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Certification

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TRANSLATOR'S DECLARATION:

I, Travis Huntsman, hereby declare:

That I possess advanced knowledge of the Japanese and English languages. The attached Japanese into English translation has been translated by me and to the best of my knowledge and belief it is a true, correct and complete translation of: JP2001-082973A. I hereby certify under penalty of perjury that the foregoing is true and correct.

A handwritten signature in black ink, appearing to read "Travis Huntsman", written over a horizontal line.

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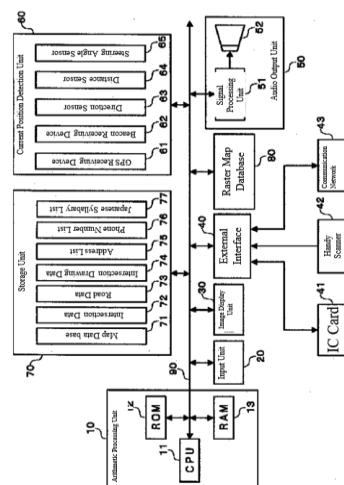
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(54) [Title of Invention] NAVIGATION DEVICE AND DESTINATION SETTING METHOD AND STORAGE MEDIUM THEREOF

(57) [Abstract] (Amended)

[Problem] To easily set a destination even when search information of the destination does not exist in a database of a navigation device.

[Resolution Means] Raster map data supply means 40 to 43 and 80 supply raster map data made up of rectangular map image data configured in a raster data format and coordinate data of two diagonally opposite points of the data or coordinate data corresponding to a defined facility on the map, and a map display means 30 displays a map based on the rectangular map image data. The coordinates of the destination designated by designating means 20 are



calculated and found by an arithmetic processing unit 10 based on the coordinate data corresponding to the two opposite points described above or the defined facility. In this manner, the user can easily set the destination simply by selectively displaying raster map data that includes the facility or the like that is desired to be set as the destination and designating using the designating means.

[Scope of Patent Claims]

[Claim 1] A navigation device, comprising: raster map data supply means for supplying raster map data comprising image data for map display configured in a raster data format and coordinate data corresponding to a predetermined point on the map;

map display means for displaying a map based on raster map data supplied from the raster map data supply means;

designating means that designates an arbitrary location on the map displayed by the map display means; and

destination setting means that defines coordinates of a point designated by the designating means based on the coordinate data and sets the defined coordinates as a destination.

[Claim 2] The navigation device according to claim 1, comprising: a vector map data supply means that supplies vector map data for map display configured in a vector data format; wherein

the map display means displays a map based on at least one of raster map data supplied from the raster map data supply means and vector map data supplied from the vector map data supply means, and

the destination setting means defines coordinates of a point based on the coordinate data when the point defined by the designating means is on a map being displayed based on the raster map data, sets the defined coordinates as a destination, and sets the coordinates of the point as a destination when the point defined by the designating means is on a map being displayed based on the vector map data.

[Claim 3] The navigation device according to claim 1 or 2, comprising: route setting means for setting a route from a current position to the destination set by the destination setting means; and

guidance execution means that executes guidance of a route set by the route setting means.

[Claim 4] The navigation device according to claim 2 or 3, wherein the map display means simultaneously displays both a map based on the raster map data and a map based on the vector map data on one screen.

[Claim 5] The navigation device according to claim 4, wherein the map display means displays at least one of the current position and the set route on at least one of a map based on the raster map data and a map based on the vector map data simultaneously displayed on one screen.

[Claim 6] The navigation device according to claim 1, wherein the raster map data supply means incorporates and supplies the raster map data from an external storage medium, a data input device, or the like.

[Claim 7] The navigation device according to claim 3, wherein the guidance execution means displays a map based on the raster map data on the map display means instead of or together with a map based on the vector map data when a relationship between the current position and coordinates of the destination or coordinates of the raster map data that includes the destination has become a predetermined relationship.

[Claim 8] The navigation device according to claim 7, wherein the guidance execution means displays a map based on the raster map data on the map display means when a distance between the current position and the coordinates of the destination is smaller than a predetermined value.

[Claim 9] The navigation device according to claim 7, wherein the guidance execution means displays a map based on the raster map data on the map display means when the current position is included in the map display region defined by the coordinates of the raster map data that includes the destination.

[Claim 10] A destination setting method of a navigation device, comprising: a step for displaying a map based on the raster map data by incorporating the raster map data comprising image data for map display configured in a raster data format and coordinate data corresponding to a predetermined point on the map;

a step for designating an arbitrary point on a map based on the raster map data;
a step for defining coordinates of a designated point based on the coordinate data; and
a step for setting the defined coordinates as the destination.

[Claim 11] A machine readable storage medium having, as its storage content, a group of instructions for a destination setting program executed by a navigation device, wherein the destination setting program includes:

a step for displaying a map based on raster map data by incorporating the raster map data comprising image data for map display configured in a raster data format and coordinate data corresponding to a predetermined point in the map;

a step for designating an arbitrary point on a map based on the raster map data;

a step for defining coordinates of a designated point based on the coordinate data; and

a step for setting defined coordinates as a destination.

[Claim 12] A storage medium comprising raster map data comprising image data for map display configured in a raster data format and coordinate data corresponding to a prescribed point on the map, which is used for setting a destination of the navigation device.

[Detailed Description of Invention]

[0001]

[Technical Field of Invention] The present invention relates to a navigation device that guides and leads to a destination while displaying a current position on a map displayed electronically and to a destination setting method thereof, and more particularly relates to a navigation device that can easily set a destination and to a destination setting method thereof. Furthermore, the present invention relates to a storage medium that stores a program relating to a destination setting method and map data used to set a destination.

[0002]

[Conventional Art] Conventionally, navigation devices set a destination by displaying a map including the destination on a display and designating a desired destination using a cursor. A variety of methods have been proposed as methods for first displaying a map including a destination on a display, including a method for inputting a telephone number of the destination, a method for inputting an address of the location of the destination, a method for inputting a name of a facility of the destination (department name, hotel name, company name, and the like) in the Japanese syllabary, and a method for selecting and inputting a desired destination from list information classified by genre and region. Japanese Unexamined Patent Application Publication No. H2-187898, Japanese Unexamined Patent Application Publication No. H1-173820, Japanese Unexamined Patent Application Publication No. H1-173823, and the like are related to these this conventional art.

[0003]

[Problem to be Solved by Invention] However, none of the aforementioned input methods can be used unless search information (telephone number, facility name, list information, and the like) corresponding to a destination is stored in advance in the database of the navigation device. For example, when attempting to set a store or the like introduced in the latest issue of a travel information magazine or the like as a destination, the destination can be easily set without problems when a telephone number or a store name of the store exists in the database of the navigation device. However, when search information relating to the destination does not exist in the database, a task must be performed to find a desired destination from a large map database of the navigation device based on a map published in the magazine and information relating to the destination. It is a troublesome task to first display a map by the prefecture where the destination exists, and then scroll and zoom to find the destination.

[0004] In light of the above, an object of the present invention is to provide a navigation device configured to be able to easily set a destination even when search information of the destination is not present in a database of the navigation device, a destination setting method thereof, and a storage medium.

[0005]

[Means for Solving Problem] The navigation device according to the present invention according to claim 1 at the time of application is provided with: raster map data supply means for supplying raster map data comprising image data for map display configured in a raster data format and coordinate data corresponding to a predetermined point on the map; map display means for displaying a map based on raster map data supplied from the raster map data supply means; designating means that designates an arbitrary location on the map displayed by the map display means; and destination setting means that defines coordinates of a point designated by the designating means based on the coordinate data and sets the defined coordinates as a destination. The raster map data supply means supplies raster map data made up of rectangular map image data configured in a raster data format and coordinate data of two opposite points of the rectangular map image data, or supplies raster map data made up of rectangular map image data and coordinate data corresponding to a defined facility on the map. Because a map based on this rectangular map image data is displayed on the map display means, a user can designate a defined facility or the like on the map displayed by the designation means as a destination. The coordinates of the destination designated by the designating means are found by arithmetic processing based on the coordinate data of the two opposite points described above or the coordinate data corresponding to the defined facility. Note that when a defined facility is designated as the destination, arithmetic processing is not performed, and the coordinate data corresponding to the facility directly becomes the coordinates of the destination. In this manner, the user can easily set the destination simply by selectively displaying raster map data that includes the facility or the like that is desired to be set as the destination and designating using the designating means.

[0006] The navigation device according to the present invention according to claim 2 at the time of application, as an embodiment of the navigation device according to claim 1, is further provided with: a vector map data supply means that supplies vector map data for map display configured in a vector data format; wherein the map display means is configured to display a map based on at least one of raster map data supplied from the raster map data supply means and vector map data supplied from the vector map data supply means, and the destination setting means is configured to define coordinates of a point based on the coordinate data when the point defined by the designating means is on a map being displayed based on the raster map data, set the defined coordinates as a destination, and set the coordinates of the point as a destination when the point defined by the designating means is on a map being displayed based on the vector map data. The vector map data supply means supplies map data in a vector data format used in a normal navigation device. The map display means displays a map based on raster map data and/or vector map data. Accordingly, when a map based on the vector map data is displayed on the map display means, the coordinates of the point designated by the designating means are set as the destination as is. Meanwhile, when a map based on the raster map data is displayed on the map display means, coordinates of a point designated by a method similar to the navigation device according to claim 1 are set as the destination. Note that when a map based on the raster map data and the vector map data is split on one screen and displayed simultaneously, a destination can be set by designating a point on either one of the maps.

[0007] The navigation device according to the present invention according to claim 3 at the time of application, as an embodiment of the navigation device according to claim 1 or 2, is further provided

with: route setting means for setting a route from a current position to the destination set by the destination setting means; and guidance execution means that executes guidance of a route set by the route setting means. This claims that route setting is performed by the route setting means and guidance is performed by the guidance execution means based on the destination set by the navigation device according to claim 1 at the time of application.

[0008] The navigation device according to the present invention according to claim 4 at the time of application, as an embodiment of the navigation device according to claim 2 or 3, is configured such that the map display means simultaneously displays both a map based on the raster map data and a map based on the vector map data on one screen. This claims that a map is displayed based on both raster map data and vector map data, regardless of whether the map display means is setting a destination, setting a route, or performing guidance.

[0009] The navigation device according to the present invention according to claim 5 at the time of application, as an embodiment of the navigation device according to claim 4, is configured such that the map display means displays at least one of the current position and the set route on at least one of a map based on the raster map data and a map based on the vector map data simultaneously displayed on one screen. This claims all combinations relating to which combinations are displayed for the current position and route when maps based on both raster map data and vector map data are simultaneously displayed on one screen.

[0010] The navigation device according to the present invention according to claim 6 at the time of application, as an embodiment of the navigation device according to claim 1, is configured such that the raster map data supply means incorporates and supplies the raster map data from an external storage medium, a data input device, or the like. Raster map data can be easily obtained on the Internet and is stored in a supplemental CD-ROM such as that in a magazine and distributed widely, or can be easily obtained by an individual by reading map data published in a travel information magazine or the like using a scanner or the like. This claims that such raster map data is incorporated and supplied from a storage medium, data input device, or the like other than the navigation device. Note that coordinate data must be added to the raster map data incorporated in this manner.

[0011] The navigation device according to the present invention according to claim 7 at the time of application, as an embodiment of the navigation device according to claim 3, is configured such that the guidance execution means displays a map based on the raster map data on the map display means instead of or together with a map based on the vector map data when a relationship between the current position and coordinates of the destination or coordinates of the raster map data that includes the destination has become a predetermined relationship. Normally, guidance by the guidance execution means is performed based on the vector map data, but because the navigation device of the present invention sets the destination based on the raster map data, the raster map used to set the destination when the current position is near the destination is displayed instead of the vector map that was conventionally displayed, or is simultaneously displayed on one screen together with a vector map. Thus, the moment the raster map is displayed, the user can recognize that the user has approached the destination.

[0012] The navigation device according to the present invention according to claim 8 at the time of application, as an embodiment of the navigation device according to claim 7, is configured such that the guidance execution means displays a map based on the raster map data on the map display means when a distance between the current position and the coordinates of the destination is smaller than a predetermined value. This focuses "when a relationship between the current position and coordinates of the destination or coordinates of the raster map data that includes the destination has become a predetermined relationship" stated in claim 7 at the time of the application on the relationship between

coordinates of the current position and the destination, and limits it to when the distances is smaller than a predetermined value. Thus, the moment the raster map is displayed, the user can recognize that their current position has reached a predetermined distance from the destination.

[0013] The navigation device according to the present invention according to claim 9 at the time of application, as an embodiment of the navigation device according to claim 7, is configured such that the guidance execution means displays a map based on the raster map data on the map display means when the current position is included in the map display region defined by the coordinates of the raster map data that includes the destination. This focuses "when a relationship between the current position and coordinates of the destination or coordinates of the raster map data that includes the destination has become a predetermined relationship" stated in claim 7 at the time of the application on the relationship between the current position and the display region of the raster map, and limits it to when the current position is in the map display region. Thus, because the current position is also displayed simultaneously while displaying the raster map, the user can easily recognize their own position.

[0014] The destination setting method of the navigation device according to the present invention according to claim 10 at the time of application is provided with: a step for displaying a map based on the raster map data by incorporating the raster map data made up of image data for map display configured in a raster data format and coordinate data corresponding to a predetermined point on the map; a step for designating an arbitrary point on a map based on the raster map data; a step for defining coordinates of a designated point based on the coordinate data; and a step for setting the defined coordinates as the destination. This claims a method for setting a destination performed by the navigation device according to claim 1 is. Note that in the present invention, it is obvious that the invention configured by each step described above can be configured as a navigation device. Furthermore, the invention of the navigation device according to claims 2 to 9 at the time of application can be configured as an invention of a method.

[0015] The machine readable storage medium according to the present invention according to claim 11 at the time of application is provided with: as its storage content, a group of instructions for a destination setting program executed by a navigation device, wherein the destination setting program includes: a step for displaying a map based on raster map data by incorporating the raster map data comprising image data for map display configured in a raster data format and coordinate data corresponding to a predetermined point in the map; a step for designating an arbitrary point on a map based on the raster map data; a step for defining coordinates of a designated point based on the coordinate data; and a step for setting defined coordinates as a destination. This is a claim relating to a storage medium storing a program for realizing the invention of the destination setting method of the navigation device according to claim 10 at the time of application. Note that similar to when configuring the invention of the navigation device according to claims 2 to 9 at the time of application as an invention of a method, it is obvious that a claim can be made as a storage medium that stores a program that realizes such a method.

[0016] The storage medium according to the present invention according to claim 12 at the time of application is provided with raster map data made up of image data for map display configured in a raster data format and coordinate data corresponding to a prescribed point on the map, which is used for setting a destination of the navigation device. This relates to a storage medium that stores raster map data used in the navigation device according to claims 1 to 11 and a destination setting method thereof.

[0017]

[Embodiments of Invention] Embodiments of the present invention will be described below using

drawings. FIG. 1 is a block diagram illustrating a schematic configuration when the navigation device of the present invention is applied to a navigation device for a vehicle. The navigation device according to the present embodiment is configured from an arithmetic processing unit 10, an input unit 20, an image display unit 30, an external interface 40, an audio output unit 50, a current position detection unit 60, a storage unit 70, and a raster map database 80, each of which is connected via a bus 90. The navigation device may have hardware other than these, but here, a description will be given wherein the necessary minimum resources are used.

[0018] The arithmetic processing unit 10 controls the operation of the entire navigation device and is provided with a CPU 11 that performs data processing and various controls on each unit. A ROM 12 and a RAM 13 or the like are connected to the CPU 11 via a bus 90. Note that timers and the like are also connected, but these are omitted in the drawings. The ROM 12 is a read-only memory that stores in advance CPU 11 system-related programs, various parameters, and various data. The RAM 13 temporarily stores various data generated when the CPU 11 executes a program, and is used as a register, a flag, or the like by respectively allocating predetermined address areas of a random access memory. Further, the RAM 13 stores image data relating to the raster map, data relating to a travel route searched for via route search, data relating to the destination, and the like.

[0019] Note that in the arithmetic processing unit 10 according to the present embodiment, the CPU 11 reads various programs stored in the ROM 12 to execute various processes such as a vehicle travel information providing programs, but the CPU 11 may read and execute a program or the like from an external recording medium such as a CD-ROM in the RAM 13 or store the read program in another storage device (not illustrated in the drawings) such as a hard disk via the bus 90. Thus, it is possible to easily newly install or upgrade operation programs.

[0020] The input unit 20 is for performing various operations such as a destination setting operation and a guidance route setting operation, or for setting various data and parameters, and this input unit is configured by various operators such as a keyboard, mouse, light pen, joy stick, touch panel, and the like. Note that the input unit 20 may be configured by a remote control that uses infrared rays or the like and a receiving unit that receives various signals transmitted from the remote control. In addition to a joystick for performing movement operations of a cursor displayed on a screen or the like, various keys such as a menu designation key (button) and a numeric keypad are disposed on the remote controller. A touch panel is disposed on the surface of the display of the image display unit 30, and is configured such that touching a key or menu displayed on the screen of the display using a finger or the like allows input of information relating to keys and the like displayed at the touched position. Additionally, the input unit 20 may be configured to convert an audio signal input from a microphone to a digital signal, extract a characteristic parameter from the digital signal, compare the characteristic parameter to a standard pattern, recognize the input audio, and generate an input signal to the navigation device according to the content of the recognized audio. When doing so, the arithmetic processing unit 10 forms a hands-free unit by providing an audio control unit that synthesizes audio such as confirmation of input content and generates audio from a speaker 52.

[0021] The external interface 40 is used by the CPU 11 to externally read computer programs for performing various processes and raster map data. Examples of the storage medium connected to the navigation device via the external interface 40 may include a magnetic recording medium such as a floppy disk, hard disk, or magnetic tape, a semiconductor recording medium such as a memory chip or an IC card; a recording medium where information is optically read such as a CD-ROM, MO, or PD (phase change rewritable optical disk), a recording medium using a paper card or paper tape, or a recording medium on which a computer program is recorded by various methods. Furthermore, devices connected to the navigation device via the external interface 40 include digital cameras, digital

video cameras, scanners, and the like for inputting image data, as well as modems and TAs for downloading programs and various data (data that includes image data such as raster maps) from various communication networks such as the Internet, personal computer communication, and the like. Note that the navigation device may be provided with a connection terminal of a wireless communication device such as a car telephone or various mobile telephones so that data can be transmitted and received via wireless communication (including satellite communication).

[0022] Note that the present embodiment illustrates an example wherein an IC card 41, a handy scanner 42, and a communication network 43 are connected to the navigation device via the external interface 40, but it is obvious that a storage medium, data input device, or the like other than this may be connected. Moreover, it is obvious that the external interface 40 not only operates as a data input unit but also operates as a data output unit. When the external interface 40 is connected to various communication networks such as the Internet or personal computer communication via a communication interface such as a modem or a TA, operation programs and various data can be exchanged with other host computers on the communication network.

[0023] The image display unit 30 is configured to display normal road maps, guidance routes, intersections, various menus, cursors, various images, and character information, and is configured by various display devices such as liquid crystal display devices, CRTs, plasma displays, and the like. The audio output unit 50 processes various guidance audio at an intersection or the like input from the CPU 11 via the bus 90 using a signal processing unit 51, and creates audio via a speaker 52 for audio installed in an automobile or the like. The speaker 52 may be configured by a dedicated speaker of the navigation device.

[0024] The current position detection unit 60 is for detecting the absolute position of the vehicle according to latitude and longitude, and uses a GPS (Global Positioning System) receiving device 61 that measures the position of the vehicle using an artificial satellite, a beacon receiving device 62 that receives position information from a beacon disposed on a road, a direction sensor 63, a distance sensor 64, a steering angle sensor 65, and the like. Note that the current position detection unit 60 may be configured using each of these devices alone, and obviously may also be configured by a combination of a plurality of these. The GPS receiving device 61 or the beacon receiving device 62 alone are capable of measuring the position, but when it is not possible to receive from the GPS receiving device 61 or the beacon receiving device 62, the current position is detected by estimated navigation using both the direction sensor 63 and the distance sensor 64. Examples of the direction sensor 63 include a geomagnetic sensor that determines the direction of the vehicle by detecting geomagnetism, a gyro such as a gas rate gyro or an optical fiber gyro that determines the direction of the vehicle by detecting a rotational angular velocity of the vehicle and integrating the angular velocity, or a wheel sensor that calculates the amount of displacement of the direction by disposing left and right wheel sensors and detecting the turning of the vehicle by an output pulse difference (difference in moving distance) thereof. Examples of the distance sensor 64 include sensors that use vehicle speed information used by an engine computer of the vehicle and output a predetermined number of vehicle speed pulses in a cycle according to the rotation speed of a drive shaft of the vehicle. The steering angle sensor 65 uses an optical rotation sensor attached to a rotating part of the steering, a rotation resistance volume, and the like to detect an angle α of the steering.

[0025] The storage unit 70 stores data files such as a map database 71, intersection data 72, road data 73, intersection drawing data 74, an address list 75, a telephone number list 76, a Japanese syllabary list, and the like that are the basis of the map drawn on the display of the image display unit 30. The storage unit 70 uses various recording media such as floppy disks, hard disks, CD-ROM, optical disks, magnetic tapes, IC cards, optical cards, and the like, and a drive device thereof. Note that the storage

unit 70 may be configured by a plurality of different types of recording media and a drive device thereof. When this is the case, it is obviously desirable to have a hardware configuration that does not overlap with that of the external interface 40 described above.

[0026] The map database 71 is configured by a hierarchized map and hierarchized map data for each level such as Japan, the Kanto region, Tokyo, and Kanda from the top layer, and is configured so that map data for each level including the current position of the vehicle detected by the current position detection unit 60 can be easily selected. Unique map codes accompany the map data of each layer. Furthermore, the map database 71 includes a facility database such as a facility name, telephone number, genre, address, and position (longitude and latitude) data relating to the facility that will be the destination. The intersection data 72 is configured by an intersection number that will be the starting point and the ending point of each intersection, the coordinates of each intersection, the presence or absence of a traffic light at each intersection, no entry information at each intersection, and the like. The road data 73 is configured by data such as a road number that will be the end point of each road, a thickness of each road, a name of the road, and the like. The navigation device searches for a travel route to the destination based on the intersection data 72 and the road data 73. The intersection drawing data 74 is configured by image data for magnifying and displaying intersection names associated with an intersection number in the intersection data 72, and convenience stores, gas stations, and the like that serve as landmarks.

[0027] The address list 75 is a search list for in which addresses are associated with facility names in a facility database. The telephone number list 76 is a search list in which telephone numbers are associated with facility names in a facility database. A Japanese syllabary list 77 is a search list configured by arranging facility names in a facility database in the order of the Japanese syllabary. The user can display a map including a desired facility on a screen, and easily select a destination based on the map merely by inputting a telephone number, address, or facility name. However, when a facility that is not registered in the facility database, a desired map cannot be selected even when a telephone number, address, or facility name is input. Therefore, in the present embodiment, the raster map database 80 is provided separately, desired map data is extracted from the map database 71 based on the raster map database 80, and it is easy to set a destination.

[0028] The raster map database 80 is different from the digitized (vector) normal map data (vector map data) stored in the map database 71. That is, normal map data is a collection of vector data configured by a combination of node coordinates indicating an intersection or a curve and a link connecting the nodes. In contrast to this, the raster map data is image data in a raster data (bitmap) format and is data in a format that is not suitable for map matching processing of the navigation device. Accordingly, the navigation device displays using image data in this raster data format only when a detailed display is required such as for the intersection drawing data 74.

[0029] Raster map data can be easily obtained on the Internet and is stored in a supplemental CD-ROM such as that in a magazine and distributed widely. Furthermore, reading map data published in travel information magazines and the like using a scanner 63 and the like, makes such easy to obtain even for an individual. In this manner, the information relating to the facilities and stores published in the magazine is often up to date and therefore not stored in the storage unit 70 of the navigation device. Conversely, there is a large demand to set these types of facilities and stores as the destination in the navigation device.

[0030] Therefore, in the present embodiment, the destination can be easily set based on raster map data in a raster data format imported from the IC card 41, the handy scanner 42, the communication network 43, or the like. FIG. 2 is a diagram illustrating a configuration example of raster map data 80 stored in a raster map database. FIG. 3 is a diagram illustrating an example wherein the raster map

data of FIG. 2 is displayed on a display of the image display unit 30. The raster map data is configured by rectangular image data in a raster data format and data showing the east longitude and north latitude coordinates of two diagonals of the lower left corner and the upper right corner of the rectangle. When importing data representing the east longitude and north latitude coordinates from the IC card 41, the communication network 43, or the like, it is preferable that the data be configured integrally with the image data. Furthermore, when importing via the handy scanner 42, data representing the east longitude and north latitude coordinates must be input at the same time as when importing image data. For example, data relating to the east longitude and north latitude coordinates may be displayed with barcodes, numbers, or the like near a displayed map of a magazine or the like, and these may be extracted by image processing after being read by the scanner.

[0031] FIG. 2 illustrates image data of the vicinity of Tokyo Station and image data of a French restaurant in the vicinity of $\triangle$ station as one example of rectangular image data. For image data of the vicinity of Tokyo Station, the east longitude and north latitude coordinates in the lower left corner are (X1, Y1), and the east longitude and north latitude coordinates in the upper right corner are (X2, Y2). For image data of the French restaurant in the vicinity of $\triangle$ station, the east longitude and north latitude coordinates in the lower left corner are (X3, Y3), and the east longitude and north latitude coordinates in the upper right corner are (X4, Y4). FIG. 3 is a display example of a raster map corresponding to image data of the French restaurant in the vicinity of $\triangle$ station. On this map, there are two French restaurants: $\circ$ French restaurant and $\triangle$ French restaurant. Note that the drawing shows a state wherein the cursor is positioned on a facility icon indicating the $\triangle$ French restaurant. For raster map data such as that in FIG. 2, the east longitude and north latitude coordinates of a point designated by the cursor (in the drawing, $\triangle$ French restaurant) are found by an arithmetic process based on the east longitude and north latitude coordinates of two diagonal points as described below. Therefore, any location, facility, or the like other than a French restaurant can be designated as the destination on the raster map in FIG. 3.

[0032] FIG. 4 is a diagram illustrating another example of a configuration of raster map data. When the target of the map display is defined as a French restaurant as illustrated in FIG. 3, raster map data may be configured by the rectangular image data, information relating to the facility in the image, and data representing the east longitude and north latitude coordinates of the facility in the rectangular image, as illustrated in FIG. 4. For example, in the map illustrated in FIG. 3, raster map data is configured by image data of French restaurants around $\triangle$ station, information relating to the $\circ$ French restaurant and the $\triangle$ French restaurant in this image, and data (Xa, Ya), (Xb, Yb) relating to the east longitude and north latitude coordinates of these restaurants. By doing so, the east longitude and north latitude coordinates for a desired facility can be accurately incorporated as a destination in the navigation device without performing arithmetic processing.

[0033] Furthermore, for raster map data configured as in FIG. 4, even when the image data of the map displayed on the display of the image display unit 30 is not an accurate map according to scale, because a desired facility (a French restaurant in the drawings) can be designated as the destination, the rectangular image data, for example, may be configured using a deformed raster map such as that illustrated in FIG. 5. In this manner, the deformed raster map is an illustration map or the like that is often used in travel information magazines and sightseeing maps. When the destination can be set using this type of illustration map, there is an effect wherein even a person unfamiliar with the operation of the navigation device can easily set the destination. Note that when two or more sets of coordinate data exist in a raster map accurate to scale such as that illustrated in FIG. 4, defining at least two or more facilities enables coordinate data relating to any location in the image to be found

through arithmetic processing, and any location or facility in the image can therefore be designated as a destination as described above. However, this method cannot be applied to a deformed map.

[0034] Next, a description will be given of an example of the operation of how a destination is set based on raster map data in the navigation device of FIG. 1. FIG. 6 is a flowchart diagram illustrating an example of a setting process performed by the navigation device of FIG. 1. FIG. 7 and FIG. 8 are diagrams illustrating an example of a menu screen displayed on a display of the image display unit 30 during execution of this setting process. First, because various menus are displayed on the display of the navigation device, a user selects a desired menu from among these menus using various operators such as a keyboard, mouse, light pen, joystick, touch panel, remote control, or the like of the input unit 20.

[0035] In step S1, a determination is made as to whether a menu relating to setting the destination has been selected, and when this determination is YES, the process proceeds to step S2 below, and when this determination is NO, the process jumps to the route setting process in step S12. When determined as YES in step S1, a menu screen relating to the selection of the destination selection method such as that illustrated in FIG. 7 is displayed. In step S2, a determination is made as to which method from among the destination selection methods in FIG. 7 is selected by the user, and the process proceeds to one of steps S3 to S6 according to the selected destination selection method. In the present embodiment, one of the methods "telephone number," "address," "Japanese syllabary," or "raster map" can be selected as the destination selection method as illustrated in the drawings. Note that there are other destination selection methods, but they will be omitted here.

[0036] When "telephone number" is selected as the destination selection method in step S2, destination selection processing is performed based on a telephone number input by the user as shown in step S3. When "address" is selected as the destination selection method in step S2, destination selection processing is performed based on an address input by the user as shown in step S4. When "Japanese syllabary" is selected as the destination selection method in step S2, destination selection processing is performed based on a Japanese syllabary character input by the user as shown in step S5. When "raster map" is selected as the destination selection method in step S2, destination selection processing is performed based on a raster map such as those shown in step S6 to step S9. Note that because the destination selection processes based on "telephone number," "address," and "Japanese syllabary" in steps S3 to S5 are performed using a conventionally well-known method, descriptions of each of these processes are omitted here.

[0037] In step S5, reading processing of the raster map and display processing of the read raster map are performed. When "raster map" is selected as the destination selection method in step S2, a menu screen relating to the selection of a raster map to be displayed as illustrated in FIG. 8 is displayed. In the present embodiment, a selection is made as to whether a raster map is incorporated from any storage medium of the IC card 41, the handy scanner 42, or the communication network 43 connected via the external interface 40, or from a data input device. FIG. 8 is a diagram illustrating an example of a storage medium and a data input device of raster graphic data that can be incorporated, and information relating to this data. That is, FIG. 8 illustrates that raster graphic data relating to French restaurants in the vicinity of Tokyo Station and in the vicinity of $\triangle$ station such as that illustrated in FIG. 2 or FIG. 3 can be incorporated from the communication network 43, raster graphic data relating to $\circ\circ$ hot spring resort and $\circ\times$ sightseeing spot can be incorporated from the IC card 41, and raster graphic data relating to recommended restaurants and French restaurants can be incorporated from the handy scanner 42. The user selects a desired item from the raster map selection menu screen in FIG. 8. Accordingly, in step S5, the raster map selected by the user is displayed. FIG. 3 illustrates a state wherein "French restaurants around $\triangle$ station" is selected on the selection menu screen of FIG.

8 and a raster map thereof is displayed on the image display unit 30.

[0038] In step S7, a determination is made as to whether a destination is designated by a cursor or another pointing device on the raster map displayed on the image display unit 30. When the result of this determination is YES, the process proceeds to the next step S8, and when the result of this determination is NO, the process is returned to step S6, and the raster map is displayed until a destination is designated. Note that while not illustrated in the drawings, when a predetermined time has elapsed without a destination being designated on the raster map, the process is forced to jump to step S12.

[0039] In step S8, the east longitude and north latitude coordinate position is acquired based on the position designated on the raster map. When raster graphic data is configured by rectangular image data as illustrated in FIG. 2 and two opposite east longitude and north latitude coordinate data, east longitude and north latitude coordinates of a point designated by a cursor are obtained by arithmetic processing based on the two opposite east longitude and north latitude coordinates. Meanwhile, when raster map data is configured by rectangular image data such as that illustrated in FIG. 4, information relating to a facility, and facility east longitude and north latitude coordinate data, the east longitude and north latitude coordinate data for the facility corresponding to the designated position is directly obtained. In step S9, selection processing of the destination is performed based on the east longitude and north latitude coordinate position acquired in step S8 described above.

[0040] In step S10, it is determined whether the destination selected by the respective destination selection methods is what the user desires. That is, the destination selected in the process in steps S3 to S9 is displayed on the screen, "Is this destination correct?" is displayed, and the user is made to select a "YES" or "NO" button. Here, when the "YES" button is selected by the user, the process proceeds to the next step S11, and when the "NO" button is selected, the process returns to step S1 and repeats the same processes as described above. The selection processing of the destination is executed until the user selects the "YES" button in step S10.

[0041] In step S11, the destination eventually determined through the process in steps S1 to S9 is set as the destination. In step S12, route setting processing is performed based on the destination set in step S11. Because this destination setting process and route setting process are performed using processes that are similar to conventional processes, descriptions thereof will be omitted here.

[0042] An example will be described of the operation of how the navigation device in FIG. 1 performs guidance processing when a destination setting process is performed based on a raster map. FIG. 9 is a flowchart diagram illustrating an example of a guidance process performed by the navigation device of FIG. 1. FIG. 10 is a diagram illustrating an example wherein a raster map and a vector map are simultaneously displayed on the image display unit during execution of the guidance process. First, in step S21, a determination is made as to whether guidance is started or not. When guidance has started (YES), the process proceeds to the next step S22, and when it has not started (NO), the process returns.

[0043] In step S22, the current position of the vehicle is acquired according to the latitude and longitude detected by the current position detection unit 60. In step S23, a map based on the vector data (including guidance information needed at each travel location), the current position of the vehicle obtained in step S22, and the route set by the route setting process in step S12 in FIG. 6 are read from the storage unit 70, and a vicinity map near the travel of the vehicle, a marker indicating the current position of the vehicle, the searched route, an arrow indicating the direction to proceed, and the like are displayed on the display of the image display unit 30. At this time, only the map based on the vector data is displayed, and the map based on the raster map data is not displayed. Furthermore, the navigation device displays a map on the image display unit 30 and gives audio

guidance such as "Turn right at the next intersection." via the audio output unit 50. The navigation device displays and outputs audio of this guidance information to navigate to the destination.

[0044] In step S24, a determination is made as to whether the current position of the vehicle is included in the raster map including the destination set by the destination setting process in FIG. 6. That is, a determination is made as to whether the current position of the vehicle is included in a rectangular region defined by data representing the east longitude and north latitude coordinates of two diagonal points of the lower-left corner and the upper-right corner of rectangular image data configuring the raster map data. Note that instead of the rectangular region of image data, a raster map that includes the destination may be displayed when the distance from the destination to the current position of the vehicle is smaller than a predetermined threshold. Therefore, a raster graphic can be displayed even when the raster graphic data is such that the rectangular area is not clear as illustrated in FIG. 4. Note that even with raster graphic data such as that illustrated in FIG. 4, arithmetic processing may be performed to define a rectangular region of rectangular image data based on at least two points of east longitude and north latitude coordinates, and a determination may be made as to whether the current position of the vehicle is included in this rectangular region. When the result of the determination in step S24 is YES (included) the process proceeds to the next step S25, and when NO (not included), the process jumps to step S27.

[0045] In step S25, the raster map including the destination set by the destination setting process in FIG. 6 is displayed. This is to notify the user that the current position of the vehicle has reached the display range of the raster map and the vehicle is near the destination. Note that at this time, as illustrated in FIG. 10, both a map based on the vector data and a map based on the raster map are displayed on the display of the image display unit 30. In FIG. 10, the map on the left side is the map based on the vector data, and the map on the right side is the raster map. Because both maps are simultaneously displayed in split-screen, a user can continue to view the familiar map based on vector data that they have viewed in the past, and confusion caused by a sudden switch from the map based on the vector data to the raster map can be reduced. Note that it is obvious that both maps may be displayed overlapping, one map may be displayed, or one map may be displayed smaller. Furthermore, the selection of these various displays may be arbitrarily performed by the user or may be performed according to a pattern set in the navigation device in advance.

[0046] In step S26, the current position of the vehicle is displayed on the raster map. Due to the process in step S25, because both maps are displayed simultaneously, displaying the current position of the vehicle on both maps in the same manner makes it possible to increase the visibility of the current position of the vehicle to the user. Furthermore, a set route may be displayed on the raster map instead of the current position of the vehicle, or both the current position of the vehicle and a set route may be displayed. That is, the current position of the vehicle and the set route may be displayed only on the raster map, the current position of the vehicle and the set route may be displayed on the raster map and the current position of the vehicle or the set route may be displayed in the vector map, the current position of the vehicle or the set route may be displayed on the raster map and the current position of the vehicle and the set route may be displayed on the vector map, the current position of the vehicle may be displayed on the raster map and the set route may be displayed on the vector map, or the set route may be displayed on the raster map and the current position of the vehicle may be displayed on the vector map. Note that in FIG. 10, the black-filled triangle graphic surrounded by a circle is the marker indicating the current position of the vehicle, the thickest of the lines indicating the road is the set route, and the thick-lined circle displayed on the map based on the vector data on the left is the destination.

[0047] In step S27, a determination is made as to whether the raster map is being displayed on the

display of the image display unit 30, and when it is being displayed (YES), the process proceeds to the next step S28, and when it is not being displayed (NO), the process jumps to step S30. In step S28, a determination is made as to whether the current position of the vehicle has deviated from the rectangular region of the raster map being displayed, and when it has deviated (YES), the process proceeds to the next step S29, and when it has not deviated (NO), the process jumps to step S30. In step S29, because it is determined in step 28 that the current position of the vehicle has deviated from the rectangular region of the raster map currently being displayed, the display of the raster map is erased. Moreover, the map is deleted and a message indicating that the current position of the vehicle has deviated from the rectangular area of the raster map is notified by audio or image.

[0048] In step S30, it is determined whether the guidance is complete, that is, it is determined whether the vehicle has arrived at the destination, and when it has not yet arrived at the destination (NO), the guidance is not completed, and the process returns to step S22. When the destination has been reached (YES), the guidance processing is finished.

[0049] Note that it is obvious that the navigation device of the present invention may be configured by an operation program corresponding to the present invention, a personal computer having various data installed thereon, or the like. When doing so, it is necessary to add the current position detection unit 60 as a peripheral device for a personal computer.

[0050] In the embodiment described above, a navigation device for a vehicle was described as an example, but it is obvious that the present invention can similarly be applied to a portable navigation device.

[0051] In the embodiment described above, a description was given wherein only the raster map was displayed when setting the destination, but both the raster map and the vector map may be displayed when setting the destination as illustrated in FIG. 10. Displaying both the maps makes it is possible to easily set the destination when compared to setting using only the vector map. When doing so, the designated spot can be set as an effective destination regardless of whether designated on the raster map or the vector map. Furthermore, a cursor for designation may be displayed simultaneously on both maps, or when a destination is designated, that portion may be displayed on both maps.

[0052]

[Effect of Invention] According to the navigation device and the destination setting method of the present invention, a destination can be easily set even when the search information of the destination does not exist in the database of the navigation device.

[Brief Description of Drawings]

[FIG. 1] is a block diagram illustrating a schematic configuration when the navigation device of the present invention is applied to a navigation device for a vehicle.

[FIG. 2] is a diagram illustrating a configuration example of raster map data stored in a raster map database of FIG. 1.

[FIG. 3] is a diagram illustrating an example wherein the raster map data of FIG. 2 is displayed on a display of an image display unit.

[FIG. 4] is a diagram illustrating another example of a configuration of raster map data.

[FIG. 5] is a diagram illustrating an example of a deformed raster map.

[FIG. 6] is a flowchart diagram illustrating an example of a setting process performed by the navigation device of FIG. 1.

[FIG. 7] is a diagram illustrating an example of a menu screen of a destination setting method displayed on a display of the image display unit during execution of the setting process of FIG. 6.

[FIG. 8] is a diagram illustrating an example of a raster map selection menu screen displayed on a display of an image display unit during execution of the setting process of FIG. 6.

[FIG. 9] is a flowchart diagram illustrating an example of a guidance process performed by the navigation device of FIG. 1.

[FIG. 10] is a diagram illustrating an example wherein a raster map and a vector map are simultaneously displayed on the image display unit during execution of the guidance process in FIG. 9.

[Description of Reference Numerals]

10... Arithmetic processing unit, 20... Input unit, 30... Image display unit, 40... External interface, 50... Audio output unit, 60... Current position detection unit, 70... Storage Unit, 80... Raster map database

FIG 1

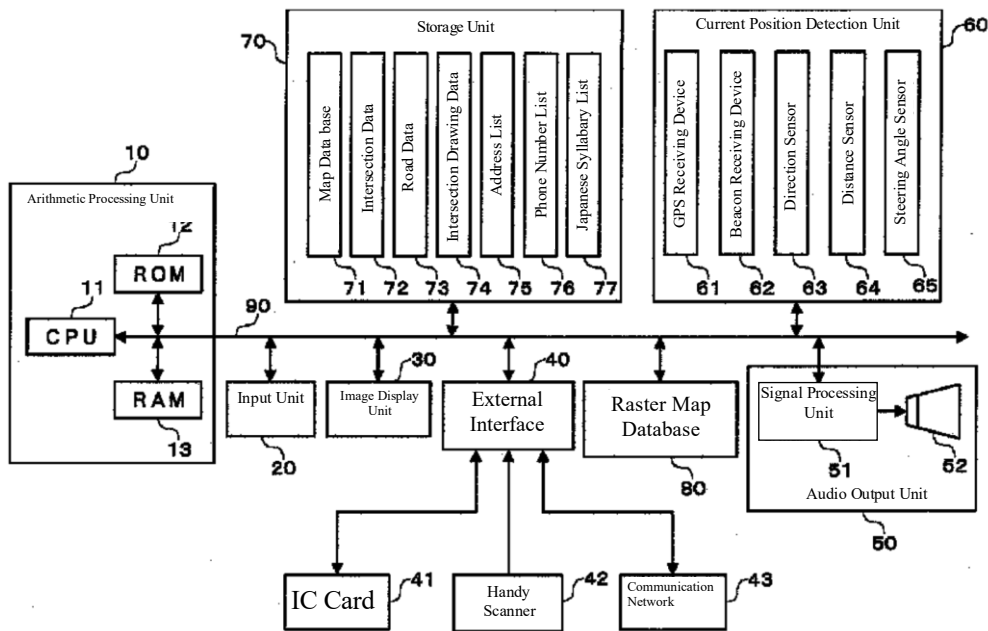


FIG 2

FIG 3

Rectangular Image Data	East longitude and latitude coordinates of two diagonal points
Image Data Around Tokyo Station	(X1, Y1) (X2, Y2)
Image Data of French Restaurants Near ▲Station	(X3, Y3) (X4, Y4)
⋮	⋮

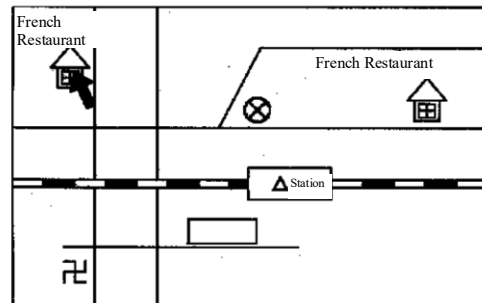


FIG 4

Rectangular Image Data	Facility in image	East Longitude and North Latitude Coordinates of Facility in Image
Image Data of French Restaurants Near▲ Station	○ French Restaurant	(Xa, Ya)
	△ French Restaurant	(Xb, Yb)
⋮	⋮	⋮
⋮	⋮	⋮

FIG 5

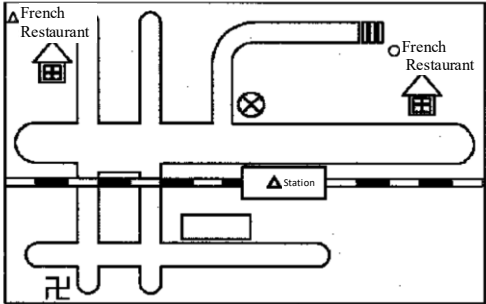


FIG 6

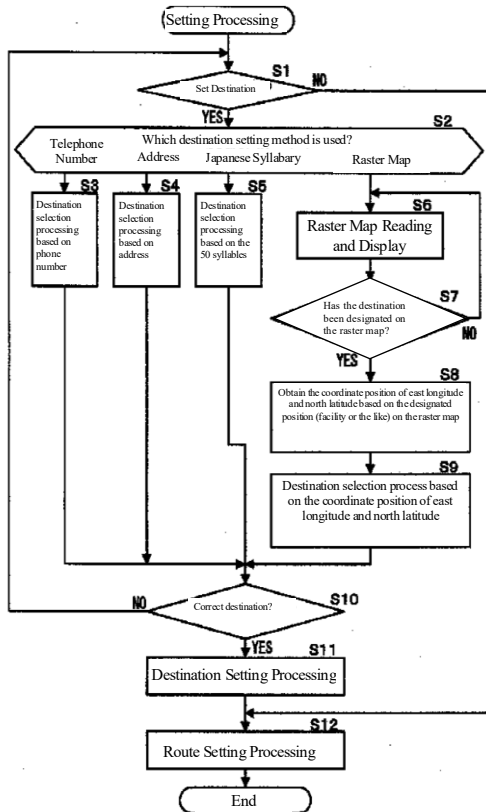


FIG 8

Please select the map you wish to view

Communication	IC Card	Scanner
Around Tokyo Station	○○ Spa	Recommendations
▲ French restaurant near the station	○× Tourist area	French Restaurant
⋮	⋮	⋮

FIG 7

Please select a destination setting method

Telephone Number
Address
Japanese Syllabary
Raster Map
⋮

FIG 9

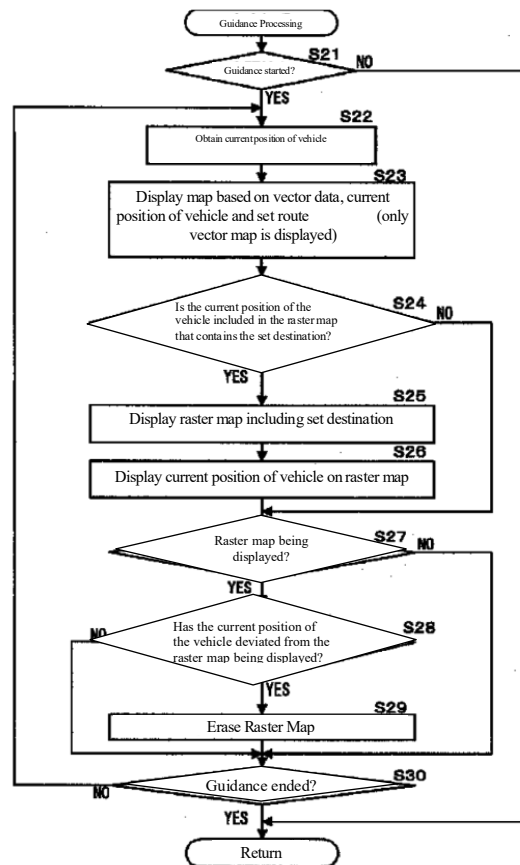
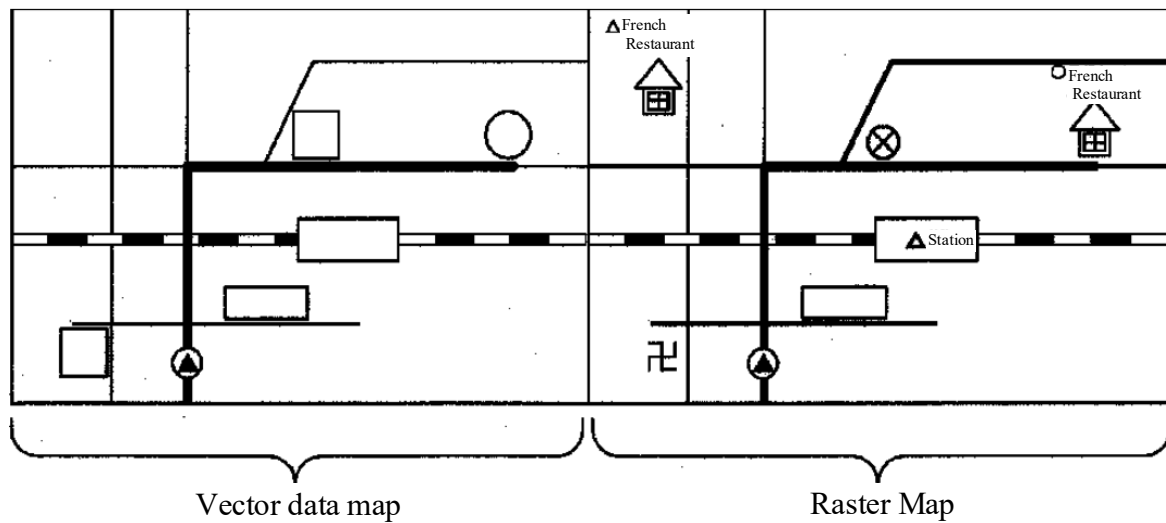


FIG 10



Continued From First Page:

F Term (Reference)	2C032 HB02 HB22 HB24 HC08 HD03
	HD07 HD16
	2F029 AA02 AB01 AB07 AB09 AB13
	AC02 AC04 AC08 AC13 AC14
	AC18
	5H180 AA01 BB12 BB13 FF04 FF05
	FF22 FF25 FF27 FF33
	9A001 BB03 DD13 JJ01 JJ78 KK56