1st least square method is completed, it shifts to the 2nd least square method application processing that a concrete front borderline should be determined as a degree. That is, as shown in drawing 5 , it is the x-coordinate xi of distance data. The size comparison with relational-expression Ayi+b computed by the 1st least square method is performed, and it is xi. The 2nd least square method is applied to the distance data constellation located in a CCD area sensor side to a point smaller than Ayi+B , i.e., relational expression. It is carried out by the same processing as the 1st least square method which also mentioned above this 2nd least square method, and A and B which turn into x=Ay+B to distance

data (xi and yi) are computed with the least square method (S301~S303).

[0023] After the front borderline of parking space is computed by the 2nd least square method, it shifts to detection processing of a parking inlet-port location next. This parking inlet-port detection is computed based on the distance of a front borderline and each distance data (xi and yi), and the concrete flow chart is shown after drawing 8 .

[0024] First, as shown in drawing 6 , the distance DX of front borderline x=Ay+B and each distance data (i) is computed (S402). Here, the distance L of a front borderline and each distance day is L=deltax-deltay/{(deltax2+deltay2) 0.5} easily from geometric consideration.

However, although it becomes deltax=|xi-Ayi-B| (delta y=|yi-(xi+B)/A |) when an applicant for this patent computes this distance actually, he has found out that there is no big difference among delta x. In this example, as mentioned above, it is supposed that calculation will detect a parking inlet port using delta x [easy].

[0025] However, by the approach of distinguishing binarization, i.e., a parking space inlet-port position coordinate, and other coordinates, only using a predetermined threshold, it cannot respond to dispersion in distance data. So, in this example, an applicant for this patent detects a parking inlet-port location using the binarization and edge detection processing which are indicated by Japanese Patent Application No. No. 64970 [three to] proposed previously (S404). That is, initial value is set to each variable as follows (S405). It is like the 1st continuation count authorization flag cok 1=0, the 2nd continuation count authorization flag cok 2=0, the 1st continuation counter fc 1=0, the 2nd continuation counter fc 2=0, the left edge candidate coordinate wn 01=0, the right edge candidate coordinate wn 02=0, the 1st detection flag fw 1=0, the right edge counter wc 1=0, the 2nd detection flag fw 2=1, and the left edge counter wc 2=0.

[0026] And distance DX (i) is compared with the predetermined threshold thl (this example 0.6m) (S407). In DX(i) <=thl, since the distance data is data in which a front borderline is shown, it sets at fc 1=0, wn 01=0, and fw 2=1 (S408).

[0027] Moreover, it judges whether cok1 is 0 (S409). cok1 is a flag used as 1, when it changes to DX(i) <=thl->DX(i) >thl so that it may mention later. For this reason, a certain abnormalities are considered to have generated by DX(i) <=thl, and that cok1 is not 0 should not detect a right edge at this time. So, it is referred to as cok 1=0 and fw 1=0 when cok1 is not 0 in S410.

[0028] On the other hand, since the last detection result was not in the above unusual conditions when it was cok 1=0, a right edge is detected as follows. First, it judges

whether it is fw 1=1 (S411). fw1 is set to 0 as initial setting, and, in DX(i) >thl, is set by 1. Therefore, in S407, data are DX(i) <=thl, and that fw1 is 1 in S411 means having detected the right edge. Then, it is referred to as variable wn02=i (distance data number) which shows the detection location of a right edge, and cok2=1 while being referred to as fw 1=0, if it is fw 1=1 in S411 (S412).

[0029] Here, when an edge is detected, that i value may be memorized as an edge location as it is, but in this example, after detecting a right edge, only when the following data are not an edge, either, that location is judged to be a right edge, and generating of an incorrect judging is controlled. For this reason, it is referred to as cok 2=1.

[0030] Next, cok2 judges whether it is 1 (S413). When cok2 is 1, 1 is added to fc2 (S414), when cok2 is not 1, this addition is not performed, but it judges whether next fc2 is 2. It is 2 when it passes along this fcS414 twice in succession [two] (i.e., when two data below a threshold thl continue). So, when fc2 is 2, the value of the right edge candidate coordinate wn02 set to the array variable wn2 [wc2] which shows the right edge coordinate specified with the right edge counter wc2 by above-mentioned S412 is memorized. Moreover, while resetting variables cok2 and fc2 to 0, 1 is added to the right edge counter wc2 (S416). therefore — the case of next right edge detection — wc2 — 1 — they are many numbers. For this reason, the location of the following right edge can be memorized to an array variable wn2. Since the processing about a right edge was completed when the case of fc 2<2 and processing of S416 were ended in S415, it returns to S406.

[0031] On the other hand, when it is judged with DX(i) >thl in S206 and parking space is detected, a left edge is detected as follows.

[0032] First, fc2 and wn02 are reset to 0, and a flag fw1 is set to 1 (S417). Moreover, it judges whether cok2 is 0 (S418). cok2 is set to 1 when it changes to DX(i) >thl->DX(i) <=thl, as mentioned above (S412). For this reason, it means that a certain abnormalities occurred that cok2 is not 0 when set to DX(i) >thl in S407. Then, in S419, when cok2 is not 0, it is referred to as cok 2=0 and fw 2=0.

[0033] On the other hand, since the last detection result was not in the above unusual conditions when it was cok 2=0, a left edge is detected as follows. First, it judges whether it is fw 2=1 (S420). It means having recognized the left edge in fw 2=1, fw2 is reset to 0, the value of i is inputted into the left edge candidate coordinate wn01, and cok1 is set to 1 (S421). And since it judged whether cok1 was 1 (S422), and the left edge was detected when cok1 was 1, 1 is added to fc1 (S423). Next, it judges whether fc1 is 2 (S424), and if it is 2, the value of the candidate coordinate wn01 will be

inputted into the array variable wn1 [wc1] specified by wc1. The location of the detected left edge is memorized by this. Moreover, since this input was made, while resetting to a flag cok 1=1 and fc 1=0, 1 is added to the variable wc1 which shows the number of left edges (S425).

[0034] Such actuation can be repeated about the total number i of distance data, and only the number which detected the location of a right edge and a left edge can be memorized. Moreover, the detected number will be memorized by wc1 and wc2. And amendment processing of these detection edge is performed next (S427).

[0035] That is, as shown in drawing 8 , wc1 is first compared with wc2 (S428). In wc1<wc2, the number of left edges means that it is smaller than the number of right edges, and it means in it that the parking space inlet port has started the left end of the image of the CCD area sensor 10. For this reason, the inlet port concerning the left end of a screen can be recognized by inserting a left edge in this left end.

[0036] For this reason, the value of wn1 [i] is changed into the value of wn1 [i+1] in S429-430. That is, there is a value of n pieces as a value of wn1, and when this is memorized as a value of wn1[1] -wn1 [n], it is changed into the value of wn1[2] -wn1 [n+1] by this processing. And while assigning the value of 0 to wn1 [1], 1 is added to wc1 (S432). This is inserted, also when it is inserted compulsorily [one] by this and a left edge is not able to be detected as a value of an array variable wn1 by it.

[0037] On the other hand, when it is wc1 >=wc2 in S428, the right edge is missing or it means that both are the same numbers. Then, wc2 are compared with wc1 below (S423). When it is wc2=wc1, both mean the equal thing here, and amendment processing is unnecessary.

[0038] On the other hand, when the wc2 is smaller than wc1, right edge insertion must be amended. Then, 1 is added to wc2 and forcible insertion of the data number is carried out at the array variable wn2 [wc2] specified by this wc2 (S434). The value at the right end of a visual field will be inserted by this as a right edge.

[0039] And wc1 is again compared with wc2 after these amendment processings, when both values are not equal, it means that the response of the number of edges cannot take by amendment, either, and a restart is carried out noting that parking section detection goes wrong (S436).

[0040] After edge amendment is completed as mentioned above, it shifts to the processing which detects a final parking space inlet-port location. The coordinate detected by old processing is an edge coordinate on either side, i.e., the coordinate of the nearest distance data of a parking inlet port. Then, it needs to be processed for computing a true parking space inlet-port coordinate from the these-extracted

distance data, and the flow chart of drawing 9 showed this processing. That is, the projective coordinates of the right-and-left edge coordinate to the front-face borderline of parking space first acquired by the 2nd least square method application in S438 are computed. In drawing 9 , (GX1 (i) and GY1 (i)) express the projective coordinates of a left edge coordinate, and (GX2 (i) and GY2 (i)) express the projective coordinates of a right edge coordinate. And in this example, the width of face of the core of parking space and parking space is further computed as an assistant parameter for guiding a car to parking space. For this reason, that main coordinate (GX (i), GY (i)) and width-of-face w (i) are computed using the parking space inlet-port coordinate (GX1 (i), GY1 (i)) searched for in the above-mentioned S438, (GX2 (i), and GY2 (i)) (S441).

[0041] In this way, although parking space detection is ended as a matter of fact by having computed the width of face of the inlet-port coordinate of parking space, a main coordinate, and parking space, in order to guide a car to this detected parking space actually, it is necessary to compute the angle of parking space and a car to make. Moreover, it is necessary to judge whether it has width of face with the suitable width of face of the parking space computed by the above-mentioned processing for a car to park a car actually.

[0042] So, in this example, the size comparison with width-of-face w (i) and breadth-of-a-car +alpha (a part for the allowances determined supposing the case where alpha opens a door) which were computed is performed (S445), and the inlet-port coordinate (GX1 (ii), GY1 (ii)) with which this condition is filled, (GX2 (i), and GY2 (ii)) are extracted (S446-S448), as on the other hand, parking space being undetectable, when not fulfilling this condition -- a restart -- or it ends (S449).

[0043] And the attitude angle (angle of a car center line and the front-face borderline of parking space to make) of a car and parking space to make is computed (S450). The vector a showing the direction of a car center line is a= (x (cent) y (cent)). However, cent is expressed focusing on the ranging field angle of a CCD sensor. Therefore, the attitude angle xi is computed by the formula shown by S451 and S452.

[0044] Thus, when the detected parking space is [two or more /(J is two or more)], in this example, the optimal parking space is chosen out of this, and it teaches an operator. That is, G (i (i)), GX (i (i)), and GY (i (i)) which were detected are considered as an input, the induction path to this parking space is calculated, and the existence SC of contact with the obstruction when running this induction path (i) and the count tuch of steering (i) are evaluated. It can ask for this simulation from the physical relationship of the well-known induction path computing method and a

self-vehicle, and obstructions (already parked other vehicle). In this example, the applicant for this patent is performing simulation using the modern control theory proposed by Japanese Patent Application No. No. 153560 [three to]. That is, the induction path to parking space is calculated using the equation of state (4) of the car indicated by Japanese Patent Application No. No. 153560 [three to], and SC (i) and tuch (i) are evaluated about each parking space (S453).

[0045] And the contact variable tuch (i) is 0 (that is, it is possible to park a car, without contacting), and the count SC of steering (i) chooses the minimum parking space (S454), and voice instruction of the parking actuation is carried out at an operator (S455). In addition, when the selected parking space is not the latest parking space, it teaches an operator simultaneously also that. Moreover, what is necessary is just to teach the latest parking space, when there is no difference in two or more existence and counts of steering of contact of parking space.

[0046] In the 1st example of the 2nd example above, although simulation was performed from the relative-position relation between a self-vehicle and parking space, in **** 2 example, it is further characterized by performing more suitable simulation, also taking an operator's operation skill into consideration.

[0047] An operator's operation skill can be grasped objective from the gap with the taught amounts of control and a actual operator's amounts of control. Therefore, the amount of gaps of the instruction amounts of control to last time and actual amounts of control is stored in memory, and if this amount of steering gaps is expected and simulation is performed, in the case of an operator unfamiliar to operation, the possibility and the count of steering of contact will be esteemed and it will be taught to more positive parking space. The conceptual diagram in consideration of the amount of steering gaps of simulation is shown in drawing 15 . It is a simulation locus in case a drawing solid line is the amount zero of steering gaps, and is a simulation locus when a broken line takes the amount of steering gaps into consideration. Only a part with the amount of steering gaps will move in a zigzag direction more greatly.

[0048] The processing flow chart of the 2nd example is shown in drawing 12 thru/or drawing 14 . Drawing 12 thru/or drawing 14 correspond to processing not more than S450 of the 1st example of the above, and the processing before S450 is the same as that of the 1st example. In addition, although a whole configuration is the same as that of the 1st example almost, in the **** 2 example, the amount of steering gaps of an operator's past is stored in memory, and whenever this amount of steering gaps performs parking actuation like the after-mentioned, renewal of sequential of it is carried out.

[0049] G (il (i)), GX (il (i)), GY (simulation is performed using il (i) and an operator's amount (error amount) study value STG of steering gaps.) after parking space was first detected like the 1st example in drawing 12 (S500-S502) Although simulation is performed based on an equation of state like the 1st example, when the amount of steering gaps is stored in the absolute value, the induction path from which steering shifted to right and left to the acquired induction path is computed, and SC (i) and tuch (i) are evaluated (S503). When the amount of steering gaps is stored with a sign (the case of right steering plus etc.), the amount of study gaps is added to each right steering of a path and left steering which were obtained, and the path shifted is computed.

[0050] And tuch (i) in consideration of the amount of steering gaps of an induction path judges altogether whether it is 1 (S505), when the path which it is not 1 altogether, i.e., does not contact exists, SC (i) chooses the minimum parking space further in this tuch(i) =0 (S506), and it teaches an operator (S507). In addition, when the latest parking space is not chosen, it is the same as that of the 1st example to report that to an operator.

[0051] On the other hand, in tuch's (i's)'s being 1 altogether, i.e., contacting in all paths, it performs simulation at the time of setting the amount STG of steering gaps to 0 further (S508). This is processing for distinguishing whether it is possible to park a car, without contacting, when contacting theoretically [this] also in the path estimated as those of contact with possibility in consideration of the amount of steering gaps even if the amount of steering gaps is zero, or the amount of steering gaps is zero.

[0052] And since (S509) and parking are impossible when it is tuch(i) =1 in all paths in addition, even if it makes the amount of steering gaps into zero, voice instruction of that is carried out at an operator, and processing is ended. Moreover, when the path whose tuch (i) is not 1 exists, ST (i) chooses the minimum path in this path (S510), and voice instruction of an operator having fear of contact is carried out at the parking path chosen after teaching (S513 in drawing 14). In addition, since there is possibility of contact, an operator can also be made to choose whether a course guidance is continued (S512).

[0053] After instruction is completed, the absolute value of this target steering angle and a actual steering angle is computed, and it is STG1. It stores and they are weighting operation STG= (alpha STG+beta STG1) / (alpha+beta).

It is alike and the amount of steering gaps is updated more. Thereby, the amount of steering gaps can always be made into the optimum value of an operator proper.

[0054]

[Effect of the Invention] As explained above, also when two or more detected parking space exists, according to the parking auxiliary device according to claim 1, the optimal parking space can be taught to an operator. Moreover, according to the parking auxiliary device according to claim 2, the parking space corresponding to an operator's operation skill can be taught, and parking can be ensured.

[Translation done.]

TECHNICAL FIELD

[Industrial Application] This invention relates to processing of the distance data about the parking space obtained in the CCD area sensor carried in parking space detection equipment, especially a car.

[Translation done.]

PRIOR ART

[Description of the Prior Art] In a manual transmission car, clutch operation joins steering actuation, actuation of an accelerator pedal, actuation of a brake pedal, and a pan, and vehicle warehousing actuation of a car turns into very complicated actuation. And in case car back empty vehicle warehousing is performed, in order to carry out back viewing, an operator has to perform the above-mentioned actuation with an unnatural position, and has become actuation of requiring skill. On the other hand, such actuation can be replaced by the routine based on the locus determined uniquely, if the relative position of a car and a car barn is determined. Then, such complicated vehicle warehousing actuation is automated and the automatic parking equipment for mitigating an operator's burden is proposed.

[0003] With such automatic parking equipment, it is an important technique how needless to say, the relative-position relation between a car and a car barn is detected to accuracy, and, for this reason, the improvement of a ranging sensor, the obtained improvement of processing of distance data are tried. For example, by

Japanese Patent Application No. No. 312339 [two to] which the applicant for this patent proposed previously, the indicator with a bar code is beforehand installed in the four corners of a parking location, and the configuration which guides a car to a car barn is shown by detecting this indicator location with a bar code by the CCD area sensor prepared in the car back. Moreover, such a special indicator was not installed, or in order to enable a response also to the parking space which cannot be installed, the applicant for this patent proposed the configuration which computes a parking location from change of the vector which detects the location of bodies, such as a car barn which exists in two or more predetermined bearings by the CCD area sensor by Japanese Patent Application No. No. 309475 [three to] further, and makes the location of an adjoining body the starting point and a terminal point. In parking space, since the sense of this vector changes rapidly, it becomes possible to detect without depending for a parking location on an indicator.

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, also when two or more detected parking space exists, according to the parking auxiliary device according to claim 1, the optimal parking space can be taught to an operator. Moreover, according to the parking auxiliary device according to claim 2, the parking space corresponding to an operator's operation skill can be taught, and parking can be ensured.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, it may not restrict that an always exact value is shown, but when the intensity of a perimeter environment changes with environmental variations, for example, the weather, time of day, etc. of the perimeter of parking space, the case where the amount of contrast of the body which carries out

image formation to a CCD area sensor is not enough may arise, and dispersion may produce the distance data to the body obtained by the CCD area sensor prepared in the car back to the distance data detected by the CCD area sensor. Thus, if dispersion arises to the distance data itself, in detecting a parking location based on the variation of the vector mentioned above, for example, in order for change of a vector to arise even in places other than a parking location and to detect a parking location to accuracy, parking location detection may not be enough [that special processing will be needed etc.].

[0005] Then, the applicant for this patent proposed previously the equipment which detects parking space by Japanese Patent Application No. No. 73851 [four to], using the least square method twice.

[0006] That is, the relational expression for separating the distance data in which the front borderline of parking space is probably shown with the 1st least square method among the distance data obtained by the CCD sensor etc., and other distance data is computed, and an exact front borderline is computed by applying the 2nd least square method to these front borderline distance data further. And the inlet-port location of parking space is detected from the relation between this front borderline and each distance data.

[0007] Although parking space is detectable to accuracy by using such parking space detection equipment, as shown, for example in drawing 18 , depending on the situation of the perimeter of a self-vehicle, two or more detection of the parking space may be carried out. Generally, an operator has the inclination to stop a self-vehicle in the place near parking schedule space, when it is going to park a car from now on. Drawing 17 is the result of investigating what kind of location two or more operators make stop a self-vehicle to parking space. The drawing Nakamaru mark shows the rear wheel shaft center location at the time of parking a car without a cut, and the rectangular head in drawing shows the rear wheel shaft center location at the time of parking a car with a cut. In any case, it turns out that a self-vehicle is stopped in the location near target parking space.

[0008] Therefore, the distance L1 to the parking space detected as performing induction to the parking space nearest to a self-vehicle when two or more detection of the parking space is carried out would agree with an operator's hope in many cases, for example, it was shown in drawing 16 and L2 It computes, and the direction [it is small either] should just guide to parking space.

[0009] However, for the operator who is not skilled in operation for which a parking auxiliary device is needed, even if guided to the latest parking space, when there need

to be many steersmen or it is necessary to need a cut or to once move forward in an initial halt location, it may be difficult to operate a self-vehicle as instruction, and it may become impossible after all parking a car it.

[0010] This invention is made in view of the technical problem which the above-mentioned conventional technique has, and the object is in offering the parking auxiliary device which can teach an operator the optimal parking space, also when two or more detected parking space exists.

[Translation done.]

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned object, a parking auxiliary device according to claim 1 A parking space detection means for it to be carried in a car and to detect the parking space of the perimeter of a car, An operation means to calculate the induction path to each parking space when there is two or more detected parking space, An assessment means to evaluate the existence and the count of steering of contact in the calculated induction path, [obstruction /a self-vehicle and] It is characterized by having a selection means by which there are not an obstruction and contact and the count of steering chooses the minimum induction path, and an instruction means to teach an operator the selected induction path, based on said assessment result.

[0012] Moreover, in order to attain the above-mentioned object, as for said assessment means, a parking auxiliary device according to claim 2 is characterized by evaluating the existence and the count of steering of said contact based on the amount of steering gaps of an operator proper.

[Translation done.]

OPERATION

[Function] Thus, when there is two or more parking space detected by parking space detection equipment, the parking auxiliary device of this invention carries out simulation of the induction path, and evaluates the existence and the count of steering of contact. [vehicle /obstructions, such as other vehicle, and /self-] And there is contact, or when there are many counts of steering, even if it is the latest parking space, it will not choose, but there is no contact and the count of steering teaches the fewest parking space.

[0014] Since the thereby easiest path is followed and it is guided to parking space, it also enables the operator who has various operation skill to park a car certainly.

[0015] Furthermore, the amount of steering gaps of an operator proper is introduced into the simulation of a course guidance, and a parking auxiliary device according to claim 2 estimates the existence and the count of steering of contact by the simulation containing this amount of gaps.

[0016] Assessment which an operator's operation skill reflected will be performed by this, and it will be guided to the optimal parking space for the operator.

[Translation done.]

EXAMPLE

[Example] Hereafter, the suitable example of the parking auxiliary device of this invention is explained, using a drawing.

[0018] The configuration of this example is shown in 1st example drawing 1 . The CCD area sensor 10 is formed in the car back, and a predetermined field including the parking space which is not illustrated is photoed. This CCD area sensor is constituted by carrying out predetermined distance alienation rotatable at the circumference of a vertical axis, and arranging CCD cameras 10a and 10b of a couple, as shown in drawing 2 . And the image data obtained by the CCD area sensor 10, i.e., the image data based on CCD camera 10a and CCD camera 10b, is supplied to ECU12 for ranging which is a computer for ranging, and the distance data from the comparison (phase contrast) of both image data to bodies, such as parking space, are computed for every bearing. The computed distance data, i.e., the data of distance R and Bearing theta, (R, theta) are supplied to ECU14 for automatic parking control which is a computer for automatic parking control. An example of the distance data (R, theta) obtained by doing in this

way is shown in drawing 3 , and the drawing bullet round head shows distance data.
[0019] ECU 14 for automatic parking control is the configuration of outputting a braking signal to the brake actuator 28, and making parking space suspending a car, while supplying the steering signal for guiding a car to parking space based on the detecting signal outputted to the steering angle sensor 16 or speed sensor 18 list from the shift position sensor 20 while performing processing later mentioned to the distance data (R, theta) from ECU12 for ranging and detecting parking space to a steering actuator 26.
[0020] Hereafter, the parking space detection processing performed by ECU14 for automatic parking control is explained to a detail. In addition, Japanese Patent Application No. No. 73851 [four to] applicant-for-this-patent submitted [which was mentioned above] serves as a foundation of this processing.
[0021] First, the distance data (R, theta) which ECU12 for ranging computed based on the image data obtained by the CCD area sensor 10 as shown in drawing 4 are read one by one (S101). And the obtained distance data (R, theta) are changed into the x-y rectangular coordinate system which sets a Y-axis as the X-axis and a shaft vertical to this X-axis for the field angle core of the CCD area sensor 10 (S102-S103). The 1st least square method is applied, the detection distance R excepting distance data with a predetermined distance of 20m or more as incorrect detection, after changing into x-y system of coordinates (S104-S108).
[0022] After application of the 1st least square method is completed, it shifts to the 2nd least square method application processing that a concrete front borderline should be determined as a degree. That is, as shown in drawing 5 , it is the x-coordinate xi of distance data. The size comparison with relational-expression Ayi+b computed by the 1st least square method is performed, and it is xi. The 2nd least square method is applied to the distance data constellation located in a CCD area sensor side to a point smaller than Ayi+B , i.e., relational expression. It is carried out by the same processing as the 1st least square method which also mentioned above this 2nd least square method, and A and B which turn into x=Ay+B to distance data (xi and yi) are computed with the least square method (S301-S303).
[0023] After the front borderline of parking space is computed by the 2nd least square method, it shifts to detection processing of a parking inlet-port location next. This parking inlet-port detection is computed based on the distance of a front borderline and each distance data (xi and yi), and the concrete flow chart is shown after drawing 6 .
[0024] First, as shown in drawing 6 , the distance DX of front borderline x=Ay+B and

each distance data (i) is computed (S402). Here, the distance L of a front borderline and each distance day is L=deltax-deltay/{(deltax2+deltay2) 0.5} easily from geometric consideration.
However, although it becomes deltax=|xi-Ayi-B| delta y=|yi-(xi+B)/A| when an applicant for this patent computes this distance actually, he has found out that there is no big difference among delta x. In this example, as mentioned above, it is supposed that calculation will detect a parking inlet port using delta x [easy].
[0025] However, by the approach of distinguishing binarization, i.e., a parking space inlet-port position coordinate, and other coordinates, only using a predetermined threshold, it cannot respond to dispersion in distance data. So, in this example, an applicant for this patent detects a parking inlet-port location using the binarization and edge detection processing which are indicated by Japanese Patent Application No. No. 64970 [three to] proposed previously (S404). That is, initial value is set to each variable as follows (S405). it is like the 1st continuation count authorization flag cok 1=0, the 2nd continuation count authorization flag cok 2=0, the 1st continuation counter fc 1=0, the 2nd continuation counter fc 2=0, the left edge candidate coordinate wn 01=0, the right edge candidate coordinate wn 02=0, the 1st detection flag fw 1=0, the right edge counter wc 1=0, the 2nd detection flag fw 2=1, and the left edge counter wc 2=0.
[0026] And distance DX (i) is compared with the predetermined threshold thl (this example 0.6m) (S407). In DX(i) ≤thl, since the distance data is data in which a front borderline is shown, it sets at fc 1=0, wn 01=0, and fw 2=1 (S408).
[0027] Moreover, it judges whether cok1 is 0 (S409). cok1 is a flag used as 1, when it changes to DX(i) ≤thl->DX(i) >thl so that it may mention later. For this reason, a certain abnormalities are considered to have generated by DX(i) ≤thl, and that cok1 is not 0 should not detect a right edge at this time. So, it is referred to as cok 1=0 and fw 1=0 when cok1 is not 0 in S410.
[0028] On the other hand, since the last detection result was not in the above unusual conditions when it was cok 1=0, a right edge is detected as follows. First, it judges whether it is fw 1=1 (S411). fw1 is set to 0 as initial setting, and, in DX(i) >thl, is set by 1. Therefore, in S407, data are DX(i) ≤thl, and that fw1 is 1 in S411 means having detected the right edge. Then, it is referred to as variable wn02=i (distance data number) which shows the detection location of a right edge, and cok2=1 while being referred to as fw 1=0, if it is fw 1=1 in S411 (S412).
[0029] Here, when an edge is detected, that i value may be memorized as an edge location as it is, but in this example, after detecting a right edge, only when the

following data are not an edge, either, that location is judged to be a right edge, and generating of an incorrect judging is controlled. For this reason, it is referred to as cok 2=1.

[0030] Next, cok2 judges whether it is 1 (S413). When cok2 is 1, 1 is added to fc2 (S414), when cok2 is not 1, this addition is not performed, but it judges whether next fc2 is 2. It is 2 when it passes along this fcS414 twice in succession [two] (i.e., when two data below a threshold thl continue). So, when fc2 is 2, the value of the right edge candidate coordinate wn02 set to the array variable wn2 [wc2] which shows the right edge coordinate specified with the right edge counter wc2 by above-mentioned S412 is memorized. Moreover, while resetting variables cok2 and fc2 to 0, 1 is added to the right edge counter wc2 (S416). therefore -- the case of next right edge detection -- wc2 -- 1 -- they are many numbers. For this reason, the location of the following right edge can be memorized to an array variable wn2. Since the processing about a right edge was completed when the case of fc 2<2 and processing of S416 were ended in S415, it returns to S406.

[0031] On the other hand, when it is judged with DX(i) >thl in S206 and parking space is detected, a left edge is detected as follows.

[0032] First, fc2 and wn02 are reset to 0, and a flag fw1 is set to 1 (S417). Moreover, it judges whether cok2 is 0 (S418). cok2 is set to 1 when it changes to DX(i) >thl->DX(i) <=thl, as mentioned above (S412). For this reason, it means that a certain abnormalities occurred that cok2 is not 0 when set to DX(i) >thl in S407. Then, in S419, when cok2 is not 0, it is referred to as cok 2=0 and fw 2=0.

[0033] On the other hand, since the last detection result was not in the above unusual conditions when it was cok 2=0, a left edge is detected as follows. First, it judges whether it is fw 2=1 (S420). It means having recognized the left edge in fw 2=1, fw2 is reset to 0, the value of i is inputted into the left edge candidate coordinate wn01, and cok1 is set to 1 (S421). And since it judged whether cok1 was 1 (S422), and the left edge was detected when cok1 was 1, 1 is added to fc1 (S423). Next, it judges whether fc1 is 2 (S424), and if it is 2, the value of the candidate coordinate wn01 will be inputted into the array variable wn1 [wc1] specified by wc1. The location of the detected left edge is memorized by this. Moreover, since this input was made, while resetting to a flag cok 1=1 and fc 1=0, 1 is added to the variable wc1 which shows the number of left edges (S425).

[0034] Such actuation can be repeated about the total number i of distance data, and only the number which detected the location of a right edge and a left edge can be memorized. Moreover, the detected number will be memorized by wc1 and wc2. And

amendment processing of these detection edge is performed next (S427).

[0035] That is, as shown in drawing 8 , wc1 is first compared with wc2 (S428). In wc1<wc2, the number of left edges means that it is smaller than the number of right edges, and it means in it that the parking space inlet port has started the left end of the image of the CCD area sensor 10. For this reason, the inlet port concerning the left end of a screen can be recognized by inserting a left edge in this left end.

[0036] For this reason, the value of wn1 [i] is changed into the value of wn1 [i+1] in S429-430. That is, there is a value of n pieces as a value of wn1, and when this is memorized as a value of wn1[1] -wn1 [n], it is changed into the value of wn1[2] -wn1 [n+1] by this processing. And while assigning the value of 0 to wn1 [1], 1 is added to wc1 (S432). This is inserted, also when it is inserted compulsorily [one] by this and a left edge is not able to be detected as a value of an array variable wn1 by it.

[0037] On the other hand, when it is wc1 >=wc2 in S428, the right edge is missing or it means that both are the same numbers. Then, wc2 are compared with wc1 below (S423). When it is wc2=wc1, both mean the equal thing here, and amendment processing is unnecessary.

[0038] On the other hand, when the wc2 is smaller than wc1, right edge insertion must be amended. Then, 1 is added to wc2 and forcible insertion of the data number is carried out at the array variable wn2 [wc2] specified by this wc2 (S434). The value at the right end of a visual field will be inserted by this as a right edge.

[0039] And wc1 is again compared with wc2 after these amendment processings, when both values are not equal, it means that the response of the number of edges cannot take by amendment, either, and a restart is carried out noting that parking section detection goes wrong (S436).

[0040] After edge amendment is completed as mentioned above, it shifts to the processing which detects a final parking space inlet-port location. The coordinate detected by old processing is an edge coordinate on either side, i.e., the coordinate of the nearest distance data of a parking inlet port. Then, it needs to be processed for computing a true parking space inlet-port coordinate from the these-extracted distance data, and the flow chart of drawing 9 showed this processing. That is, the projective coordinates of the right-and-left edge coordinate to the front-face borderline of parking space first acquired by the 2nd least square method application in S438 are computed. In drawing 9 , (GX1 (i) and GY1 (i)) express the projective coordinates of a left edge coordinate, and (GX2 (i) and GY2 (i)) express the projective coordinates of a right edge coordinate. And in this example, the width of face of the core of parking space and parking space is further computed as an assistant

parameter for guiding a car to parking space. For this reason, that main coordinate (GX (i), GY (i)) and width-of-face w (i) are computed using the parking space inlet-port coordinate (GX1 (i), GY1 (i)) searched for in the above-mentioned S438, (GX2 (i), and GY2 (i)) (S441).

[0041] In this way, although parking space detection is ended as a matter of fact by having computed the width of face of the inlet-port coordinate of parking space, a main coordinate, and parking space, in order to guide a car to this detected parking space actually, it is necessary to compute the angle of parking space and a car to make. Moreover, it is necessary to judge whether it has width of face with the suitable width of face of the parking space computed by the above-mentioned processing for a car to park a car actually.

[0042] So, in this example, the size comparison with width-of-face w (i) and breadth-of-a-car +alpha (a part for the allowances determined supposing the case where alpha opens a door) which were computed is performed (S445), and the inlet-port coordinate (GX1 (ii), GY1 (ii)) with which this condition is filled, (GX2 (ii), and GY2 (ii)) are extracted (S446-S448). as on the other hand, parking space being undetectable, when not fulfilling this condition --- a restart --- or it ends (S449).

[0043] And the attitude angle (angle of a car center line and the front-face borderline of parking space to make) of a car and parking space to make is computed (S450). The vector a showing the direction of a car center line is a=(x (cent) y (cent)). However, cent is expressed focusing on the ranging field angle of a CCD sensor. Therefore, the attitude angle xi is computed by the formula shown by S451 and S452.

[0044] Thus, when the detected parking space is [two or more /(J is two or more)], in this example, the optimal parking space is chosen out of this, and it teaches an operator. That is, G (ii (j)), GX (ii (j)), and GY (ii (j)) which were detected are considered as an input, the induction path to this parking space is calculated, and the existence SC of contact with the obstruction when running this induction path (i) and the count tuch of steering (i) are evaluated. It can ask for this simulation from the physical relationship of the well-known induction path computing method and a self-vehicle, and obstructions (already parked other vehicle). In this example, the applicant for this patent is performing simulation using the modern control theory proposed by Japanese Patent Application No. No. 153560 [three to]. That is, the induction path to parking space is calculated using the equation of state (4) of the car indicated by Japanese Patent Application No. No. 153560 [three to], and SC (i) and tuch (i) are evaluated about each parking space (S453).

[0045] And the contact variable tuch (i) is 0 (that is, it is possible to park a car,

without contacting), and the count SC of steering (i) chooses the minimum parking space (S454), and voice instruction of the parking actuation is carried out at an operator (S455). In addition, when the selected parking space is not the latest parking space, it teaches an operator simultaneously also that. Moreover, what is necessary is just to teach the latest parking space, when there is no difference in two or more existence and counts of steering of contact of parking space.

[0046] In the 1st example of the 2nd example above, although simulation was performed from the relative-position relation between a self-vehicle and parking space, in **** 2 example, it is further characterized by performing more suitable simulation, also taking an operator's operation skill into consideration.

[0047] An operator's operation skill can be grasped objective from the gap with the taught amounts of control and a actual operator's amounts of control. Therefore, the amount of gaps of the instruction amounts of control to last time and actual amounts of control is stored in memory, and if this amount of steering gaps is expected and simulation is performed, in the case of an operator unfamiliar to operation, the possibility and the count of steering of contact will be esteemed and it will be taught to more positive parking space. The conceptual diagram in consideration of the amount of steering gaps of simulation is shown in drawing 15 . It is a simulation locus in case a drawing solid line is the amount zero of steering gaps, and is a simulation locus when a broken line takes the amount of steering gaps into consideration. Only a part with the amount of steering gaps will move in a zigzag direction more greatly.

[0048] The processing flow chart of the 2nd example is shown in drawing 12 thru/or drawing 14 . Drawing 12 thru/or drawing 14 correspond to processing not more than S450 of the 1st example of the above, and the processing before S450 is the same as that of the 1st example. In addition, although a whole configuration is the same as that of the 1st example almost, in the **** 2 example, the amount of steering gaps of an operator's past is stored in memory, and whenever this amount of steering gaps performs parking actuation like the after-mentioned, renewal of sequential of it is carried out.

[0049] G (I (i)), GX (I (i)), GY (simulation is performed using I (i) and an operator's amount (error amount) study value STG of steering gaps.) after parking space was first detected like the 1st example in drawing 12 (S500-S502) Although simulation is performed based on an equation of state like the 1st example, when the amount of steering gaps is stored in the absolute value, the induction path from which steering shifted to right and left to the acquired induction path is computed, and SC (i) and tuch (i) are evaluated (S503). When the amount of steering gaps is stored with a sign

(the case of right steering plus etc.), the amount of study gaps is added to each right steering of a path and left steering which were obtained, and the path shifted is computed.

[0050] And tuch (i) in consideration of the amount of steering gaps of an induction path judges altogether whether it is 1 (S505), when the path which it is not 1 altogether, i.e., does not contact exists, SC (i) chooses the minimum parking space further in this tuch(i) =0 (S506), and it teaches an operator (S507). In addition, when the latest parking space is not chosen, it is the same as that of the 1st example to report that to an operator.

[0051] On the other hand, in tuch's (i's)'s being 1 altogether, i.e., contacting in all paths, it performs simulation at the time of setting the amount STG of steering gaps to 0 further (S508). This is processing for distinguishing whether it is possible to park a car, without contacting, when contacting theoretically [this] also in the path estimated as those of contact with possibility in consideration of the amount of steering gaps even if the amount of steering gaps is zero, or the amount of steering gaps is zero.

[0052] And since (S509) and parking are impossible when it is tuch(i) =1 in all paths in addition, even if it makes the amount of steering gaps into zero, voice instruction of that is carried out at an operator, and processing is ended. Moreover, when the path whose tuch (i) is not 1 exists, ST (i) chooses the minimum path in this path (S510), and voice instruction of an operator having fear of contact is carried out at the parking path chosen after teaching (S513 in drawing 14). In addition, since there is possibility of contact, an operator can also be made to choose whether a course guidance is continued (S512).

[0053] After instruction is completed, the absolute value of this target steering angle and a actual steering angle is computed, and it is STG1. It stores and they are weighting operation STG= (alpha STG+beta STG1) / (alpha+beta).

It is alike and the amount of steering gaps is updated more. Thereby, the amount of steering gaps can always be made into the optimum value of an operator proper.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is automatic parking structure-of-a-system drawing in one example of this invention.

[Drawing 2] It is the block diagram of the CCD area sensor in this example.

[Drawing 3] It is the ranging explanatory view of this example.

[Drawing 4] It is the processing flow chart of this example.

[Drawing 5] It is the processing flow chart of this example.

[Drawing 6] It is the processing flow chart of this example.

[Drawing 7] It is the processing flow chart of this example.

[Drawing 8] It is the processing flow chart of this example.

[Drawing 9] It is the processing flow chart of this example.

[Drawing 10] It is the processing flow chart of this example.

[Drawing 11] It is the processing flow chart of this example.

[Drawing 12] It is the processing flow chart of other examples of this invention.

[Drawing 13] It is the processing flow chart of this example.

[Drawing 14] It is the processing flow chart of this example.

[Drawing 15] It is the conceptual diagram of the simulation locus of this example.

[Drawing 16] It is a parking space detection explanatory view.

[Drawing 17] It is drawing showing the relation between parking space and the halt location of a self-vehicle.

[Description of Notations]

10 CCD Area Sensor

12 ECU for Ranging

14 ECU for Automatic Parking Control

[Translation done.]

SATELLITE NAVIGATION TERMINAL DEVICE

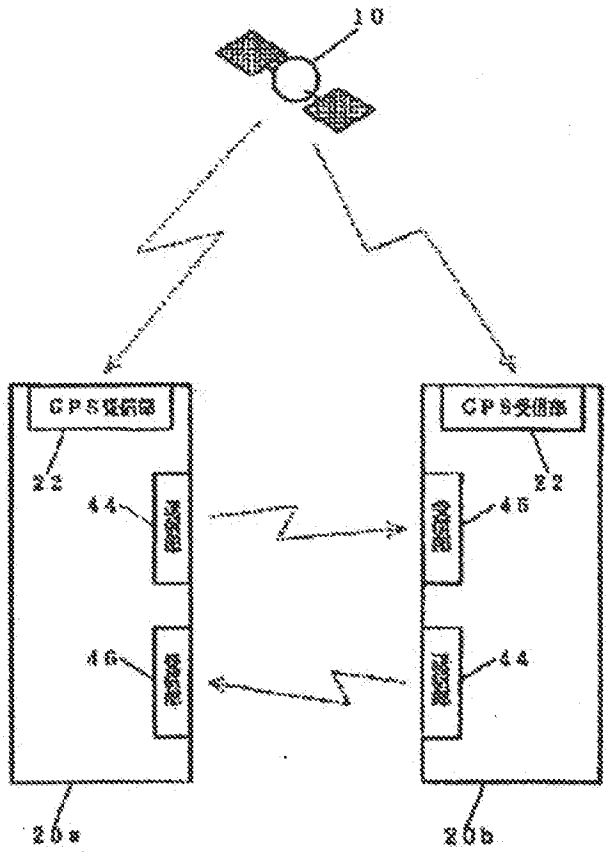
Publication number: JP6289118
Publication date: 1994-10-18

Inventor: KUBO MORIKUNI
Applicant: SEGA ENTERPRISES KK

Classification:
- international: *G01C21/00; G01S5/14; G06F17/30; H04B7/26; H04Q7/34;* G01C21/00; G01S5/14; G06F17/30; H04B7/26; H04Q7/34; (IPC1-7): G01S5/14; G01C21/00; H04B7/26
- European:
Application number: JP19930074573 19930331
Priority number(s): JP19930074573 19930331

Abstract of JP6289118

PURPOSE:To provide a satellite navigation terminal device which displays not only one's own coordinate position but also the coordinate position of other satellite navigation terminal device, and can effectively utilize each recognized position information. CONSTITUTION:A satellite navigation terminal device 20a has a GPS receiving section 22 having a built-in antenna for receiving a satellite signal sent from a plurality of GPS satellites 10, a character display section and an image display section which display ones own coordinate position computed on the satellite signal fed from the GPS receiving section 22, and a transmitting section 44 and a receiving section 46 which communicate coordinate position data to other satellite navigation terminal devices. Thus the data communication with other satellite navigation terminal device 20b becomes practicable, and ones own and others coordinate positions can be simultaneously imagingly displyed as a point on the same map.



(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平6－289118

(43)公開日　平成６年(1994)10月18日

(51)Int.Cl.⁵	識別記号	庁内整理番号	Ｆ Ｉ	技術表示箇所
Ｇ０１Ｓ　5/14		4240－5Ｊ		
Ｇ０１Ｃ　21/00		Ｚ		
Ｈ０４Ｂ　7/26	１０６	Ａ　7304－5Ｋ		

審査請求　未請求　請求項の数４　ＯＬ　（全７頁）

(21)出願番号　特願平5－74573

(22)出願日　平成５年(1993)３月31日

(71)出願人　000132471
株式会社セガ・エンタープライゼス
東京都大田区羽田１丁目２番12号

(72)発明者　久保　盛国
東京都大田区羽田１丁目２番12号　株式会社セガ・エンタープライゼス内

(74)代理人　弁理士　北野　好人

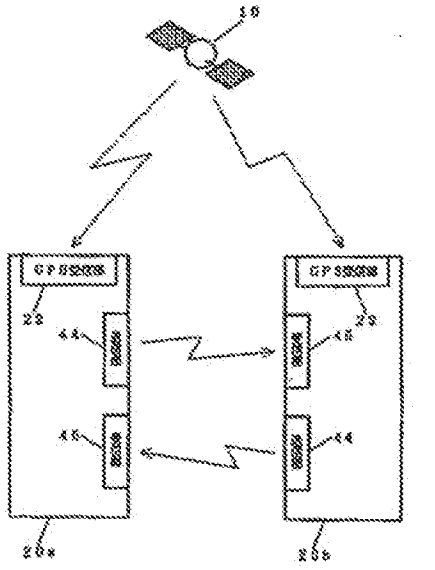
(54)【発明の名称】　衛星ナビゲーション端末装置

(57)【要約】

【目的】本発明は、自己の座標位置を表示するのみならず、他の衛星ナビゲーション端末装置の座標位置を表示し、各自の認識した位置情報を有効に利用することができる衛星ナビゲーション端末装置を提供することを目的とする。

【構成】衛星ナビゲーション端末装置２０ａは、複数のＧＰＳ衛星１０から送信される衛星信号を受信するアンテナを内蔵するＧＰＳ受信部２２及びＧＰＳ受信部２２からの衛星信号に基づいて算出した自己の座標位置を表示する文字表示部３６及び映像表示部３８と共に、他の衛星ナビゲーション端末装置と座標位置データを通信するための送信部４４及び受信部４６を有している。これにより、他の衛星ナビゲーション端末装置２０ｂとデータ通信することができ、自他の座標位置を同一画面の地図上の点として同時に映像表示することが可能になる。

本発明の一実施例による衛星ナビゲーション端末システムの全体を示すブロック図



10－ＧＰＳ衛星
20ａ，20ｂ－衛星ナビゲーション端末装置

1

【特許請求の範囲】

【請求項1】　衛星からの信号を受信する衛星信号受信部と、前記衛星信号受信部からの信号に基づいて自己の座標位置を算出する信号処理部と、前記信号処理部によって算出した自己の座標位置を表示する表示部とを有する衛星ナビゲーション端末装置において、

前記自己の座標位置についての情報を他の衛星ナビゲーション端末装置に送信する送信部と、

前記他の衛星ナビゲーション端末装置から送信されてきた座標位置についての情報を受信する受信部とを有し、

前記他の衛星ナビゲーション端末装置の座標位置を前記表示部に表示することを特徴とする衛星ナビゲーション端末装置。

【請求項2】　請求項1記載の衛星ナビゲーション端末装置において、

前記送信部が、前記自己の座標位置についての情報を自動的に送信する送信部であり、

前記受信部が、前記他の衛星ナビゲーション端末装置から送信されてきた座標位置についての情報を自動的に受信する受信部であることを特徴とする衛星ナビゲーション端末装置。

【請求項3】　請求項1又は2に記載の衛星ナビゲーション端末装置において、

前記表示部が、前記自己の座標位置と前記他の衛星ナビゲーション端末装置の座標位置とを同一画面上に同時に映像表示する表示部であることを特徴とする衛星ナビゲーション端末装置。

【請求項4】　請求項1乃至3のいずれかに記載の衛星ナビゲーション端末装置において、

前記他の衛星ナビゲーション端末装置と交信する音声入出力部を有することを特徴とする衛星ナビゲーション端末装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は衛星ナビゲーション端末装置に関する。近年、複数の人工衛星から送られてくる衛星信号により受信位置を極めて正確に知ることができるＧＰＳ（Global Positioning System）が普及しつつある。例えば自動車等に衛星ナビゲーション端末装置を搭載し、この衛星ナビゲーション端末装置によりＧＰＳ衛星からの衛星信号を受信することにより、自動車等の正確な位置をリアルタイムで測定することができる。

【0002】

【従来の技術】従来の衛星ナビゲーション端末装置を、図4に示すブロック図を用いて説明する。従来の衛星ナビゲーション端末装置は、複数のＧＰＳ衛星１０から送信される衛星信号を受信するＧＰＳ受信部２２、地図情報を記録したマップ用ＲＯＭ２８、操作入力部３４、文字表示部３６及び映像表示部３８が設けられ、それぞれインターフェイス２４を介して、ＣＰＵ２６に接続されている。また、ＣＰＵ２６には、ＲＡＭ５２、ＲＯＭ５４及びマップ用ＲＯＭ５６がそれぞれ接続されている。

2

【0003】そして複数のＧＰＳ衛星１０から送信される衛星信号をＧＰＳ受信部２２が受信し、このＧＰＳ受信部２２が受信した衛星信号に基づいて、ＣＰＵ２６が自己の座標位置を算出する。次いで、このＣＰＵ２６が算出した衛星ナビゲーション端末装置の座標位置を文字表示部３６に文字表示するか、或いはマップ用ＲＯＭ２８の地図情報と合わせて映像表示部３８に地図上の点として映像表示する。

【0004】

【発明が解決しようとする課題】しかしながら、上記従来の衛星ナビゲーション端末装置においては、その衛星ナビゲーション端末装置の自身の座標位置しか認識することができず、例えば同時に移動している他の衛星ナビゲーション端末装置の座標位置を認識することができなかった。従って、自分自身の座標位置は正確に認識できるものの、他の衛星ナビゲーション端末装置の座標位置を同時に認識することができないため、認識した各自の位置情報を有効に利用することに欠けるという問題があった。

【0005】そこで本発明は、自己の座標位置を表示するのみならず、他の衛星ナビゲーション端末装置の座標位置を表示し、各自の認識した位置情報を有効に利用することができる衛星ナビゲーション端末装置を提供することを目的とする。

【0006】

【課題を解決するための手段】上記課題は、衛星からの信号を受信する衛星信号受信部と、前記衛星信号受信部からの信号に基づいて自己の座標位置を算出する信号処理部と、前記信号処理部によって算出した自己の座標位置を表示する表示部とを有する衛星ナビゲーション端末装置において、前記自己の座標位置についての情報を他の衛星ナビゲーション端末装置に送信する送信部と、前記他の衛星ナビゲーション端末装置から送信されてきた座標位置についての情報を受信する受信部とを有し、前記他の衛星ナビゲーション端末装置の座標位置を前記表示部に表示することを特徴とする衛星ナビゲーション端末装置によって達成される。

【0007】また、上記の衛星ナビゲーション端末装置において、前記送信部が、前記自己の座標位置についての情報を自動的に送信する送信部であり、前記受信部が、前記他の衛星ナビゲーション端末装置から送信されてきた座標位置についての情報を自動的に受信する受信部であることを特徴とする衛星ナビゲーション端末装置によって達成される。

【0008】また、上記の衛星ナビゲーション端末装置において、前記表示部が、前記自己の座標位置と前記他の衛星ナビゲーション端末装置の座標位置とを同一画面上に同時に映像表示する表示部であることを特徴とする

衛星ナビゲーション端末装置によって達成される。更に、上記の衛星ナビゲーション端末装置において、前記他の衛星ナビゲーション端末装置と交信する音声入出力部を有することを特徴とする衛星ナビゲーション端末装置によって達成される。

【０００９】

【作用】本発明は、複数の衛星ナビゲーション端末装置のそれぞれに、自己の座標位置についての情報を送信する送信部と他の衛星ナビゲーション端末装置から送信されてきた座標位置についての情報を受信する受信部とを有することにより、複数の衛星ナビゲーション端末装置間で相互に自他の座標位置についての情報を送受信することができるため、同一の表示部に自他の座標位置を同時に表示することが可能となる。従って、相互の位置関係を視覚的に把握することができる。

【００１０】また、他の衛星ナビゲーション端末装置と交信する音声入出力部を有することにより、相互の位置関係の視覚的な表示と並行して音声会話をすることが可能となる。従って、複数の衛星ナビゲーション端末装置間で新しい形態の通信コミュニケーションを実現することができる。

【００１１】

【実施例】本発明の一実施例による衛星ナビゲーション端末システム及び衛星ナビゲーション端末装置を図１乃至図３を用いて説明する。図１は衛星ナビゲーション端末システムの全体を示すブロック図であり、図２はその衛星ナビゲーション端末システムにおける衛星ナビゲーション端末装置を示すブロック図であり、図３はその衛星ナビゲーション端末装置の外観を示す斜視図である。

【００１２】本実施例による衛星ナビゲーション端末システムは、図１に示されるように、ＧＰＳ衛星１０からの衛星信号を受信する衛星ナビゲーション端末装置２０ａ、２０ｂにより構成される。通常の場合、これらの衛星ナビゲーション端末装置２０ａ、２０ｂは、例えば自動車や船舶等に搭載されて移動している。尚、ここでは説明の都合上、衛星ナビゲーション端末装置の数を２個としてが、この数に限定する必要はなく、３個以上の場合にも本実施例を適用することができる。

【００１３】次に、衛星ナビゲーション端末装置２０ａ、２０ｂは全く同一の構成であるため、一方の衛星ナビゲーション端末装置２０ａについて説明し、他方の衛星ナビゲーション端末装置２０ｂの説明は省略する。衛星ナビゲーション端末装置２０ａは、図１乃至図３に示されるように、複数のＧＰＳ衛星１０から送信される衛星信号を受信するアンテナを内蔵するＧＰＳ受信部２２を有し、このＧＰＳ受信部２２はインターフェイス２４を介して信号処理部としてのＣＰＵ２６に接続されている。また、このＣＰＵ２６には、地図情報を記録したマップ用ＲＯＭ２８、各種の操作入力用ボタン３０及び操作入力用ペン３２からなる操作入力部３４、文字表示部３６及び映像表示部３８を兼用するディスプレイ部４０が、それぞれインターフェイス２４を介して接続されている。

【００１４】また、ＣＰＵ２６には、送受信用アンテナ４２を用いて他の衛星ナビゲーション端末装置とデータ通信及び音声データを通信するための送信部４４及び受信部４６並びに音声入力部４８及び音声出力部５０がインターフェイス２４を介して接続されている点に、本実施例の特徴がある。更に、ＣＰＵ２６には、ＧＰＳ受信部２２からの衛星信号を一時的に格納したり、他の衛星ナビゲーション端末装置からの通信データ等を一時的に格納するＲＡＭ５２、初期設定等の立上げに必要なプログラムやその他の基本的なプログラム等が格納されているＲＯＭ５４、及び地図情報を記録したマップ用ＲＯＭ５６がそれぞれ接続されている。

【００１５】そして衛星ナビゲーション端末装置２０ａには、マップ用ＲＯＭ２８等の記録媒体を挿入するための記録媒体挿入口５８及び外部装置とのデータのやり取りをするための入出力端子６０が設けられている。次に、動作を説明する。まず、複数のＧＰＳ衛星１０から送信される衛星信号をＧＰＳ受信部２２が受信し、このＧＰＳ受信部２２が受信した衛星信号に基づいて、ＣＰＵ２６が衛星ナビゲーション端末装置２０ａの座標位置を算出する。そしてこのＣＰＵ２６がを算出した座標位置をディスプレイ部４０に文字表示するか、或いはマップ用ＲＯＭ２８の地図情報と合わせて地図上の点として映像表示する。

【００１６】次いで、他の衛星ナビゲーション端末装置２０ｂと通信し、その座標位置を自己の座標位置と共にディスプレイ部４０に文字表示するか、或いは地図上の点として映像表示する。このようにして、自他の衛星ナビゲーション端末装置２０ａ、２０ｂの座標位置を同時に文字表示したり、同一画面の地図上の点として同時に映像表示することができる点に本実施例の特徴がある。

【００１７】ところで、この場合の他の衛星ナビゲーション端末装置２０ｂとの通信方法には、種々の方法が考えられる。例えば最も単純な方法として、トランシーバーのごとき無線通信等を用いた音声通信により、他方の座標位置を聞き取り、自己の衛星ナビゲーション端末装置２０ａの操作入力部３４を通じて入力する方法がある。

【００１８】また、携帯電話回線等を用いて、他の衛星ナビゲーション端末装置２０ｂのＧＰＳ受信部２２が受信した衛星信号をそのまま転送するか、或いは他の衛星ナビゲーション端末装置２０ｂのＣＰＵ２６が算出した座標位置情報をデータ送信することもできる。この場合、こうしたデータ通信と並行して例えば無線通信等による音声会話を行うことも可能である。

【００１９】更に、携帯電話回線等を用いて、必要に応じて一方が他方を呼び出し、上記のようなデータ通信を

行うマニュアル方式を採用してもよいが、一定の時間間隔をおいて、相互に自動的に送信し、かつ自動的に受信する方式を採用してもよい。特に後者の方式は、衛星ナビゲーション端末装置が多数ある場合に、それぞれ一定の時間をずらして定期的に自動送受信することにより、多数の衛星ナビゲーション端末装置の位置を全体的に把握することができる等の利点がある。

【００２０】このように本実施例によれば、複数の衛星ナビゲーション端末装置２０ａ、２０ｂはそれぞれ送信部４４及び受信部４６を有することにより、各自の座標位置について他の衛星ナビゲーション端末装置と相互にデータ通信することができるため、自他の座標位置をディスプレイ部４０に同時に文字表示したり、同一画面の地図上の点として同時に映像表示したりすることができる。従って、複数の衛星ナビゲーション端末装置２０ａ、２０ｂの相互の位置関係を視覚的に把握することが可能となり、各衛星ナビゲーション端末装置が認識した位置情報の有効利用を図ることができる。

【００２１】また、複数の衛星ナビゲーション端末装置２０ａ、２０ｂはそれぞれ音声入力部４８及び音声出力部５０を有することにより、互いに他の衛星ナビゲーション端末装置と音声通信することができるため、複数の衛星ナビゲーション端末装置２０ａ、２０ｂの相互の位置関係の視覚的な把握と音声会話とを併用することが可能となる。従って、新しい形態の連絡コミュニケーションを実現することができる。

【００２２】尚、本発明は上記実施例に限らず種々の変形が可能である。複数の衛星ナビゲーション端末装置２０ａ、２０ｂ間の通信方法については既に述べたが、例えばその際の音声通信は、上記実施例のようにＣＰＵ２６を介することなく行うことも可能である。また、複数の衛星ナビゲーション端末装置２０ａ、２０ｂは、通常、自動車や船舶等に搭載されているとしたが、その小型化、軽量化に伴って、種々の携帯方法を採ることが可能である。従って、例えば複数のグループが連携した行動をとる場合のみならず子供の迷子防止用にも、本発明を適用した衛星ナビゲーション端末装置を携帯する等の利用方法が考えられる。

【００２３】

【発明の効果】以上のように本発明によれば、衛星からの信号を受信し、その受信した信号に基づいて自己の座標位置を算出し、その算出した自己の座標位置を表示する衛星ナビゲーション端末装置において、自己の座標位置についての情報を他の衛星ナビゲーション端末装置に送信する送信部と、他の衛星ナビゲーション端末装置から送信されてきた座標位置についての情報を受信する受信部とを有することにより、複数の衛星ナビゲーション端末装置間で相互に自他の座標位置についての情報を送受信することができるため、同一の表示部に自他の座標位置を同時に表示することができる。また、他の衛星ナビゲーション端末装置と交信する音声入出力部を有することにより、相互に音声会話をすることもできる。

【００２４】これにより、複数の衛星ナビゲーション端末装置の相互の位置関係を視覚的に把握することが可能となるため、各衛星ナビゲーション端末装置が認識した位置情報の有効利用を図ることができると共に、視覚的な把握と音声会話とを併用することが可能となるため、新しい形態の連絡コミュニケーションを実現することができる。

【図面の簡単な説明】

【図１】本発明の一実施例による衛星ナビゲーション端末システムの全体を示すブロック図である。

【図２】図１に示す衛星ナビゲーション端末システムにおける衛星ナビゲーション端末装置を示すブロック図である。

【図３】図２に示す衛星ナビゲーション端末装置の外観を示す斜視図である。

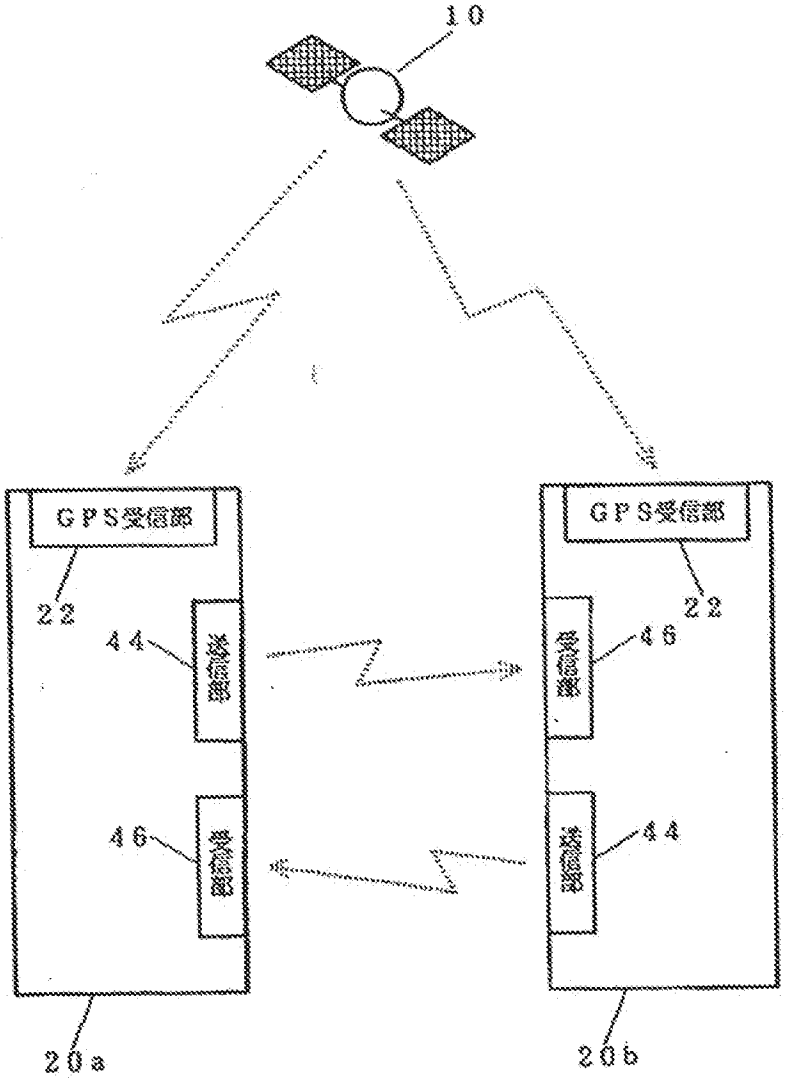
【図４】従来の衛星ナビゲーション端末装置を示すブロック図である。

【符号の説明】

１０…ＧＰＳ衛星
２０ａ、２０ｂ…衛星ナビゲーション端末装置
２２…ＧＰＳ受信部
２４…インターフェイス
２６…ＣＰＵ
２８…マップ用ＲＯＭ
３０…操作入力用ボタン
３２…操作入力用ペン
３４…操作入力部
３６…文字表示部
３８…映像表示部
４０…ディスプレイ部
４２…送受信用アンテナ
４４…送信部
４６…受信部
４８…音声入力部
５０…音声出力部
５２…ＲＡＭ
５４…ＲＯＭ
５６…マップ用ＲＯＭ
５８…記録媒体挿入口
６０…入出力端子

【図1】

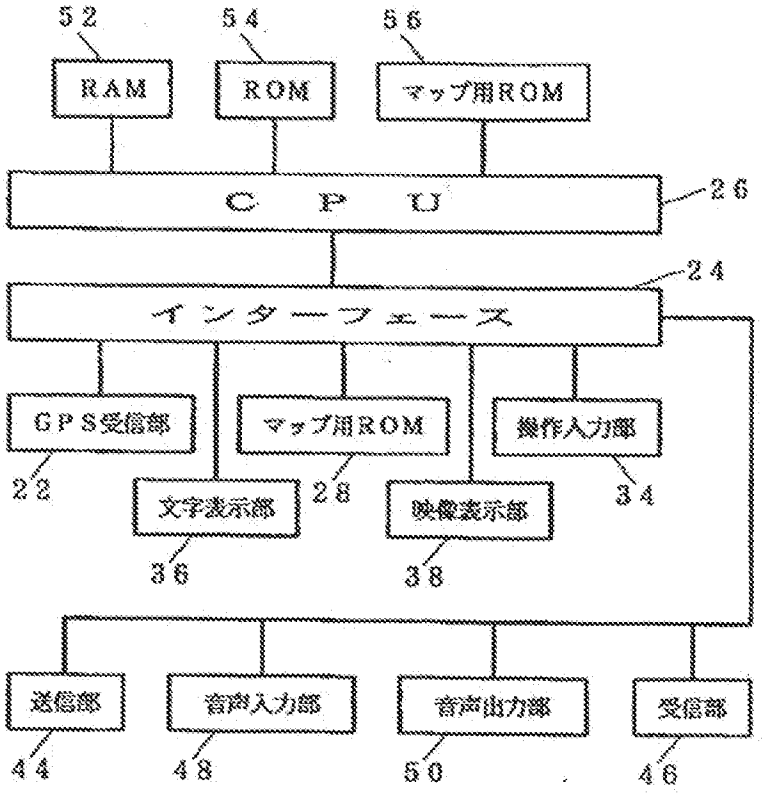
本発明の一実施例による衛星ナビゲーション端末システムの全体を示すブロック図



10…GPS衛星
20a、20b…衛星ナビゲーション端末装置

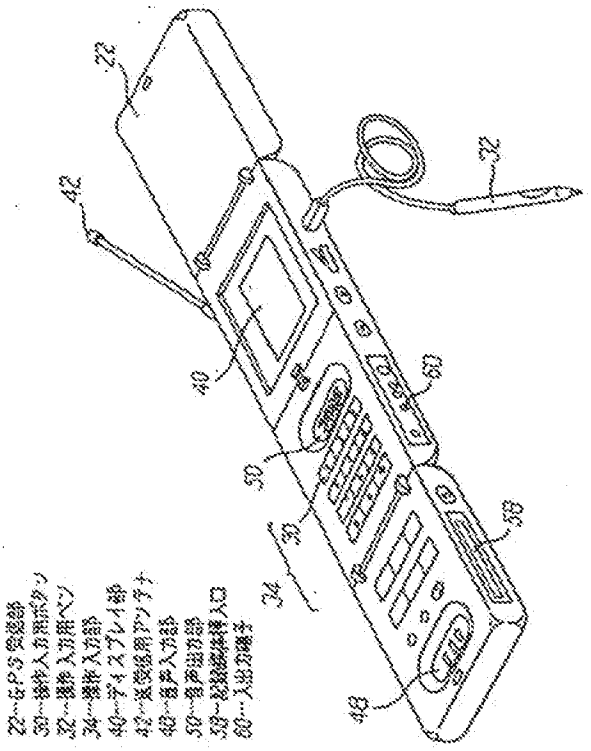
【図2】

図1に示す衛星ナビゲーション端末システムにおける衛星ナビゲーション端末装置を示すブロック図



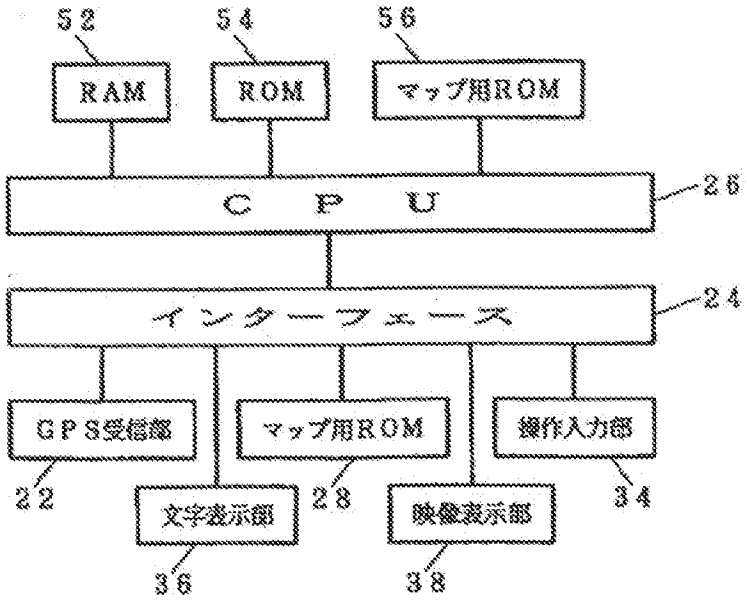
【図3】

図2に示す衛星ナビゲーション端末装置の外観を示す斜視図



【図4】

従来の衛星ナビゲーション端末装置を示すブロック図



Reference No.: A997430 Mailing No.: 220162

Mailing Date: April 22, 2008

NOTICE OF REASONS FOR REJECTION

(Translation)

Patent Application No.: 11-504866

Drafting Date: April 14, 2008

Patent Office Examiner: Kaoru Kida

Attorney for Applicant: Takashi Ishida et al.

Article Applied: Article 29, Paragraph 2

It is deemed that this application should be rejected for the following reasons. Any argument should be submitted in writing within three months from the mailing date of this notice.

REASON

The inventions described in the claims, indicated in the remarks below, of this application are deemed ones which could easily have been made, prior to the filing of this application, by a person with ordinary skill in the art to which the invention pertains, on the basis of the invention described in the publication, cited in the remarks below, distributed in Japan or foreign country prior to the filing of this application and, therefore, are unpatentable under Article 29, paragraph 2 of the Patent Law.

Re: Claims 1-4

Cited references 1 and 2

Note:

Reference 1 describes determining a area where the vehicle is located, by vehicle location determining unit 3, adding additional information to a map of the area, and displaying the map. Further, reference 1 describes displaying more detailed information by selecting the additional information by key input (refer to paragraphs (0019),(0024),(0025),(0027) and (0028)).

Comparing the invention described in claim 1 with the invention described in reference 1, "additional information" described in reference 1 corresponds to "markers" described in claim 1, and "more detailed information" described in reference 1 corresponds to "further additional data" described in claim 1.

In addition, in the invention described in claim 1, GPS means determines a location of the personal digital communicator. On the other hand, in the invention described in reference 1, it is unclear as to what vehicle location determining unit 3 uses in order to determine the location of the vehicle. Accordingly, with respect this matter, the invention described in claim 1 differs from the invention described in reference 1 (difference 1).

Further, in the invention described in claim 1, a map is downloaded. On the other hand, in the invention described in reference 1, map information is read out from the record medium. Accordingly, with respect this matter, the invention described in claim 1 differs from the invention described in reference 1 (difference 2).

Difference 1:

A means for determining a location by means of GPS is

well-known art (if need be, please refer to paragraph (0012) of reference 2). Therefore, a person with ordinary skill in the art could easily have employed GPS as the means for determining a location in the invention described in reference 1.

Difference 2:

Reference 2 describes receiving map information and other information, and thereby displaying needed information, without a recording medium which previously stores the map information (refer to paragraphs (0005)-(0006)). Therefore, a person with ordinary skill in the art could easily have applied the technique described in reference 2 to the invention described in reference 1, so that the map information is downloaded, but not read out from the recording medium in the invention described in reference 1.

Accordingly, the invention described in claim 1 could easily have been conceived by a person with ordinary skill in the art, on the basis of references 1 and 2.

Similarly, the inventions described in claims 2-4 could easily have been conceived by a person with ordinary skill in the art.

Re: Claim 5

Cited references 1 and 2

Note:

Password authentication is well-known art.

Re: Claims 6 and 7

Cited references 1-3

Note:

Reference 3 describes a satellite navigation terminal device which sends the coordinates of the location of the device to other plurality of satellite navigation terminal devices. Reference 3 also describes that each user of the device can visually understand the relationship among the locations of the devices (refer to paragraph (0009)). Further, a person with ordinary skill in the art could easily have applied the technique described in reference 3 to the invention described in reference 1.

Therefore, the inventions described in claims 6 and 7 could easily have been conceived by a person with ordinary skill in the art.

LIST OF CITED REFERENCES

1. Japanese Unexamined Patent Publication No.7-36382
2. Japanese Unexamined Patent Publication No.6-294659
3. Japanese Unexamined Patent Publication No.6-289118

Record of Results of Prior Art Search

- Technical Fields Searched: IPC G06F 17/30

Name of Data Base: JICST

This Record of Results of Prior Art Search does not constitute a reason for rejection.

For inquiries on the contents of this Notice of Reasons for Rejection or an interview on this case, please contact the following:

Examiner: Kaoru Kida
E-commerce Div., 4th Examination Dpt.
Tel: 03-3581-1101, Ext: 3598
Fax: 03-3501-0737

MAP DISPLAY

Publication number: JP6294659

Publication date: 1994-10-21

Inventor: SERIGUCHI HIDEJI; SATO SHUNICHI; KUNUGI TADASHI

Applicant: DAINIPPON PRINTING CO LTD

Classification:

- International: *G01C21/00; G06F17/30; G08G1/0969; G09B29/10; H04B7/155; H04B7/26; H04Q7/34;* G01C21/00; G06F17/30; G08G1/0969; G09B29/10; H04B7/155; H04B7/26; H04Q7/34; (IPC1-7): G01C21/00; G08G1/0969; G09B29/10; H04B7/155; H04B7/26

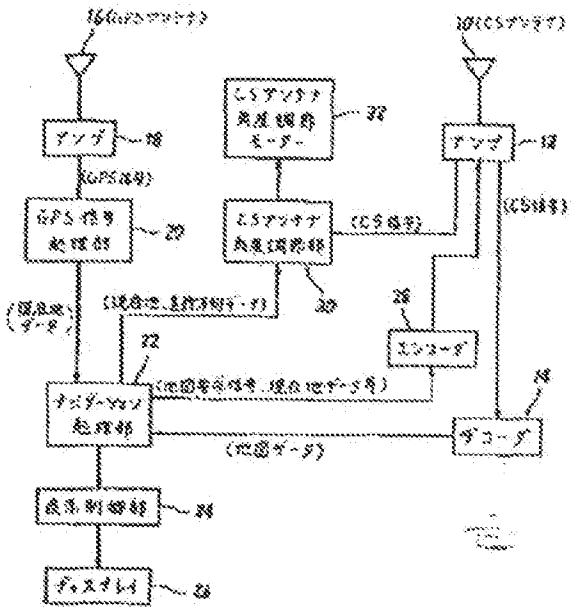
- European:

Application number: JP19930079915 19930407

Priority number(s): JP19930079915 19930407

Abstract of JP6294659

PURPOSE:To obtain a navigation system requiring no memory medium for previously recording map information by providing means for displaying map information, measuring the position, and controlling the display. CONSTITUTION:A GPS signal processing section 20 calculates a current position which is delivered to a navigation processing section 22 where a decision is made whether a map data corresponding to current position is present or not. When the map data is not present, the processing section 22 inputs a necessary data and adjusts the angle of a CS antenna 10. A map data request generated at the processing section, current position data, etc., are the transmitted through a communication satellite CS to a map providing station. A necessary map is selected on the station side and transmitted to a vehicle. The map data received on the vehicle side is delivered through a decoder 14 to the processing section 22 thence delivered, along with the current position data, to a display control section 24. The control section 24 presents the map data on a display 26 and displays the current position data on the map.



(19)日本国特許庁（JP）　(12)公開特許公報（A）　(11)特許出願公開番号
特開平6－294659
(43)公開日　平成6年(1994)10月21日

(51)Int.Cl.*	識別記号	庁内整理番号	FI	技術表示箇所
G01C 21/00		N		
G08G 1/0969			7531－2N	
G09B 29/10		A	7517－2C	
H04B 7/155			8226－5K	
7/26	106		7304－5K	

審査請求　未請求　請求項の数1　OL　（全 6 頁）

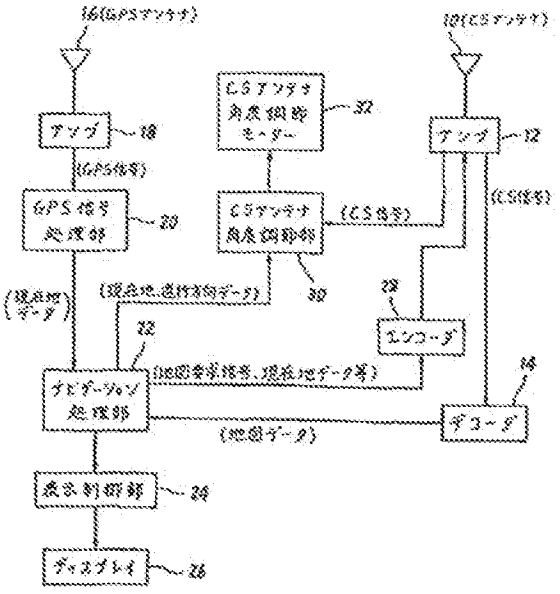
(21)出願番号　特願平5－79915

(22)出願日　平成5年(1993)4月7日

(71)出願人　000002897
大日本印刷株式会社
東京都新宿区市谷加賀町一丁目1番1号
(72)発明者　戸口　秀治
東京都新宿区市谷加賀町一丁目1番1号
大日本印刷株式会社内
(72)発明者　佐藤　俊一
東京都新宿区市谷加賀町一丁目1番1号
大日本印刷株式会社内
(72)発明者　功力　正
東京都新宿区市谷加賀町一丁目1番1号
大日本印刷株式会社内
(74)代理人　弁理士　高矢　諭　（外2名）

(54)【発明の名称】　地図表示装置

(57)【要約】
【目的】　予め地図情報が記録されている記憶媒体を必要としないナビゲーションシステムを提供する。
【構成】　通信衛星から地図情報とその他の情報をＣＳ信号としてＣＳアンテナ１０で受信し、それをアンプ１２で増幅した後、地図データに変換するためのデコーダ１４と、ＧＰＳ衛星からＧＰＳ信号をＧＰＳアンテナ１６で受信し、それをアンプ１８で増幅した後、ＧＰＳ信号から現在地データを生成するＧＰＳ信号処理部２０と、デコーダ１４からの地図データとＧＰＳ信号２０からの現在地データを画像信号に変換するためのナビゲーション処理部２２と、該ナビゲーション処理部２２で変換された画像信号を基に地図情報と現在地をディスプレイ２６に表示し、現在地を地図上の該当位置に一致させる表示制御部２４とを備えた地図表示装置。



1

【特許請求の範囲】
【請求項1】地図情報と位置情報とを画面上に表示する地図表示装置において、
通信衛星を介して伝送されてくる地図情報を受信し、それを画像信号に変換して画面に表示する手段と、
現在位置を検出して位置情報を生成する位置測定手段と、
位置測定手段からの位置情報に基づいて、現在位置を画面に表示すると共に、該現在位置を地図上の該当位置に一致させる表示制御手段と、を備えていることを特徴とする地図表示装置。
【発明の詳細な説明】
【0001】
【産業上の利用分野】本発明は、地図表示装置、特に、通信衛星を介して地図情報を受信し、それを画面上に表示すると共に、別途測定した現在位置を、その該当する地図上に重ねて表示することができる地図表示装置に関する。
【0002】
【従来の技術】一般に、地図は製本された形態で用いられるため、必要な場所を捜す際には、頁を捲る作業が必要である。従って、運転中に地図で現在位置を確認することは極めて不便である。
【0003】一方、車載用ナビゲーションシステムが最近増加してきている。このようなナビゲーションシステムに用いられる地図表示装置としては、例えば特開平4－98287に開示されている、操作盤から入力された地名等の情報に従って、所望の地図を地図情報記憶媒体から検索し、それを読込んで画面に表示するものが知られている。
【0004】
【発明が解決しようとする課題】しかしながら、前記従来の地図表示装置では、地図情報記憶媒体としてCD－ROM又はICカード等が使用されているため、ランダムアクセスができ、しかもアクセス時間が短いというメリットがあるものの、常に記憶容量の制約を受けるために表示内容の精彩さや使用可能な色数に制限がある上に、記憶媒体及び装置自体の価格が高いという問題がある。
【0005】本発明は、前記従来の問題点を解決するべくなされたもので、予め地図情報が記録されている地図媒体を用意することなく、必要な地図情報を画面に表示できると共に、その地図上に現在位置等を表示することができ、更に他の様々な情報をも表示することができる地図表示装置を提供することを課題とする。
【0006】
【課題を解決するための手段】本発明は、地図情報と位置情報とを画面上に表示する地図表示装置において、通信衛星を介して伝送されてくる地図情報を受信し、それを画像信号に変換して画面に表示する手段と、現在位置を検出して位置情報を生成する位置測定手段と、位置測定手段からの位置情報に基づいて、現在位置を画面に表示すると共に、該現在位置を地図上の該当位置に一致させる表示制御手段と、を備えた構成とすることにより、前記課題を達成したものである。

2

【0007】
【作用】本発明においては、地図情報を通信衛星（CS）から受取り、それを、例えば車載テレビの液晶やブラウン管からなる画面に表示すると共に、測定した現在位置を同画面に表示し、その現在位置を画面上の地図の該当位置に一致させるようにしたので、前もって地図情報を準備しておくことなく、様々の地図情報を受信して表示することが可能となり、その結果地図表示装置をナビゲーションシステムとして利用することが可能となる。
【0008】又、併せて、通信衛星から例えば旅行ガイド等のその他の情報をも受信して画面に表示することにより、例えば旅行ガイド付きナビゲーションシステムとしても利用することが可能となる。
【0009】本発明において、現在位置を検出して位置情報を生成する位置測定手段としては、例えば全地球的測位システム（Global Positioning System：GPS）を利用でき、このGPSにより現在位置を検出し、それを画面に表示することにより、現在位置を上記地図情報に重ねて表示することができる。
【0010】
【実施例】以下、図面を参照して、本発明の実施例を詳細に説明する。
【0011】図1は、本発明に係る一実施例の地図表示装置の要部構成を示すブロック図である。本実施例は、車載テレビ（図示せず）をナビゲーションシステムとして利用する場合の例である。
【0012】本実施例の地図表示装置は、通信衛星（CS）を介して送られてくる地図情報やその他の情報をCS信号としてCSアンテナ10で受信し、それをアンプ12で増幅した後、地図データ等に変換するためのデコーダ14と共に、GPS衛星から送られてくるGPS信号をGPSアンテナ16で受信し、それをアンプ18で増幅した後、GPS信号から現在位置データを生成するためのGPS信号処理部20とを備えており、上記デコーダ14及びGPS信号処理部20でそれぞれ処理された信号がナビゲーション処理部22に入力されるようになっている。
【0013】上記ナビゲーション処理部22は、GPS信号処理部20から入力される情報（現在地データ）に基づいて現在位置等の位置情報を、例えばNTSC信号等のテレビ用信号に変換し、それを表示制御部24に出力すると共に、デコーダ14から入力される地図データ等をテレビ画面に表示可能な画像信号に変換し、それを同じく表示制御部24に出力する機能を有している。

【００１４】この表示制御部２４は、ナビゲーション処理部２２及びデコーダ１４からそれぞれ上記データ信号が入力されると、車載テレビの、例えば液晶画面（ディスプレイ）２６に地図情報を表示すると共に、現在位置等をそれに重ねて表示し、且つ、この現在位置が、地図情報上の該当する位置に一致するように制御する機能を有している。

【００１５】上記ナビゲーション処理部２３からは、地図要求信号と、ＧＰＳ信号処理部２０から入力された現在地データがエンコーダ２８に入力され、それが符号化されてアンプ１２を介してＣＳアンテナ１０から通信衛星へ発信されるようになっている。

【００１６】又、このナビゲーション処理部２２からは、現在地データと進行方向データがＣＳアンテナ角度調節部３０に入力されるようになっており、このＣＳアンテナ角度調節部３０は、これらデータとアンプ１２から入力されるＣＳ信号とに基づいてＣＳアンテナを向けるべき最適受信角度を算出し、その算出結果に基づいてＣＳアンテナ角度調節モータ３２を駆動し、ＣＳアンテナ１０を最適角度に設定できるようになっている。

【００１７】次に、本実施例の作用を、図２、図３のフローチャートに従って説明する。なお、ここでは、図４に概念的に示すように、前記地図表示装置を搭載している車両が、ＧＰＳ衛星から信号を受信すると共に、地図提供局との間で通信衛星を介して各種データの送受信を行う場合を前提としている。

【００１８】車載のナビゲーションシステム（地図表示装置）の側で実行される処理の流れを、図２を用いて説明する。まず、ＧＰＳ衛星からＧＰＳデータ信号を受信・取得し（ステップ１１０）、そのデータ信号に基づいてＧＰＳ信号処理部２０で現在地が算出され、その結果がナビゲーション処理部２２に現在地データとして入力されると、ここで現在地に該当する地図データが保存されているか否か、又は現在地が地図の境界部にあるか否かを判定する（ステップ１１２）。

【００１９】上記ステップ１１２で、現在地に該当する地図データがないか、又はその位置が境界部である（Ｙｅｓ）場合は、ナビゲーション処理部２２からＣＳアンテナ角度調節部３０に必要なデータが入力され、該ＣＳアンテナ角度調節部３０はその必要データとアンプ１２からのＣＳ信号とに基づいて算出した最適設定角度になるようにＣＳアンテナ角度調節モータ３２を駆動し、ＣＳアンテナ１０の角度調節を行う（ステップ１１４）。

【００２０】ＣＳアンテナ１０の角度調節が終了した後、ナビゲーション処理部２２で生成した地図データ要求信号、現在地データ及び進行方向データを通信衛星を介して地図提供局に送信する（ステップ１１６）。

【００２１】上記のように車載のナビゲーションシステムから送信が行われると、地図提供局側では、図３に示す流れに従って処理が実行される。即ち、ステップ１３０で地図要求信号が受信されると共に、それを発信した車両の現在地データと進行方向データが受信され（ステップ１３２）、これらデータに基づいて必要な地図が選択され（ステップ１３４）、選択された地図のデータが車両側に送信される（ステップ１３６）。

【００２２】車両側では、地図提供局から送信された現在地に該当する上記地図データを受信すると（ステップ１１８）、それがデコーダ１４を通してナビゲーション処理部２２に入力され、該ナビゲーション処理部２２から現在地データと共に表示制御部２４に入力される。この表示制御部２４は入力された地図データをディスプレイ２６に表示すると共に、現在地データをその地図上の該当する位置と一致させて表示する（ステップ１２０）。

【００２３】一方、前記ステップ１１２で、現在地に該当する地図データを既に所有しており、しかも現在地が地図の境界部にない（Ｎｏ）場合は、上記ステップ１２０に跳び、地図と現在地をディスプレイに表示する。

【００２４】又、以上の処理を繰返す場合には、前記ステップ１１０に戻り、逐に同処理を終了する場合には電源を切る（ステップ１２２）。

【００２５】以上詳述した本実施例によれば、地図情報等を地図提供局から通信衛星を介して受取ることができるため、従来のナビゲーションシステムのような、予め地図情報を格納してある大容量の記憶媒体がなくとも、地図表示装置をナビゲーションシステムとして機能させることが可能となる。

【００２６】又、地図提供局から地図情報以外の、例えば旅行ガイドの情報をも受取るようにすることにより、旅行ガイド機能付きナビゲーションシステムとして利用することも可能となる。

【００２７】又、現在のテレビ受像機の液晶画面やブラウン管の表示精度を基準とすると、地図提供局から地図情報を送信する場合には、例えば１／１００にデータ圧縮しても十分な精度で表示できるため、短時間で大量の地図情報等を送受信することができる。

【００２８】以上、本発明について具体的に説明したが、本発明は前記実施例に示したものに限られるものでなく、その要旨を逸脱しない範囲で種々変更可能である。

【００２９】例えば、実施例では、車両側から地図提供局へ地図の要求信号を発信して必要な地図情報を要求する場合を示したが、地図提供局に多くのチャンネルを持たせ、例えば第１チャンネルでは時間分割でＮｏ．１～Ｎｏ．１０の一方向に連続している地図を常時流しておくようにし、車両側でその中から必要な地図を画面を見ながら選択するようにしてもよい。

【００３０】又、実施例では、ＣＳアンテナ１０を通信衛星からのＣＳ信号を受信するに最適な角度に追従させる場合を示したが、これに限られるものでなく、受信条

5

件の良い位置で、出発前や走行途中（例えばパーキングエリア）で、必要な地図情報等を受信し、それを所定の記憶媒体に蓄えるようにしてもよい。

【００３１】

【発明の効果】以上説明した通り、本発明によれば、予め地図情報が記録されている記憶媒体を用意することなく、必要な地図情報を画面に表示できると共に、その地図情報上に現在位置等を表示することができ、しかも他の様々の情報をも表示することができるナビゲーションシステムを提供することが可能となる。

【図面の簡単な説明】

【図１】本発明に係る一実施例の地図表示装置の要部構

6

成を示すブロック図

【図２】実施例の作用を示すフローチャート

【図３】実施例の作用を示す他のフローチャート

【図４】実施例の作用を示す説明図

【符号の説明】

１０…ＣＳアンテナ

１４…デコーダ

１６…ＧＰＳアンテナ

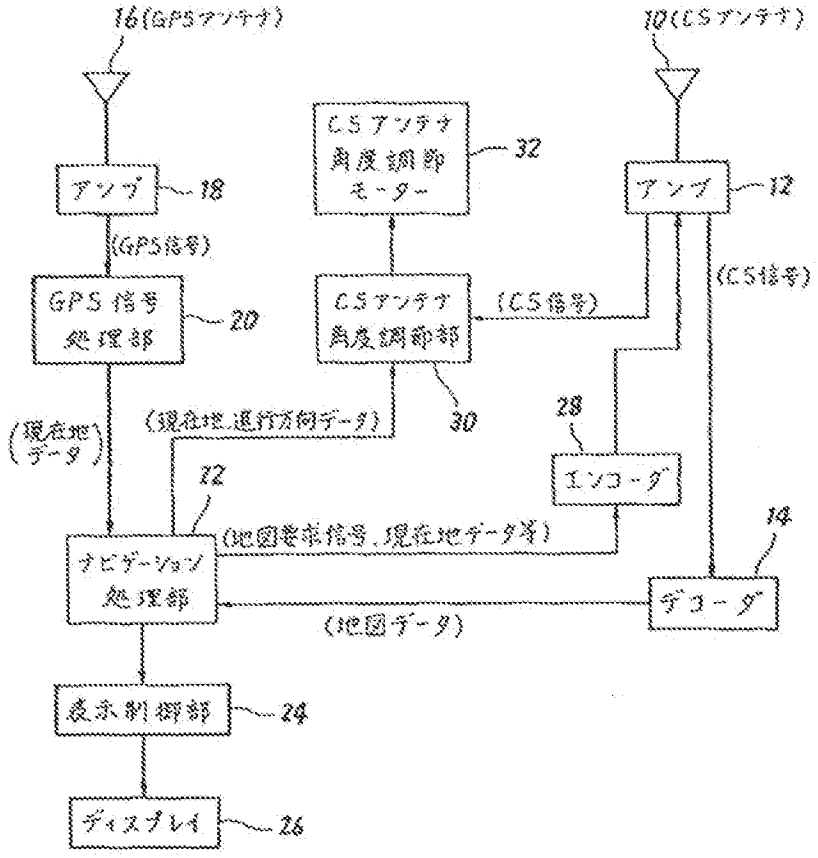
２０…ＧＰＳ信号処理部

２２…ナビゲーション処理部

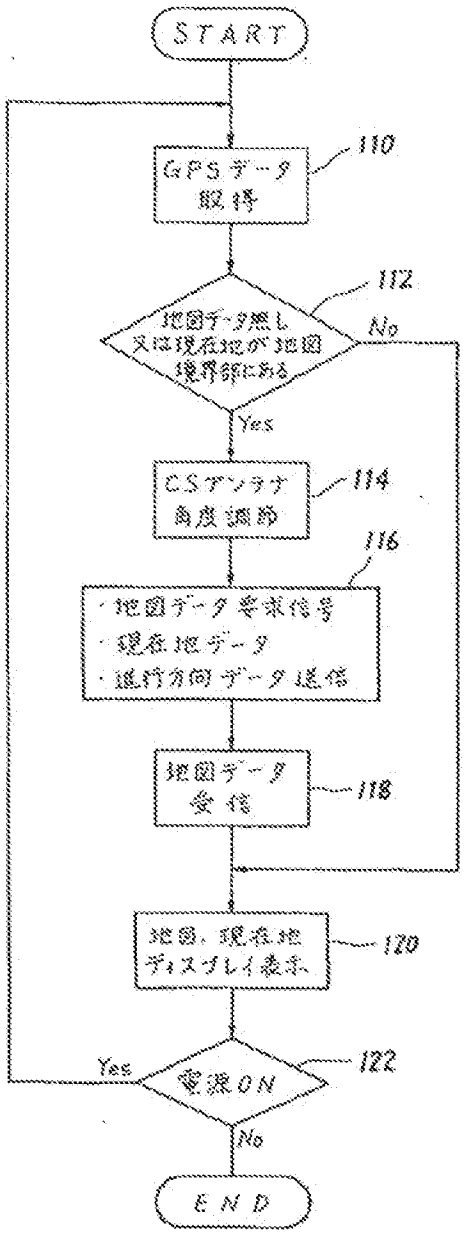
２４…表示制御部

２６…ディスプレイ

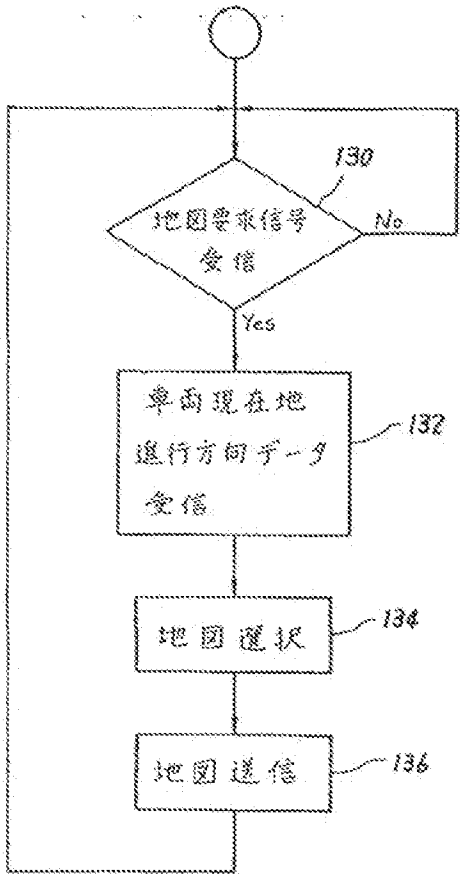
【図１】



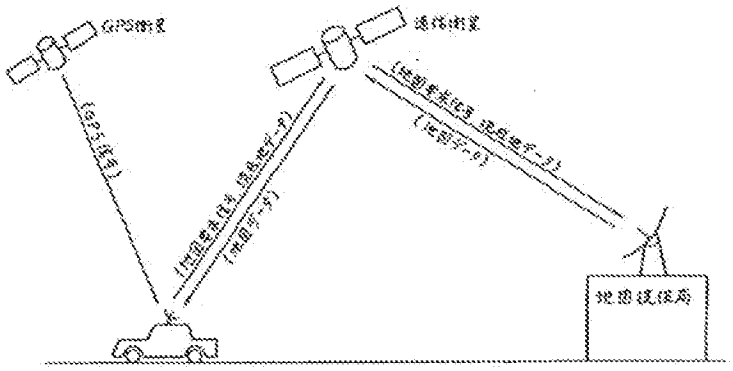
【図2】



【図3】



【図4】



[Claim(s)]
[Claim 1]A map display device which displays map information and position information on a screen, comprising:
A means to receive map information transmitted via a communications satellite, to change it into a picture signal, and to display on a screen.
A position measuring means which detects a current position and generates position information, and a display control means which a current position is displayed on a screen based on position information from a position measuring means, and coincides this current position with an applicable position on a map.

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates a map display device and the current position which received map information via the communications satellite, and it was especially displayed on the screen, and was measured separately to the map display device which can be displayed in piles on the applicable map.

[0002]
[Description of the Prior Art]Generally, since it is used with the gestalt for which a book was bound, when a map looks for a required place, it needs the work which turns over a page. Therefore, it is very inconvenient to check a current position with a map during operation.

[0003]On the other hand, the navigation system for mount is increasing these days. As a map display device used for such a navigation system, according to the information, including the name of a place etc. which were inputted from the distribution power board, currently disclosed by JP,4-98287,A, for example, a desired map is searched from a map information storage medium, and what reads it and is displayed on a screen is known.

[0004]
[Problem(s) to be Solved by the Invention]However, in said conventional map display device. Since CD-ROM or an IC card is used as a map information storage medium, Random access is possible, although there is moreover a merit that access time is short, in order to always receive restrictions of a storage capacity, brilliance ** and the usable color number of display information have restriction, and also there is a problem that the prices of a storage and the device itself are high.

[0005]This invention can display required map information on a screen, without preparing the map medium by which it was made in order to solve said conventional problem, and map information is recorded beforehand, and. Let it be a technical problem to provide the map display device which can display a current position etc. on the map, and also can display other various information.

[0006]
[Means for Solving the Problem]In a map display device with which this invention displays map information and position information on a screen, A means to receive map information

transmitted via a communications satellite, to change it into a picture signal, and to display on a screen, Said technical problem is attained by having composition provided with a position measuring means which detects a current position and generates position information, and a display control means which a current position is displayed on a screen based on position information from a position measuring means, and coincides this current position with an applicable position on a map.

[0007]
[Function]Map information was received from the communications satellite (CS), and the measured current position is displayed on the screen, and it was made have displayed it on the screen which consists of the liquid crystal and cathode-ray tube of mounted television, for example, and to coincide the current position with the applicable position of the map on a screen in this invention.
Therefore, without preparing map information beforehand, it becomes possible to receive and display various map information, and it becomes possible to use a map display device as a navigation system as a result.

[0008]It becomes possible by combining, also receiving the information on others, such as a travel guide, from a communications satellite, and displaying on a screen to use also, for example as a navigation system with a travel guide.

[0009]As a position measuring means which detects a current position and generates position information in this invention, For example, a current position can be displayed on the above-mentioned map information in piles by being able to use a global positioning system (Global Positioning System:GPS), and this GPS's detecting a current position, and displaying it on a screen.

[0010]
[Example]Hereafter, with reference to drawings, the example of this invention is described in detail.

[0011]Drawing 1 is a block diagram showing the important section composition of the map display device of one example concerning this invention. This example is an example in the case of using mounted television (not shown) as a navigation system.

[0012]CS antenna 10 receives the map display device of this example by making into a CS signal the map information sent via a communications satellite (CS), and other information, After amplifying it with the amplifier 12, with the decoder 14 for changing into map data etc. The GPS antenna 16 received the GPS signal sent from a GPS Satellite, and after amplifying it with the amplifier 18, it has the GPS signal treating part 20 for generating present position data from a GPS signal.
The signal processed, respectively by the above-mentioned decoder 14 and the GPS signal treating part 20 is inputted into the navigation processing section 22.

[0013]The above-mentioned navigation processing section 22 changes the position information on a current position etc. into signals for televisions, such as an NTSC signal, based on the