

(54) TITLE OF THE INVENTION**ROAD-MAP DISPLAY DEVICE, ROAD-MAP DISPLAY METHOD, AND
PROGRAM FOR DISPLAYING ROAD MAPS****(57) ABSTRACT**

OBJECTIVE: To provide a road-map display device and a road-map display method that allow the display mode to be altered according to individual attributes of each road or background, such as the type and width of the road.

MEANS FOR RESOLUTION: The present invention provides a road-map display device or a road-map display method designed to read out road-map data from a road-map data storage medium in which said road-map data has been stored beforehand and then display the desired road map on the display part, said device or method being provided with a means for changing the display mode for each attribute, including the type of the roads and/or backgrounds to be displayed. Accordingly, the present invention makes it possible to arbitrarily set which roads, backgrounds, etc., should be omitted when the scale factor for the display is reduced. It also makes it possible to arbitrarily set and thus customize the mode of display, including the colors/road widths, style, etc., used to display the roads and backgrounds, doing so according to the applicable scale and user preferences.

"Road Settings"

Type of Road	Show/Hide	Display Color	Display Width (dot)	Minimum Road Width (m)
Highways	O	Purple	5	0
National Roads	O	Red	4	0
Prefectural Roads	O	Green	3	5
Local Roads	—	Yellow	2	3
Alleyways	—	Black	1	3

WHAT IS CLAIMED IS:

CLAIM 1

A road-map display device, which is configured to read out road-map data from a road-map data storage means in which said road-map data has been stored beforehand and then display the desired road map on the display part, said device comprising a means for changing the display mode for each attribute including the type of the roads and/or backgrounds to be displayed.

CLAIM 2

The road-map display device according to Claim 1, wherein at least one, or more, of the following items are used for said display mode: Show/Hide, Display Color, Display Width, and Minimum Road Width to Be Displayed.

CLAIM 3

The road-map display device according to Claim 1 or Claim 2, further comprising a means for changing the display mode for each attribute including the type of the backgrounds to be displayed.

CLAIM 4

The road-map display device according to Claim 3, wherein at least one, or more, of the following items are used for said display mode: Show/Hide, Display Color, and Style.

CLAIM 5

A road-map display method for reading out road-map data from a road-map data storage means in which said road-map data has been stored beforehand and then displaying the desired road map on the display part, said method comprising:

A step for changing the display mode for each attribute including the type of roads to be displayed, doing so according to the user's preferences,

A step for assessing if any change has been made to the display mode in the aforementioned step for changing the display mode for each attribute,

A step for storing the post-change display mode when it is determined that a change has been made in the aforementioned step for assessing changes made to the display mode,

A step for assessing whether the user's instruction for the display mode is the default view or a user-configured view, and

A step for displaying the default or user-configured view based on pre-stored data, doing so according to the result of the aforementioned step for assessing the user's instruction.

CLAIM 6

The road map display method according to Claim 5, further comprising:

A step for selecting or setting the scale of the aforementioned road map to be displayed, and

A step for selecting various display-mode items for each scale that has been selected or set in the step mentioned above.

CLAIM 7

A computer program for displaying road maps, said program being configured to read out road-map data from a road-map data storage means in which said road-map data has been stored beforehand and then display the desired road map on the display part, wherein said program comprises a means for changing the display mode for each attribute including the type of the roads and/or backgrounds to be displayed.

DETAILED DESCRIPTION OF THE INVENTION

[0001]

TECHNOLOGICAL FIELD OF THE INVENTION

The present invention pertains to a road-map display device. In particular, it pertains to a device, method, and program for displaying road maps, such a device, method, and program configured to read out a road map that is data pre-stored in a storage medium and display the road map on a display device.

[0002]

PRIOR ART

Among this type of road-map display devices, a conventional road-map display device disclosed, for example, in the Japanese Patent No. 2522223, is configured to pre-store road map information and name information separately, read out the necessary name information

selectively corresponding to changes in the road map information displayed in conjunction with changes in the display mode (such as zooming in or out of the map), and display the map accordingly. With such a conventional road-map display device, the necessary name information corresponding to the post-change road map information is selectively read out from the storage means, making it possible to respond flexibly to changes in the display mode of the displayed map. It is also possible to display appropriate name information that corresponds to the road map information thus displayed.

[0003]

PROBLEMS TO BE RESOLVED BY THE INVENTION

The prior art mentioned above changes the road display mode by making the displayed roads "sparse" or "dense." When zooming out, the main roads are preferentially displayed while minor roads are omitted from the display; whereas, when zooming in, minor roads are displayed as many as possible. Consequently, the above-mentioned prior art does not offer the concept of changing the mode of display according to individual attributes, such as the type and width of each road, meaning that it is impossible to make changes by attributes. It was also impossible to change such attributes of roads based on the user's choice.

[0004] Given these factors, the present invention is intended to provide a road-map display device, a road-map display method, and a program for the display of road maps, which allow the display mode to be altered according to individual attributes of each road or background, such as the type and width of the road.

[0005]

MEANS FOR RESOLVING THE PROBLEMS

In order to achieve the aforementioned objective, the present invention provides a road-map display device or a road-map display method designed to read out road-map data from a road-map data storage means in which said road-map data has been stored beforehand and then display the desired road map on the display part, said device or method being provided with a means for changing the display mode for each attribute, including the type of the roads and/or backgrounds to be displayed. Such a configuration makes it possible to arbitrarily set which roads, backgrounds, etc., should be omitted when the display scale factor is reduced, for example. It also makes it possible to arbitrarily set and thus customize the mode of display, including the colors/road widths, style, etc., used to display the roads and backgrounds, doing so according to the applicable scale and user preferences.

[0006]

EMBODIMENT OF THE INVENTION

The following is an explanation of preferable embodiments of the road-map display device and road-map display method according to the present invention with reference to drawings:

Figure 3 is a block diagram that illustrates a preferable embodiment of the road-map display device according to the present invention. Said road-map display device can also be embodied as a road-map display device for a navigation system that uses GPS. However, since the present invention does not require a navigation system and the essence of the present invention pertains only to displaying maps, the description relating to navigation systems, such as the detection and display of the current position with GPS, shall be omitted herefrom.

[0007] In Figure 3, map-data storage part 7 contains pre-stored data constituting the map, e.g., data on roads, backgrounds, etc. The pre-stored data are read out according to the control part's control on an as-needed basis. A DVD player equipped with a DVD, a hard disk, or a CD player equipped with a CD can be used as map-data storage part 7. Control part 3 has map-data acquisition part 4, screen-transition management part 5, and map depiction part 6. The necessary map data is read from map-data storage part 7, processed appropriately, and sent to display part 1. Selected-information input part 2 consists of a group of buttons (switches) for user operations. It is provided around display part 1 or on a remote-control device. Display part 1 displays a map according to the control of control part 3. It provides features necessary to display a setup screen, enabling the user to set the display mode as described in a later section. A CRT, LCD, organic EL, plasma display, etc., may be used as display part 1.

[0008] Map-data acquisition part 4 controls the retrieval and acquisition of road and background data from map-data storage part 7 in order to draw a map. Once the user — while looking at the selection screen — sets the display mode by entering his or her selection through selected-information input part 2, screen-transition management part 5 reads each command thus entered by the user and processes it to determine the display mode, i.e., the widths and colors of the roads, the background colors and styles, and the like, which will be described in a later section. Here, “screen transition” refers to the transition between the normal map display screen and the setup screen used to set the display mode. Accordingly, screen-transition management part 5 also has features necessary to manage such screen transitions. Map depiction part 6 generates image signals to depict a map on display part 1 according to the user-selected widths and colors of the roads, colors of the background items, etc., and the user-specified display mode, which shall be described in a later section.

[0009] Incidentally, while map-data acquisition part 4, screen-transition management part 5, and map depiction part 6 are illustrated as individual functional blocks in the foregoing, they may be formed individually as discrete circuits, or they may be composed of a single central processing unit (CPU) and multiple interfaces, memories, etc. Memory part 8 comprises a ROM and a RAM (not shown). The ROM in memory part 8 stores the default display mode that has been preset during the production. Additionally, display modes selected by the user, as

will be described in greater detail later, are stored in RAM in memory part 8 at any time as appropriate.

[0010] Figure 1 shows an example of the setup screen used by the user to set the display mode by road type. Incidentally, said screen is displayed on display part 1 when the user selects "Road Settings" from the initial screen (not shown). More specifically, the initial screen displayed when the power is turned on shows icons such as "Map View," "Road Settings," "Background Settings," and the like. The user can select the desired icon with the applicable button or joystick provided on selected-information input part 2. Incidentally, the screen may be configured to switch to the setup screen upon the selection of "Road Settings" or "Background Settings." However, the screen may be configured to switch to the setup screen after the scale to be displayed is set.

[0011] The setup screen for the road settings shown in Figure 1 is organized in a tabular format, in which the following columns are arranged in the horizontal direction: "Road Type," "Show/Hide," "Display Color," "Display Width (dot)," "Minimum Road Width (m)." It should be understood that the following five types of roads are vertically listed under "Road Type": "Highways," "National Roads," "Prefectural Roads," "Local Roads," and "Alleyways." Incidentally, other types of roads may be added on an as-needed basis. The user can select "Show/Hide," "Display Color," "Display Width (dot)," and the "Minimum Road Width (m)" for each type of road as desired. Suppose that a prescribed scale has been selected now and that it will be difficult to see "local roads" and "alleyways" at said scale. Accordingly, these items (local roads, alleyways, and the like) are set to be hidden. In other words, the circle marks (○) in the "Show/Hide" column indicate that the items will be shown, while the hyphen marks (-) indicate that they will be hidden.

[0012] Subsequently, the "Display Color" is selected for each road, as shown in Figure 1. Then, a numerical value representing the number of dots is entered in the "Display Width (dot)" column as shown in Figure 1, followed by the entry of a numerical value in the "Minimum Road Width (m)" column. The "Minimum Road Width (m)" means that roads with a width equal to or less than a value specified will not be displayed. In the example shown in Figure 1, highways and national roads are displayed regardless of their road widths, but prefectural roads and local roads with a width of 5 m or less and allays with a width of 3 m or less are not displayed. However, in the example shown in Figure 1, local roads and allays are not subject to display, so there is no need to set them. However, when a different scale is used, i.e., in the case of an enlarged map, the local road and allay settings are enabled as they will be subject to display.

[0013] Figure 2 shows another example of the setup screen, which shows the screen the user can use to set the display mode by background type. The setup screen shown in Figure 2, similar to the one shown in Figure 1, is organized in a tabular format, in which the following columns are arranged in the horizontal direction: "Background Type," "Show/Hide," "Display Color,"

and "Style." It should be noted that the following four background types are vertically listed under "Background Type": "Premises," "Green Spaces," "Water Areas," and "Train Station Buildings." Incidentally, other types of background may be added on an as-needed basis. The user can set "Show/Hide," "Display Color," and "Style" for each background type. The "Show/Hide" and "Display Color" are set in the same as the example shown in Figure 1. As for the "Style," the user can choose between texture and solid color. In this way, various aspects of displaying roads and backgrounds can be selected according to the scale and the user's preference, meaning that so-called customization is available.

[0014] The setup screen is described with reference to figures 1 and 2 in the foregoing. However, when modifying the content of the settings for each display scale, it is necessary to set the display scale and then select the settings on the setup screen. With these settings, it becomes possible to show a more detailed view of the roads and backgrounds in a zoomed-in map or omit smaller roads and backgrounds as the scale factor is reduced. The display mode, including color and width, can also be set arbitrarily.

[0015] Figure 4 shows a flowchart that illustrates the operation of the CPU that constitutes control part 3 of the road-map display device shown in Figure 3. When the setup screen is selected as described above, the CPU's operation starts in the flow shown in Figure 3. First, it is assessed if the user setting has been completed in step 102. If completed, the control will proceed to step 105. If not, whether any changes have been made to the settings in step 103 will be confirmed. If there are no changes to the settings, the control will return to step 102. If changes have been made, the content of the modified settings will be retained in memory part 8 in step 104. Then, in step 105, it is assessed whether the user's instruction for the display mode is the default setting or a user-configured setting. If it is the default setting, then the control proceeds to step 106 and sets the pointer to the address (in memory part 8) where the default content is stored. Or, if it is a user-configured setting (if it is not the default), then the control proceeds to step 107 and sets the pointer to the address where the user-configured setting is stored.

[0016] Subsequently, the map data is read from map-data storage part 7 in step 108, and then the processing (step 109 → step 110) is repeated for the required number of data. If the answer to step 110 is YES, it is assessed in step 111 whether or not the target data are subject to display. This is achieved by recognizing "○" and "-" in the "Show/Hide" columns shown in figures 1 and 2. Specifically, it is determined whether or not the target data should be actually displayed, doing so by checking the "○" and "-" in the "Show/Hide" column of the display mode stored in the address indicated by the pointer as set in steps 106 and 107 against the corresponding data in the map data read from map-data storage part 7. If it is determined that the target data is not subject to display, the control returns to step 109 to continue the processing. If the target data is subject to display, the attributes for depicting the target data are set in step 111. That is, the depiction attributes are set according to the display mode stored in the address indicated by

the pointer as set in step 106 or 107. Then, in step 112, a map is depicted according to the depiction attributes set in step 111.

[0017] The present invention is illustrated as a road-map display device or a road-map display method in the above-mentioned embodiment. However, the essence of the present invention is in the ability to change the mode of display for each attribute, including the types of roads and/or backgrounds. Therefore, it is practically possible to implement the road-map display device or road-map display method according to the present invention by executing, with a given personal computer, a program that enables the modification of the display mode for each attribute, as mentioned above. Thus, the present invention also encompasses such a program.

[0018] As described above, the present invention provides a road-map display device or a road-map display method, whereby the aforementioned road-map data are read out from a road-map data storage medium (road-map data storage means), in which said road-map data have been pre-stored, so that the desired road map is displayed on the display part, such a device or method being provided with a means for altering the mode of display for each attribute, including the type of the roads and/or backgrounds to be displayed. Such a configuration makes it possible to arbitrarily set roads, backgrounds, etc., that should be omitted according to the display scale, user preferences for the display, etc. It also makes it possible to arbitrarily customize and thus set the display mode, such as the colors/road widths and the style used to display the roads and backgrounds, according to the applicable scale and user preferences.

BRIEF EXPLANATION OF THE DRAWINGS

Figure 1 shows a diagram that illustrates the setup screen the user uses to set the display mode by road type, such a setup screen being shown herein as an example of the setup screen in the preferred embodiment of the road-map display device according to the present invention.

Figure 2 shows a diagram that illustrates the setup screen the user uses to set the display mode by background type, such a setup screen being shown herein as an example of the setup screen in the preferred embodiment of the road-map display device according to the present invention.

Figure 3 shows a block diagram of the preferred embodiment of the road-map display device according to the present invention.

Figure 4 shows a flowchart that illustrates the operation of the CPU constituting control part 3 of the road-map display device shown in Figure 3.

EXPLANATION OF REFERENCE CODING

- 1: Display part
- 2: Selected-information input part
- 3: Control unit (which constitutes a means for changing the display mode in conjunction with the operation of selected-information input part 2)
- 4: Map-data acquisition part
- 5: Screen-transition management part
- 6: Map depiction part
- 7: Map-data storage part
- 8: Memory part

Figure 1
"Road Settings"

Type of Road	Show/Hide	Display Color	Display Width (dot)	Minimum Road Width (m)
Highways	O	Purple	5	0
National Roads	O	Red	4	0
Prefectural Roads	O	Green	3	5
Local Roads	—	Yellow	2	3
Alleyways	—	Black	1	3

Figure 2
"Background Settings"

Type of Background	Show/Hide	Display Color	Style
Premises	—	Gray	Texture
Green Spaces	O	Green	Solid color
Water Areas	O	Blue	Texture
Train Station Buildings	—	Brown	Solid color

Figure 3

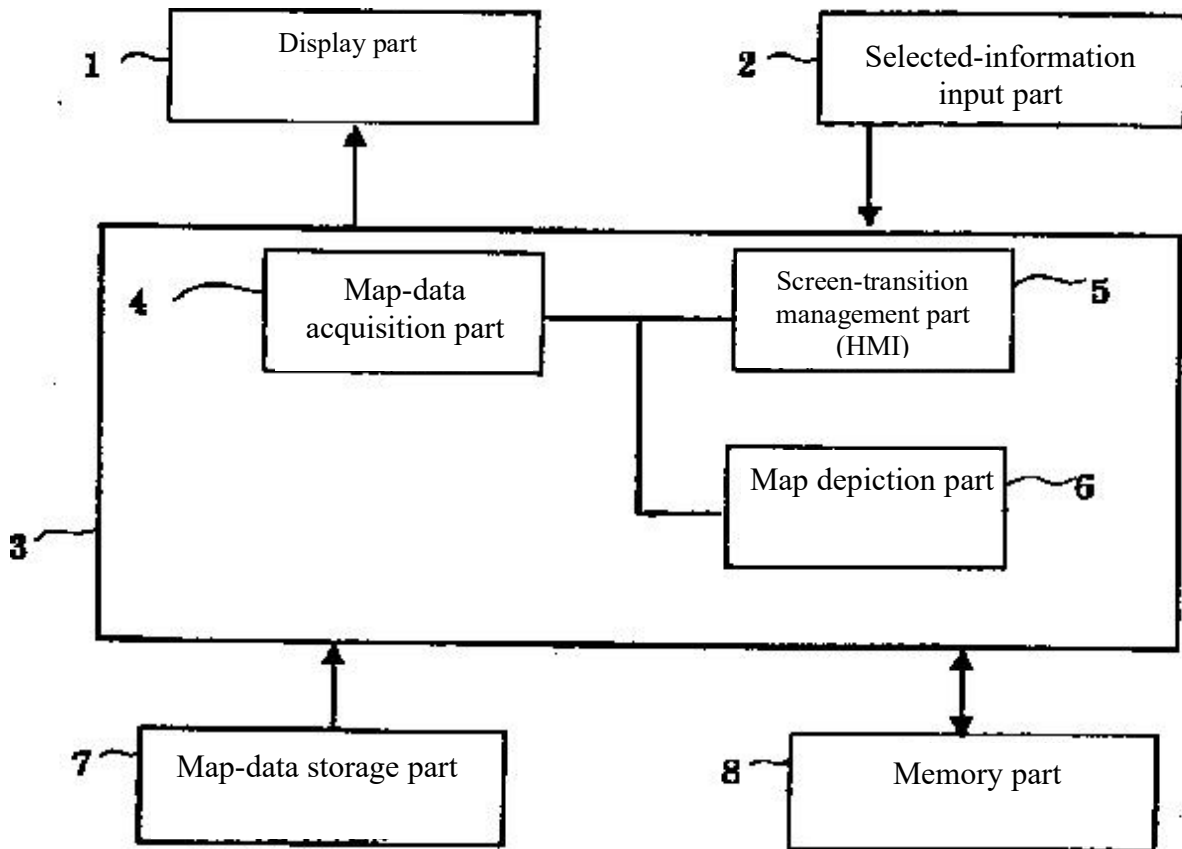
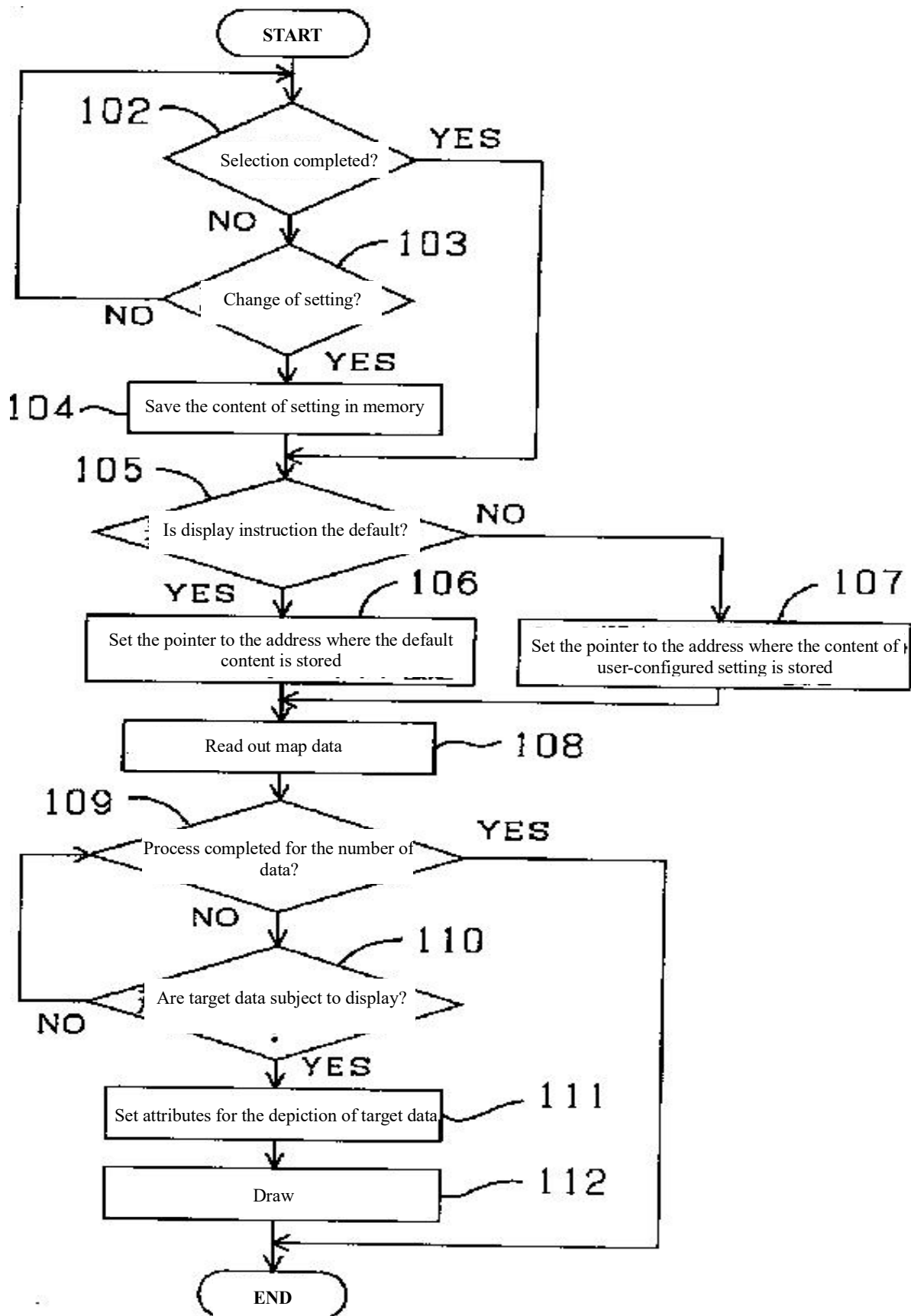


Figure 4



I, Yukie Hirose, hereby declare as follows:

1. I, Yukie Hirose, hereby certify that I am a professional translator fluent in both Japanese and English and I am competent to translate from Japanese into English.
2. I am a translator at Nelles Translations, which is located at 3 Grant Square, #336, Hinsdale, IL 60521.
3. I possess advanced knowledge of the Japanese and English languages.
4. The attached translation is, to the best of my knowledge and belief, a true and accurate translation from the Japanese patent JP-2002-372909-A to English.
5. I declare under penalty of perjury that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment or both, under Section 1001 of Title 18 of the United States Code.

Dated: 10/3/23

A handwritten signature in black ink, appearing to read 'Yukie Hirose', is written over a solid black horizontal line.

Ms. Yukie Hirose