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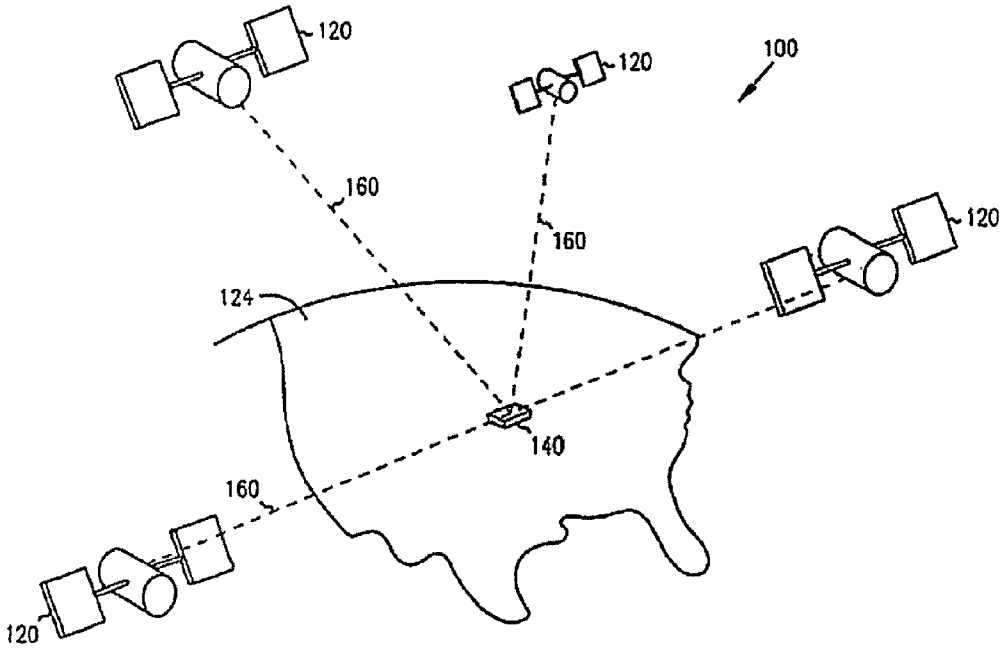
(54) **Title:** A NAVIGATION DEVICE AND METHOD FOR SEQUENTIAL MAP DISPLAY



(57) **Abstract:** A method and device are disclosed for providing a navigation device particularly suited for walking routes. In one embodiment, the method includes determining, in a navigation device, a number of maps for traveling along a route based upon an initial position and an input end position; inputting the end position; and displaying a map on the navigation device and prompting sequential display of the determined number of maps for traveling along the route from the initial position to the input end position.

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A NAVIGATION DEVICE AND METHOD FOR SEQUENTIAL MAP DISPLAY

Priority Statement

The present application hereby claims priority under 35 U.S.C. §119 on each of Great Britain Patent Application numbers 0604709.6 filed March 8, 2006; 0604708.8 filed March 8, 2006; 0604710.4 filed March 8, 2006; 0604704.7 filed March 8, 2006; and 0604706.2 filed March 8, 2006, the entire contents of each of which is hereby incorporated herein by reference.

Field

The present application generally relates to navigation methods and devices.

Background

Navigation devices were traditionally utilized mainly in the areas of vehicle use, such as on cars, motorcycles, trucks, boats, etc. These devices were typically tailored to produce a route of travel based upon an initial position of the navigation device and a selected/input travel destination (end position), noting that the initial position could be entered into the device but is traditionally calculated via GPS Positioning from a GPS Receiver within the navigation device.

As the devices were mainly used for motorized vehicles, many complex algorithms were developed to determine a best route of travel, taking into consideration speed of highway travel compared to city travel, as well as many other factors. Although many such devices were portable and detachable from a motorized vehicle (for placement in a different motorized vehicle, for example), and although the devices were used for both personal navigation when walking or running, as well as navigation in a motorized vehicle, such known navigation systems mainly focus on navigation with a vehicle.

SUMMARY

In at least one embodiment of the present application, a navigation device includes a focus on personal use of a navigation device (as opposed to vehicle

use) such as when walking, for example. In at least one embodiment, such a navigation device includes a processor to determine a number of maps for traveling along a route based upon an initial position and an input end position (e.g. travel destination); and an integrated input and display device to input the end position, to display a map and to prompt sequential display of the determined number of maps for traveling along the route from the initial position to the input end position.

In at least one other embodiment, a method includes determining, in a navigation device, a number of maps for traveling along a route based upon an initial position and an input end position. The method then further includes inputting the end position and displaying a map on the navigation device and prompting sequential display of the determined number of maps for traveling along the route from the initial position to the input end position.

BRIEF DESCRIPTION OF THE DRAWINGS

The present application will be described in more detail below by using example embodiments, which will be explained with the aid of the drawings, in which:

Figure 1 illustrates an example view of a Global Positioning System (GPS);

Figure 2 illustrates an example block diagram of electronic components of a navigation device of an embodiment of the present application;

Figure 3 illustrates an example block diagram of a server, navigation device and connection therebetween of an embodiment of the present application;

Figure 4 illustrates an example of a display of a route on a navigation device of an embodiment of the present application;

Figure 5 illustrates an example of a menu displayed on a navigation device of an embodiment of the present application;

Figure 6 illustrates an example of a two-dimensional display on a navigation device of an embodiment of the present application;

Figure 7 illustrates an example of a display screen in an embodiment of the present application;

Figure 8 illustrates an example of a display screen of a schematic view in an embodiment of the present application; and

Figure 9 illustrates an example of a summary map in an embodiment of the present application.

DETAILED DESCRIPTION OF THE EXAMPLE EMBODIMENTS

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the present invention. As used herein, the singular forms "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "includes" and/or "including", when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

In describing example embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this patent specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner.

Referencing the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, example embodiments of the present patent application are hereafter described. Like numbers refer to like elements throughout. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

Figure 1 illustrates an example view of Global Positioning System (GPS), usable by navigation devices, including the navigation device of embodiments of the present application. Such systems are known and are used for a variety of purposes. In general, GPS is a satellite-radio based navigation system capable of determining continuous position, velocity, time, and in some instances direction information for an unlimited number of users.

Formerly known as NAVSTAR, the GPS incorporates a plurality of satellites which work with the earth in extremely precise orbits. Based on these precise orbits, GPS satellites can relay their location to any number of receiving units. The GPS system is implemented when a device, specially equipped to receive GPS data, begins scanning radio frequencies for GPS satellite signals. Upon receiving a radio signal from a GPS satellite, the device determines the precise location of that satellite via one of a plurality of different conventional methods. The device will continue scanning, in most instances, for signals until it has acquired at least three different satellite signals (noting that position is not normally, but can be determined, with only two signals using other triangulation techniques). Implementing geometric triangulation, the receiver utilizes the three known positions to determine its own two-dimensional position relative to the satellites. This can be done in a known manner. Additionally, acquiring a fourth satellite signal will allow the receiving device to calculate its three dimensional position by the same geometrical calculation in a known manner. The position and velocity data can be updated in real time on a continuous basis by an unlimited number of users.

As shown in Figure 1, the GPS system is denoted generally by reference numeral 100. A plurality of satellites 120 are in orbit about the earth 124. The orbit of each satellite 120 is not necessarily synchronous with the orbits of other satellites 120 and, in fact, is likely asynchronous. A GPS receiver 140, usable in embodiments of navigation devices of the present application, is shown receiving spread spectrum GPS satellite signals 160 from the various satellites 120.

The spread spectrum signals 160, continuously transmitted from each satellite 120, utilize a highly accurate frequency standard accomplished with an extremely accurate atomic clock. Each satellite 120, as part of its data signal transmission 160, transmits a data stream indicative of that particular satellite 120. It is appreciated by those skilled in the relevant art that the GPS receiver device 140 generally acquires spread spectrum GPS satellite signals 160 from at least three satellites 120 for the GPS receiver device 140 to calculate its two-dimensional position by triangulation. Acquisition of an additional signal, resulting in signals 160 from a total of four satellites 120, permits the GPS

receiver device 140 to calculate its three-dimensional position in a known manner.

Figure 2 illustrates an example block diagram of electronic components of a navigation device 200 of an embodiment of the present application, in block component format. It should be noted that the block diagram of the navigation device 200 is not inclusive of all components of the navigation device, but is only representative of many example components.

The navigation device 200 is located within a housing (not shown). The housing includes a processor 210 connected to an input device 220 and a display screen 240. The input device 220 can include a keyboard device, voice input device, and/or any other known input device utilized to input information; and the display screen 240 can include any type of display screen such as an LCD display, for example. In at least one embodiment of the present application, the input device 220 and display screen 240 are integrated into an integrated input and display device, including a touchpad or touchscreen input wherein a user need only touch a portion of the display screen 240 to select one of a plurality of display choices or to activate one of a plurality of virtual buttons.

In addition, other types of output devices 250 can also include, including but not limited to, an audible output device. As output device 250 can produce audible information to a user of the navigation device 200, it is equally understood that input device 240 can also include a microphone and software for receiving input voice commands as well.

In the navigation device 200, processor 210 is operatively connected to and set to receive input information from input device 240 via a connection 225, and operatively connected to at least one of display screen 240 and output device 250, via output connections 245, to output information thereto. Further, the processor 210 is operatively connected to memory 230 via connection 235 and is further adapted to receive/send information from/to input/output (I/O) ports 270 via connection 275, wherein the I/O port 270 is connectible to an I/O device 280 external to the navigation device 200. The external I/O device 270 may include, but is not limited to an external listening device such as an earpiece for example. The connection to I/O device 280 can further be a wired or wireless connection to any other external device such as a car stereo unit for

hands-free operation and/or for voice activated operation for example, for connection to an ear piece or head phones, and/or for connection to a mobile phone for example, wherein the mobile phone connection may be used to establish a data connection between the navigation device 200 and the internet or any other network for example, and/or to establish a connection to a server via the internet or some other network for example.

The navigation device 200, in at least one embodiment, may establish a "mobile" network connection with the server 302 via a mobile device 400 (such as a mobile phone, PDA, and/or any device with mobile phone technology) establishing a digital connection (such as a digital connection via known Bluetooth technology for example). Thereafter, through its network service provider, the mobile device 400 can establish a network connection (through the internet for example) with a server 302. As such, a "mobile" network connection is established between the navigation device 200 (which can be, and often times is mobile as it travels alone and/or in a vehicle) and the server 302 to provide a "real-time" or at least very "up to date" gateway for information.

The establishing of the network connection between the mobile device 400 (via a service provider) and another device such as the server 302, using the internet 410 for example, can be done in a known manner. This can include use of TCP/IP layered protocol for example. The mobile device 400 can utilize any number of communication standards such as CDMA, GSM, WAN, etc.

As such, an internet connection may be utilized which is achieved via data connection, via a mobile phone or mobile phone technology within the navigation device 200 for example. For this connection, an internet connection between the server 302 and the navigation device 200 is established. This can be done, for example, through a mobile phone or other mobile device and a GPRS (General Packet Radio Service)-connection (GPRS connection is a high-speed data connection for mobile devices provided by telecom operators; GPRS is a method to connect to the internet.

The navigation device 200 can further complete a data connection with the mobile device 400, and eventually with the internet 410 and server 302, via existing Bluetooth technology for example, in a known manner, wherein the

data protocol can utilize any number of standards, such as the GSRM, the Data Protocol Standard for the GSM standard, for example.

The navigation device 200 may include its own mobile phone technology within the navigation device 200 itself (including an antenna for example, wherein the internal antenna of the navigation device 200 can further alternatively be used). The mobile phone technology within the navigation device 200 can include internal components as specified above, and/or can include an insertable card, complete with necessary mobile phone technology and/or an antenna for example. As such, mobile phone technology within the navigation device 200 can similarly establish a network connection between the navigation device 200 and the server 302, via the internet 410 for example, in a manner similar to that of any mobile device 400.

For GRPS phone settings, the Bluetooth enabled device may be used to correctly work with the ever changing spectrum of mobile phone models, manufacturers, etc., model/manufacturer specific settings may be stored on the navigation device 200 for example. The data stored for this information can be updated in a manner discussed in any of the embodiments, previous and subsequent.

Figure 2 further illustrates an operative connection between the processor 210 and an antenna/receiver 250 via connection 255, wherein the antenna/receiver 250 can be a GPS antenna/receiver for example. It will be understood that the antenna and receiver designated by reference numeral 250 are combined schematically for illustration, but that the antenna and receiver may be separately located components, and that the antenna may be a GPS patch antenna or helical antenna for example.

Further, it will be understood by one of ordinary skill in the art that the electronic components shown in Figure 2 are powered by power sources (not shown) in a conventional manner. As will be understood by one of ordinary skill in the art, different configurations of the components shown in Figure 2 are considered within the scope of the present application. For example, in one embodiment, the components shown in Figure 2 may be in communication with one another via wired and/or wireless connections and the like. Thus, the

scope of the navigation device 200 of the present application includes a portable or handheld navigation device 200.

In addition, the portable or handheld navigation device 200 of Figure 2 can be connected or "docked" in a known manner to a motorized vehicle such as a car or boat for example. Such a navigation device 200 is then removable from the docked location for portable or handheld navigation use.

Figure 3 illustrates an example block diagram of a server 302 and a navigation device 200 of the present application, via a generic communications channel 318, of an embodiment of the present application. The server 302 and a navigation device 200 of the present application can communicate when a connection via communications channel 318 is established between the server 302 and the navigation device 200 (noting that such a connection can be a data connection via mobile device, a direct connection via personal computer via the internet, etc.).

The server 302 includes, in addition to other components which may not be illustrated, a processor 304 operatively connected to a memory 306 and further operatively connected, via a wired or wireless connection 314, to a mass data storage device 312. The processor 304 is further operatively connected to transmitter 308 and receiver 310, to transmit and send information to and from navigation device 200 via communications channel 318. The signals sent and received may include data, communication, and/or other propagated signals. The transmitter 308 and receiver 310 may be selected or designed according to the communications requirement and communication technology used in the communication design for the navigation system 200. Further, it should be noted that the functions of transmitter 308 and receiver 310 may be combined into a signal transceiver.

Server 302 is further connected to (or includes) a mass storage device 312, noting that the mass storage device 312 may be coupled to the server 302 via communication link 314. The mass storage device 312 contains a store of navigation data and map information, and can again be a separate device from the server 302 or can be incorporated into the server 302.

The navigation device 200 is adapted to communicate with the server 302 through communications channel 318, and includes processor, memory, etc. as

previously described with regard to Figure 2, as well as transmitter 320 and receiver 322 to send and receive signals and/or data through the communications channel 318, noting that these devices can further be used to communicate with devices other than server 302. Further, the transmitter 320 and receiver 322 are selected or designed according to communication requirements and communication technology used in the communication design for the navigation device 200 and the functions of the transmitter 320 and receiver 322 may be combined into a single transceiver.

Software stored in server memory 306 provides instructions for the processor 304 and allows the server 302 to provide services to the navigation device 200. One service provided by the server 302 involves processing requests from the navigation device 200 and transmitting navigation data from the mass data storage 312 to the navigation device 200. According to at least one embodiment of the present application, another service provided by the server 302 includes processing the navigation data using various algorithms for a desired application and sending the results of these calculations to the navigation device 200.

The communication channel 318 generically represents the propagating medium or path that connects the navigation device 200 and the server 302. According to at least one embodiment of the present application, both the server 302 and navigation device 200 include a transmitter for transmitting data through the communication channel and a receiver for receiving data that has been transmitted through the communication channel.

The communication channel 318 is not limited to a particular communication technology. Additionally, the communication channel 318 is not limited to a single communication technology; that is, the channel 318 may include several communication links that use a variety of technology. For example, according to at least one embodiment, the communication channel 318 can be adapted to provide a path for electrical, optical, and/or electromagnetic communications, etc. As such, the communication channel 318 includes, but is not limited to, one or a combination of the following: electric circuits, electrical conductors such as wires and coaxial cables, fiber optic cables, converters, radio-frequency (rf) waves, the atmosphere, empty space, etc. Furthermore, according to at

least one various embodiment, the communication channel 318 can include intermediate devices such as routers, repeaters, buffers, transmitters, and receivers, for example.

In at least one embodiment of the present application, for example, the communication channel 318 includes telephone and computer networks. Furthermore, in at least one embodiment, the communication channel 318 may be capable of accommodating wireless communication such as radio frequency, microwave frequency, infrared communication, etc. Additionally, according to at least one embodiment, the communication channel 318 can accommodate satellite communication.

The communication signals transmitted through the communication channel 318 include, but are not limited to, signals as may be required or desired for given communication technology. For example, the signals may be adapted to be used in cellular communication technology such as Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), Code Division Multiple Access (CDMA), Global System for Mobile Communications (GSM), etc. Both digital and analogue signals can be transmitted through the communication channel 318. According to at least one embodiment, these signals may be modulated, encrypted and/or compressed signals as may be desirable for the communication technology.

The mass data storage 312 includes sufficient memory for the desired navigation applications. Examples of the mass data storage 312 may include magnetic data storage media such as hard drives for example, optical storage media such as CD-Roms for example, charged data storage media such as flash memory for example, molecular memory, etc.

According to at least one embodiment of the present application, the server 302 includes a remote server accessible by the navigation device 200 via a wireless channel. According to at least one other embodiment of the application, the server 302 may include a network server located on a local area network (LAN), wide area network (WAN), virtual private network (VPN), etc.

According to at least one embodiment of the present application, the server 302 may include a personal computer such as a desktop or laptop computer, and the communication channel 318 may be a cable connected between the

personal computer and the navigation device 200. Alternatively, a personal computer may be connected between the navigation device 200 and the server 302 to establish an internet connection between the server 302 and the navigation device 200. Alternatively, a mobile telephone or other handheld device may establish a wireless connection to the internet, for connecting the navigation device 200 to the server 302 via the internet.

The navigation device 200 may be provided with information from the server 302 via information downloads which may be periodically updated upon a user connecting navigation device 200 to the server 302 and/or may be more dynamic upon a more constant or frequent connection being made between the server 302 and navigation device 200 via a wireless mobile connection device and TCP/IP connection for example. For many dynamic calculations, the processor 304 in the server 302 may be used to handle the bulk of the processing needs, however, processor 210 of navigation device 200 can also handle much processing and calculation, oftentimes independent of a connection to a server 302.

The mass storage device 312 connected to the server 302 can include volumes more cartographic and route data than that which is able to be maintained on the navigation device 200 itself, including maps, etc. The server 302 may process, for example, the majority of the devices of a navigation device 200 which travel along the route using a set of processing algorithms. Further, the cartographic and route data stored in memory 312 can operate on signals (e.g. GPS signals), originally received by the navigation device 200.

A navigation device 200 of an embodiment of the present application is focused on, but not limited to use, in a portable or mobile manner, for running, walking etc. through an area such as a city, park, etc. To benefit such portable use, the navigation device 200 includes the capability of allowing a user to step through a series of instructions with or without the use of GPS technology. In at least one embodiment, the idea is that the user can utilize the navigation device to navigate through a city, park, etc. in an easy, sequential manner, with or without the use of GPS technology.

Thus, in at least one embodiment, a navigation device 200 includes a processor 210 and an integrated input and display device (integrated as a touchscreen, for

example, from display screen 240 and input device 220). The processor 210 is used to determine a number of maps for traveling along a route based upon an initial position and an input end position (e.g. travel destination). The inputting can include direct input of an address, any type of selection from menu choices, etc. The integrated input and display device is then used to input of the end position, to display a map and to prompt display of the determined number of maps for traveling along the route from the initial position to the input end position.

In at least one other embodiment, a method of the present application includes determining, in a navigation device 200, a number of maps for traveling along a route based upon an initial position and an input end position. The method further includes inputting the end position and displaying a map, on the navigation device, and prompting sequential display of the determined number of maps for traveling along the route from the initial position to the input end position.

As indicated above in Figure 2 of the application, a navigation device 200 of an embodiment of the present application includes a processor 210, an input device 220, and a display screen 240. In at least one embodiment, the input device 220 and display screen 240 are integrated into an integrated input and display device to enable both input of information (via direct input, menu selection, etc.) and display of information through a touch panel screen, for example. Such a screen may be a touch input LCD screen, for example, as is well known to those of ordinary skill in the art.

In at least one embodiment of the present application, the navigation device 200 of the present application is especially developed for mobile use, especially for walking/running routes. In such a navigation device 200, the integrated input and display device can be used to enable both input of at least an end position (and an initial position if GPS positioning is not used) and to prompt sequential display of a determined number or sequence of maps, for traveling along a route from the initial position to the end position. Again, if the initial position is entered (via direct input, selection, etc.) along with the end position, the user can use the navigation device 200 for walking/running routes to walk/run through a city, park, countryside, etc. without the necessity of GPS technology.

In one embodiment, there will be two entry points from which the user of the navigation device 200 can develop a route and begin a determination of a number of maps for traveling along the route based upon an initial position and end position. As shown in an example embodiment of Figure 4 of the present application, once an initial position has been entered or determined (via GPS technology in a known manner for example), and once an end position has been entered, the navigation device 200 then calculates a route for travel by the user. Such an example route is shown in Figure 4.

Once the route is determined, based upon an initial position and an end position and map information stored in memory 230, the processor 210 of the navigation device 200 then determines, from map information, stored in memory 230 and/or received from mass data storage 312 via server 302 and communication channel 318 , a number of maps which can be used for traveling along a route based upon the initial position and input end position. After the route has been determined, instructions are generated as for normal turn-by-turn navigation. The instructions include e.g. "turn left", "turn right", "take the exit", and similar phrases, noting that when using the navigation device 200 as a walking device, it is mostly turn left or turn right. Thus, s shown in Figure 4, the user of the navigation device 200 can see the route as a number of instructions(instruction 3/10 in Figure 4), the total number of which depends on the route. For every instruction, a map is generated so the total number of maps equals the total number of instructions (noting that there may be additional ones for departure and destination points).

In some situations, e.g. in difficult road situations, an instruction may be given (via display on the navigation device 200, for example) for walking straight ahead (with or without a map). This may be done independent of GPS technology or availability of a GPS signal. The map may further be created in a way that it is oriented in the walking direction so that a "turn left" instruction is indeed a left turn. The map may further be magnified to such a level that the user of the navigation device 200 can clearly understand the picture while walking. It might further be zoomed to a level that only that crossing (and its close surrounding) is seen, where a left or right turn is to be made.

Once the number of maps is determined , the maps and the number can be stored in memory 230 and can be utilized when sequentially displaying the maps on the display screen 240 of the integrated input and display device in an embodiment of the present application. Both the current map number and the total number of instructions or maps can be displayed, wherein sequential display of the determined number of maps is prompted to the user.

As shown in Figure 5, once the route is determined and the number and actual maps are determined, a main menu can optionally be displayed on the display screen 240 of the integrated input and display device of navigation device 200. The menu can include, for example, a selectable option to show route instructions or maps. Upon selection, this can then instruct the prompting of sequential display of the determined number of maps for traveling along the route from the initial position to the selected end position. The menu can further include alternatives for providing a route demonstration, a selection for providing status information, a selection for providing a guided tour to the user, a selection for showing a version, etc. Each of these options shown in the main menu of Figure 5 are displayable on display screen 240 of the integrated input and display device, and are selectable via touch screen input of the integrated input and display device.

When selecting route demonstration, for example, the navigation device 200 may display a bird's eye view (3-D) or, optionally, a 2D view of the planned route and may follow the route with a certain, user selectable speed, as if the user would be driving on the route for example. When selecting status, an overview of the planned route may be drawn on the map in whole or in part. The guided tour feature opens a multimedia tutorial about using the navigation device 200 in general, and also how to plan a route. When selecting the show version feature, the user of the navigation device 200 can see the version number of the application and the map currently in use or installed on the navigation device 200.

Figure 6 illustrates a two-dimensional display view of a display screen 240 of the integrated input and display device. This view may be from an overhead perspective of the user. This view illustrates a basic instruction map which may or may not be displayed to the user, depending upon particular settings

which are selected by the user. The user can select between a two and three dimensional view in the preference or setup menu of the navigation device, for example. In most instances, after determining a route and the number of maps for traveling along the route, sequential display of the maps can be controlled as follows.

Figure 7 illustrates an example embodiment of a display on the integrated input and display device of the navigation device 200. Once the processor 210 determines the number of maps for traveling on the route based upon an initial position and an input end position, the integrated input and display device can then display a map and can prompt sequential display of the determined number of maps for traveling along the route. As shown in Figure 7, an example display can include an indication of a current map number which is being displayed 705, along with a total number of maps or instructions 710 to enable a user to know how many maps are needed travel along the route from the initial position to the end position or travel destination. In the current example shown in.Figure 7, the map displayed is map three of ten. In this way, the user is prompted to select a next map four, and is essentially prompted to sequentially display each of the ten maps. It should be noted that the display of Figure 7 is merely an example display, noting that the application should not be limited to the way the information is conveyed to the user, the number of maps, the type of display configuration, etc.

In addition, the display of the embodiment of Figure 7 displays the distance from the previous map location to the current map location 715, and the time 720, from the previous map or instruction to the current map or instruction. Optionally, the display can also indicate a distance between the initial position and the end position and an estimated time of travel along the route from the initial position to the end position. The display can also indicate a next street after the current map or instruction, as well as the current street before the current map or instruction. Button 735 and 740 are provided as virtual buttons, for example, on the integrated input and display device, and provide the ability to scroll back to a previous map or instruction (735) and/or to scroll to a next map or instruction (740). Again, it should be noted that the display of Figure 7 is merely an example display, noting that the application should not be

limited to the information indicated above, and that other methods of scrolling through sequential maps are encompassed within the embodiments of the application including but not limited to automatic sequential display upon reaching a map end point, physical devices for scrolling including but not limited to hard wired buttons, scroll wheels, etc.

The main display area 750 can display the map information in three-dimensional form, for example, from the viewpoint or first-person perspective of the user. In other words, the maps may be displayed from the viewpoint of the user looking into the particular road along which he is traveling. The navigation system 200 may thus be selectable between display of the maps from the overhead perspective of the user and display of the maps from the viewpoint or first-person perspective of the user.

The maps may further be provided, in at least one example embodiment, so that the map information turns with the user as the user is turning along a particular route, and thus the user does not have to turn the display of the navigation device 200. This is particularly advantageous when displaying from the viewpoint or first-person perspective of the user. This can be done if the navigation device 200, for example, has a built-in compass, which can be used to turn the map in the direction of walking.

As previously indicated, the processor 210 determines a number of maps for traveling along the route, and the integrated input and display device displays a current map or instruction 705 and a total number of maps or instructions 710. The maps can then be displayed in sequence as the user travels along the route, wherein the maps can be automatically changed and redrawn at decision points and/or can be manually changed by the user.

The integrated input and display device shown in Figure 7 can further display additional information. This information can include, for example, a request to pronounce a current instruction 755. For example. as the maps are based on instructions, the navigation device 200 may also generate voice and output (via an audible output device, not shown) instructions such as simple "turn left", "turn right" or "turn right to Kalverstraat", "turn left from Muntplein to Kalverstraat", etc._ This information can further include, for example, a current instruction arrow 760 , a virtual button which allows a user to go back to the

instruction browser 765, and an optional mark 770, indicating that an instruction has been passed.

This mark 770 is generally used only in guided navigation wherein GPS tracking is utilized. Decision points are the points where an instruction is needed to guide the user of the navigation device 200 to the destination, mainly at crossings where a left or right turn has to be made for example(or keeping direction in some cases). The user of the navigation device 200 can navigate through the decision points using next and previous buttons instead of GPS based navigation when the current location is continuously updated.

Based on a current GPS location, the navigation device 200 may determine that a decision point has been passed and hence it may switch the display to the next map showing the next decision point, without the user pressing the next button on the navigation device 200. As such, the optional mark 770, indicating that an instruction has been passed, may be checked.

Further, the navigation device 200 does not follow, in at least one embodiment, the user's location on the map, which is the normal way of navigation. It is, in at least one embodiment, a fixed map determined by the next instruction. However, it is possible to turn this fixed map so that it is either always North-up, directed to expected heading (e.g. along the current road segment), set according to destination or any pre-determined direction, set so that it may follow a compass, etc.

Accordingly, the navigation device 200 of an embodiment of the present application is able to operate without normal GPS tracking in a step through manner to guide a user along a walking route from an input initial location to and end position/location/destination. The navigation device 200 includes map information stored in memory 230 which can permit this route tracking option, once the processor 210 determines the number of maps and the particular maps needed for traveling along a route based upon an initial position and an input end position. The initial position may be input along with the end position, and in this manner the navigation device can operate without GPS navigation. The user can then sequentially step through the maps or instructions utilizing the virtual buttons to access a previous map or instruction 735 or a next map or instruction 740.

As previously described in the embodiment with regard to Figure 6, two-dimensional view can be displayed to a user in an optional manner. Namely, the user may be provided with an option to select a two-dimensional view or the three-dimensional view such as that shown in Figure 7.

Additionally, as shown in the embodiment of Figure 8, other views can be displayed to a user, such as the schematic view of Figure 8. The schematic view still provides the current map or instruction number 805, the total number of maps or instructions 810, the distance from the previous to a current map or instruction 715, the time from a previous to a current map or instruction 720, etc.; and still further includes virtual buttons 835 and 840, for scrolling to a previous and next instruction. Other aspects of the display are similar to those of Figure 7, noting that the schematic view may merely illustrate a different aspect of the walking route, without particular street names, for example.

As shown in the example embodiment of Figure 9, once a route is selected and travel along the route is to begin, a summary map may be provided. The summary map as shown in Figure 9 may indicate the initial position as selected/input, the end position as selected/input, a total distance to be traveled, and a total time. Further, virtual display buttons 935 and 940 may be provided to permit the user to scroll through the determined number of maps, and a total number of instructions or maps may be displayed to the user, to indicate to the user how many maps have been determined for traveling along a route, based upon the initial position and the input end position.

The methods of at least one embodiment expressed above may be implemented as a computer data signal embodied in the carrier wave or propagated signal that represents a sequence of instructions which, when executed by a processor (such as processor 304 of server 302, and/or processor 210 of navigation device 200 for example) causes the processor to perform a respective method. In at least one other embodiment, at least one method provided above may be implemented above as a set of instructions contained on a computer readable or computer accessible medium, such as one of the memory devices previously described, for example, to perform the respective method when executed by a processor or other computer device. In varying embodiments, the medium may be a magnetic medium, electronic medium, optical medium, etc.

Even further, any of the aforementioned methods may be embodied in the form of a program. The program may be stored on a computer readable media and is adapted to perform any one of the aforementioned methods when run on a computer device (a device including a processor). Thus, the storage medium or computer readable medium, is adapted to store information and is adapted to interact with a data processing facility or computer device to perform the method of any of the above mentioned embodiments.

The storage medium may be a built-in medium installed inside a computer device main body or a removable medium arranged so that it can be separated from the computer device main body. Examples of the built-in medium include, but are not limited to, rewriteable non-volatile memories, such as ROMs and flash memories, and hard disks. Examples of the removable medium include, but are not limited to, optical storage media such as CD-ROMs and DVDs; magneto-optical storage media, such as MOs; magnetism storage media, including but not limited to floppy disks (trademark), cassette tapes, and removable hard disks; media with a built-in rewriteable non-volatile memory, including but not limited to memory cards; and media with a built-in ROM, including but not limited to ROM cassettes; etc. Furthermore, various information regarding stored images, for example, property information, may be stored in any other form, or it may be provided in other ways.

As one of ordinary skill in the art will understand upon reading the disclosure, the electronic components of the navigation device 200 and/or the components of the server 302 can be embodied as computer hardware circuitry or as a computer readable program, or as a combination of both.

The system and method of embodiments of the present application include software operative on the processor to perform at least one of the methods according to the teachings of the present application. One of ordinary skill in the art will understand, upon reading and comprehending this disclosure, the manner in which a software program can be launched from a computer readable medium in a computer based system to execute the functions found in the software program. One of ordinary skill in the art will further understand the various programming languages which may be employed to create a

software program designed to implement and perform at least one of the methods of the present application.

The programs can be structured in an object-orientation using an object-oriented language including but not limited to JAVA, Smalltalk, C++, etc., and the programs can be structured in a procedural-orientation using a procedural language including but not limited to COBAL, C, etc. The software components can communicate in any number of ways that are well known to those of ordinary skill in the art, including but not limited to by application of program interfaces (API), interprocess communication techniques, including but not limited to report procedure call (RPC), common object request broker architecture (CORBA), Component Object Model (COM), Distributed Component Object Model (DCOM), Distributed System Object Model (DSOM), and Remote Method Invocation (RMI). However, as will be appreciated by one of ordinary skill in the art upon reading the present application disclosure, the teachings of the present application are not limited to a particular programming language or environment.

The above systems, devices, and methods have been described by way of example and not by way of limitation with respect to improving accuracy, processor speed, and ease of user interaction, etc. with a navigation device 200. Further, elements and/or features of different example embodiments may be combined with each other and/or substituted for each other within the scope of this disclosure and appended claims.

Still further, any one of the above-described and other example features of the present invention may be embodied in the form of an apparatus, method, system, computer program and computer program product. For example, of the aforementioned methods may be embodied in the form of a system or device, including, but not limited to, any of the structure for performing the methodology illustrated in the drawings.

Example embodiments being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the present invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

What is claimed is:

1. A navigation device, comprising:

a processor to determine a number of maps for traveling along a route based upon an initial position and an input end position; and

an integrated input and display device to input the end position and to display a map and to prompt sequential display of the determined number of maps for traveling along the route from the initial position to the input end position.

2. The navigation device of claim 1, wherein the device is a portable navigation device.

3. The navigation device of claims 1-2, wherein the integrated input and display device is further used to display the determined number of maps.

4. The navigation device of claims 1-3, wherein the integrated input and display device is further used to display a sequential map number, of the determined number of maps, for a currently displayed map.

5. The navigation device of claim 3, wherein the integrated input and display device is further used to display both the determined number of maps and a sequential map number, of the determined number of maps, for a currently displayed map.

6. The navigation device of claims 1-5, wherein the integrated input and display device is further used to display a distance relative to at least one of a previously display map and a next sequential map to be displayed.

7. The navigation device of claims 1-6, wherein the integrated input and display device is further used to display a time relative to at least one of a previously display map and a next sequential map to be displayed.

8. The navigation device of claims 1-7, wherein the integrated input and display device further includes at least one virtual button to change the display to at least one of a previous sequential map and a next sequential map.

9. The navigation device of claims 1-8, wherein the initial position is determined using GPS satellite information.

10. The navigation device of claims 1-9, wherein the initial position is input.

11. The navigation device of claims 1-10, wherein the integrated input and display device is further used to display a map of the route based upon the initial position and the input end position.

12. The navigation device of claims 1-11, wherein the integrated input and display device is further used to display a menu for selection between at least a map of the route based upon the initial position and the input end position, and the sequential route maps.

13. The navigation device of claims 1-12, wherein the integrated input and display device is used to display the maps from at least one of an overhead perspective and a first-person perspective.

14. The navigation device of claim 13, wherein the integrated input and display device is selectable between display of the maps from the overhead perspective and display of the maps from the first-person perspective.

15. The navigation device of claims 1-14, wherein the integrated input and display device is used to display an indication that a map has been previously displayed.

16. The navigation device of claims 1-15, wherein the integrated input and display device is used to display a map of the route, initial position, end position and total determined number of maps.

17. The navigation device of claim 16, wherein the integrated input and display device is used to display a distance between the initial position and the end position and an estimated time of travel along the route from the initial position to the end position.

18. A navigation device, comprising:

means for determining a number of maps for traveling along a route based upon an initial position and an input end position; and

means for inputting the end position, for displaying a map and for prompting sequential display of the determined number of maps for traveling along the route from the initial position to the input end position.

19. The navigation device of claim 18, wherein the device is a portable navigation device.

20. The navigation device of claims 18-19, wherein the means for inputting, displaying and prompting is further for displaying the determined number of maps.

21. The navigation device of claims 18-20, wherein the means for inputting, displaying and prompting is further for displaying a sequential map number, of the determined number of maps, for a currently displayed map.

22. The navigation device of claim 20, wherein the means for inputting, displaying and prompting is further for displaying both the determined number of maps and a sequential map number, of the determined number of maps, for a currently displayed map.

23. The navigation device of claims 18-22, wherein the means for inputting, displaying and prompting is further for displaying a distance relative to at least one of a previously display map and a next sequential map to be displayed.

24. The navigation device of claims 18-23, wherein the means for inputting, displaying and prompting is further for displaying a time relative to at least one of a previously display map and a next sequential map to be displayed.

25. The navigation device of claims 18-24, wherein the means for inputting, displaying and prompting further includes at least one virtual button for selecting display of at least one of a previous sequential map and a next sequential map.

27. The navigation device of claims 18-26, wherein the initial position is determined using GPS satellite information.

28. The navigation device of claims 18-27, wherein the initial position is input.

29. The navigation device of claims 18-28, wherein the means for inputting, displaying and prompting is further for displaying a map of the route based upon the initial position and the input end position.

30. The navigation device of claims 18-29, wherein the means for inputting, displaying and prompting is further for displaying a menu for selection between at least a map of the route based upon the initial position and the input end position, and the sequential route maps.

31. The navigation device of claims 18-30, wherein the means for inputting, displaying and prompting is further for displaying the maps from at least one of an overhead perspective and a first-person perspective.

32. The navigation device of claim 31, wherein means for inputting, displaying and prompting is further for selecting between display of the maps from the overhead perspective and display of the maps from the first-person perspective.

33. The navigation device of claims 18-32, wherein the means for inputting, displaying and prompting is further for displaying an indication that a map has been previously displayed.

34. The navigation device of claims 18-33, wherein the means for inputting, displaying and prompting is further for displaying a map of the route, initial position, end position and total determined number of maps.

35. The navigation device of claim 34, wherein the means for inputting, displaying and prompting is further for displaying a distance between the initial position and the end position and an estimated time of travel along the route from the initial position to the end position.

36. A method, comprising:

determining, in a navigation device, a number of maps for traveling along a route based upon an initial position and an input end position;

inputting the end position; and

displaying a map on the navigation device and prompting sequential display of the determined number of maps for traveling along the route from the initial position to the input end position.

37. The method of claim 36, wherein the displaying includes displaying the determined number of maps.

38. The method of claims 36-37, wherein the displaying includes displaying a sequential map number, of the determined number of maps, for a currently displayed map.

39. The method of claim 37, wherein the displaying includes displaying both the determined number of maps and a sequential map number, of the determined number of maps, for a currently displayed map.

40. The method of claims 36-39, wherein the displaying includes displaying a distance relative to at least one of a previously display map and a next sequential map to be displayed.

41. The method of claims 36-40, wherein the displaying includes displaying a time relative to at least one of a previously display map and a next sequential map to be displayed.

42. The method of claims 36-41, wherein at least one virtual button for selecting display of at least one of a previous sequential map and a next sequential map.

43. The method of claims 36-42, wherein the initial position is determined using GPS satellite information.

44. The method of claims 36-43, wherein the initial position is input.

45. The method of claims 36-44, wherein the displaying includes displaying a map of the route based upon the initial position and the input end position.

46. The method of claims 36-45, wherein the displaying includes displaying a menu for selection between at least a map of the route based upon the initial position and the input end position, and the sequential route maps.

47. The method of claims 36-46, wherein the displaying includes displaying the maps from at least one of an overhead perspective and a first-person perspective.

48. The method of claim 47, further comprising selecting between display of the maps from the overhead perspective and display of the maps from the first-person perspective.

48. The method of claims 36-47, wherein the displaying includes displaying an indication that a map has been previously displayed.

49. The method of claims 36-48, wherein the displaying includes displaying a map of the route, initial position, end position and total determined number of maps.

50. The method of claims 36-49, wherein the displaying includes displaying a distance between the initial position and the end position and an estimated time of travel along the route from the initial position to the end position.

51. A computer readable medium including program segments for, when executed on a processor of a navigation device, causing the navigation device to implement the method of claim 36.

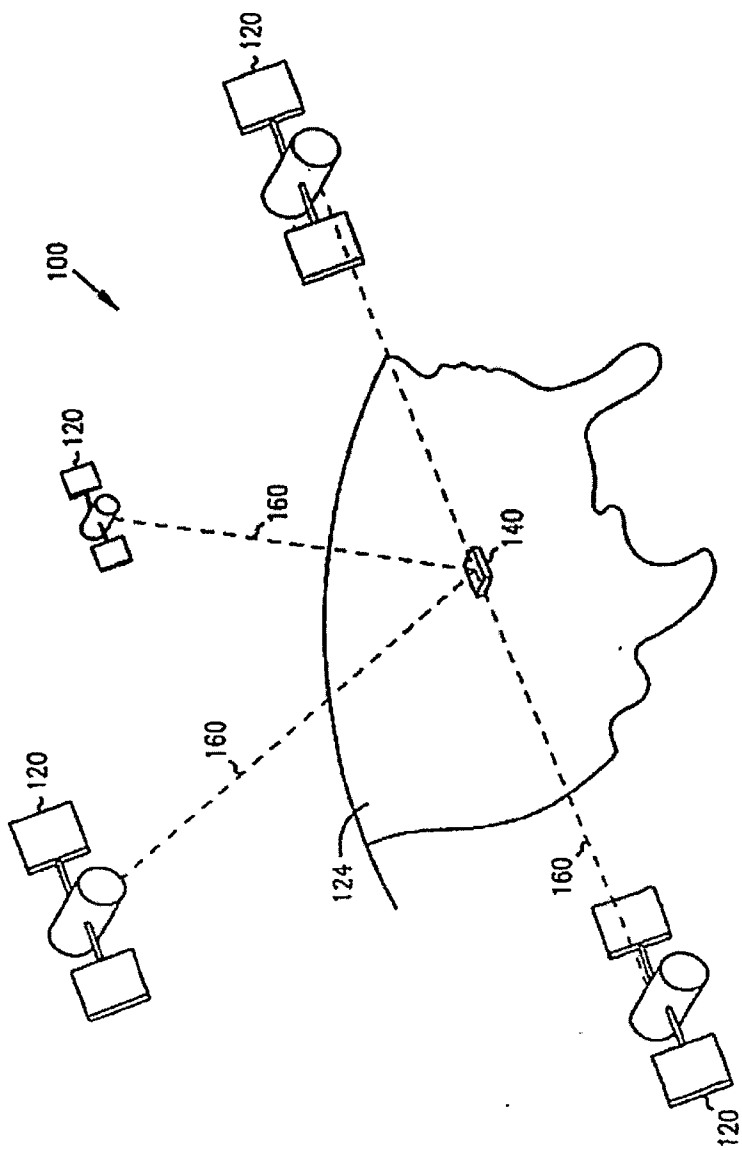
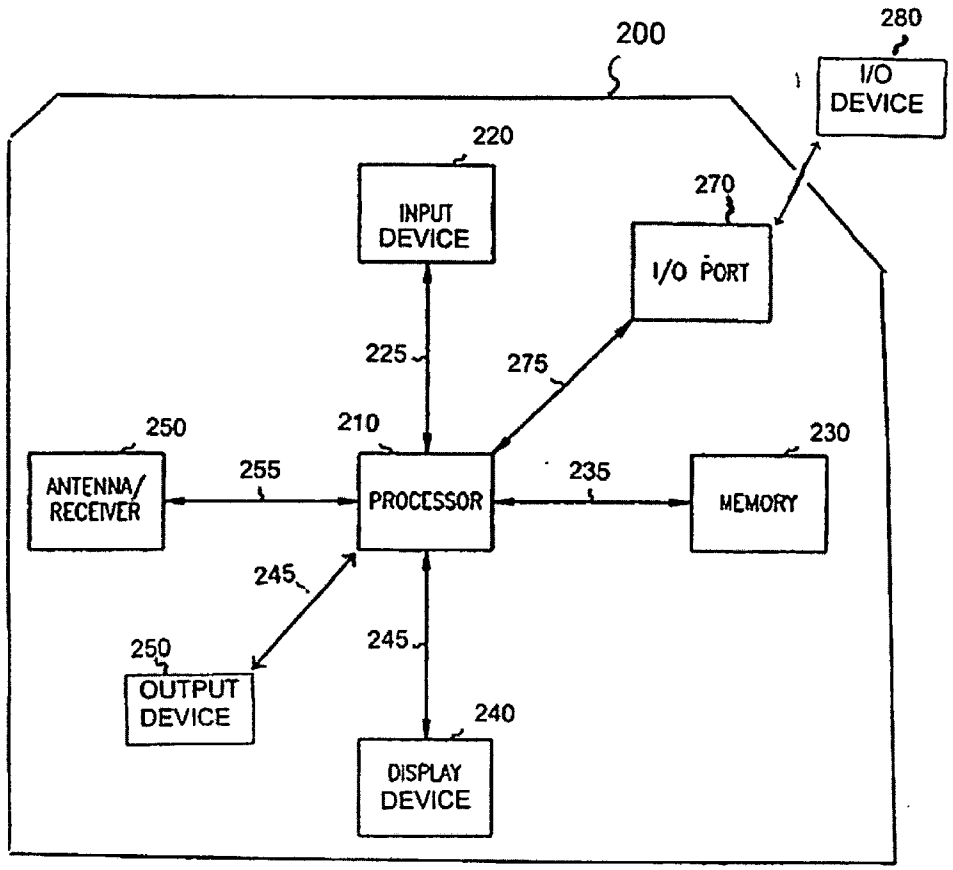


FIG. 1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280
I/O DEVICE
220
INPUT DEVICE
270
I/O PORT
225
275
250
210
230
ANTENNA/ RECEIVER
255
PROCESSOR
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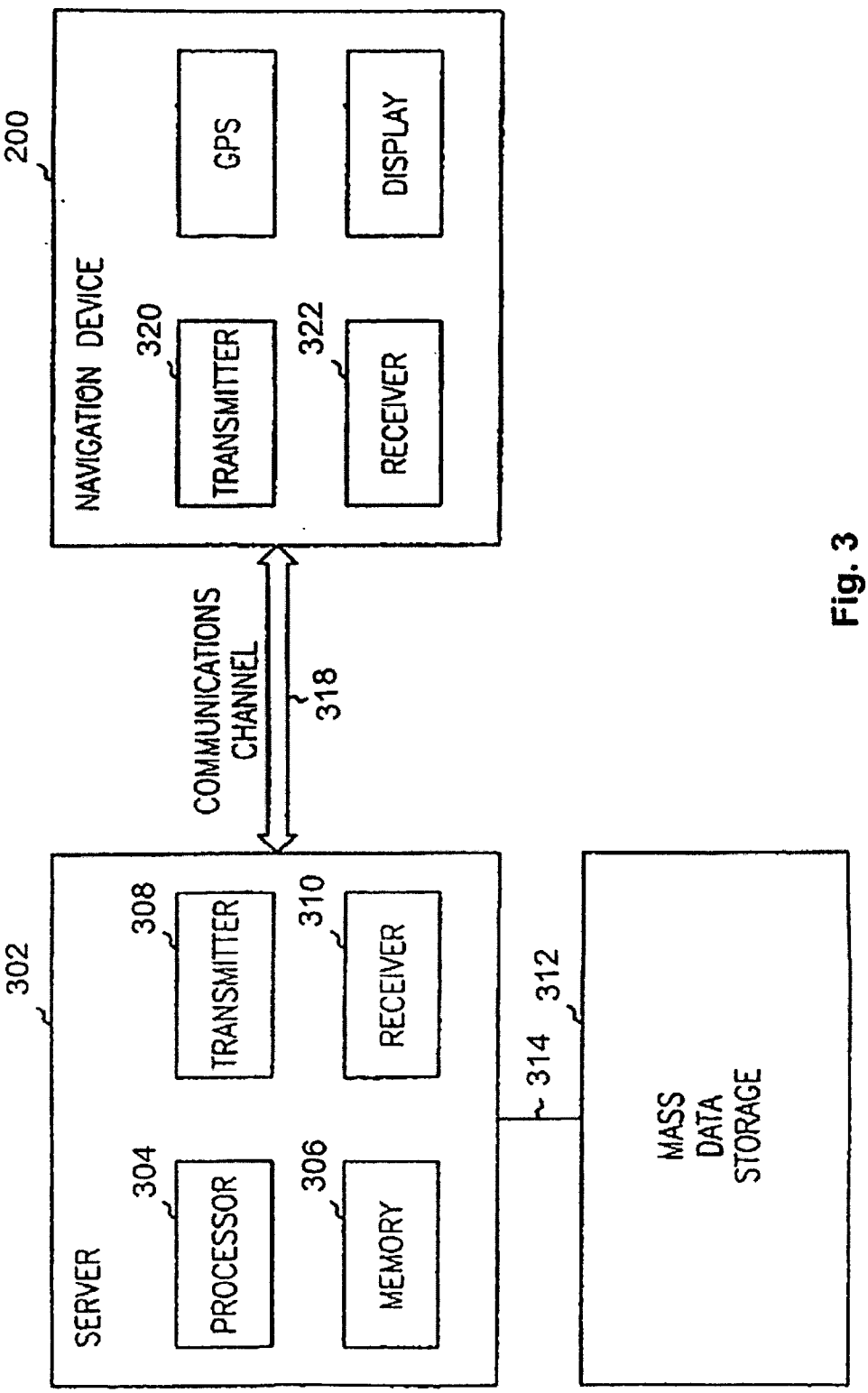
MEMORY
245
250
245
OUTPUT DEVICE
240
DISPLAY DEVICE

Fig. 2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GPS
DISPLAY
320
TRANSMITTER
322
RECEIVER
COMMUNICATIONS CHANNEL
318
302
SERVER
308
TRANSMITTER
310
RECEIVER
304
PROCESSOR
306
MEMORY
314
312
MASS DATA STORAGE

Fig. 3

Fig. 4

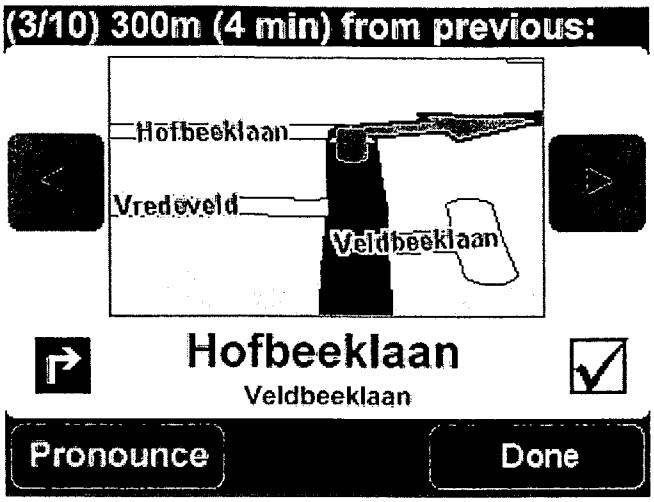

(3/10) 300m (4 min) from previous:
Hofbeeklaan
Vredeveld
Veldbeeklaan
Hofbeeklaan
Veldbeeklaan
Pronounce
Done

Fig. 5

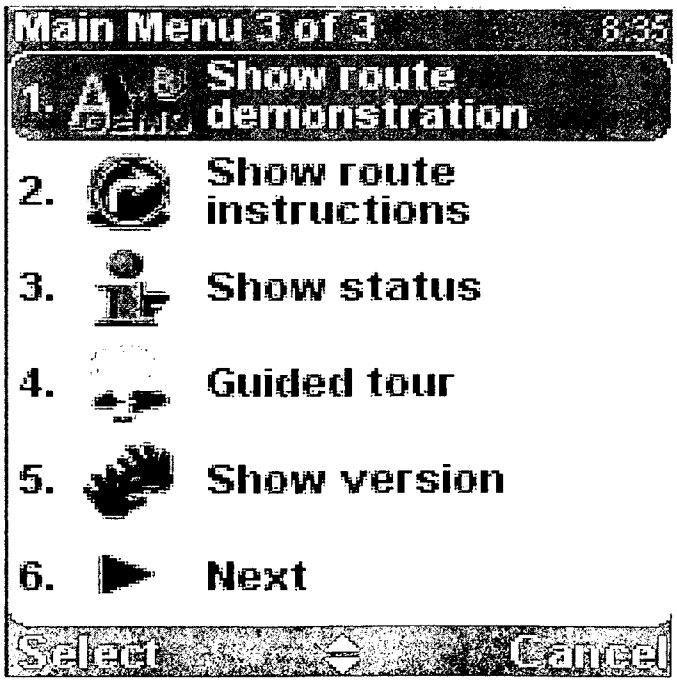

Main Menu 3 of 3
8:35
1. Show route demonstration
2. Show route instructions
3. Show status
4. Guided tour
5. Show version
6. Next
Select
Cancel

Fig. 6

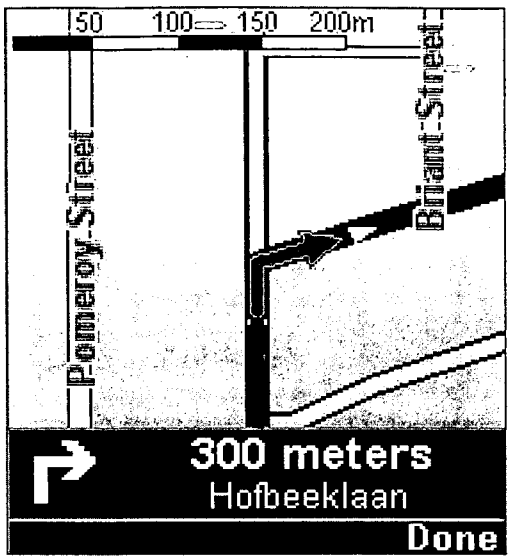
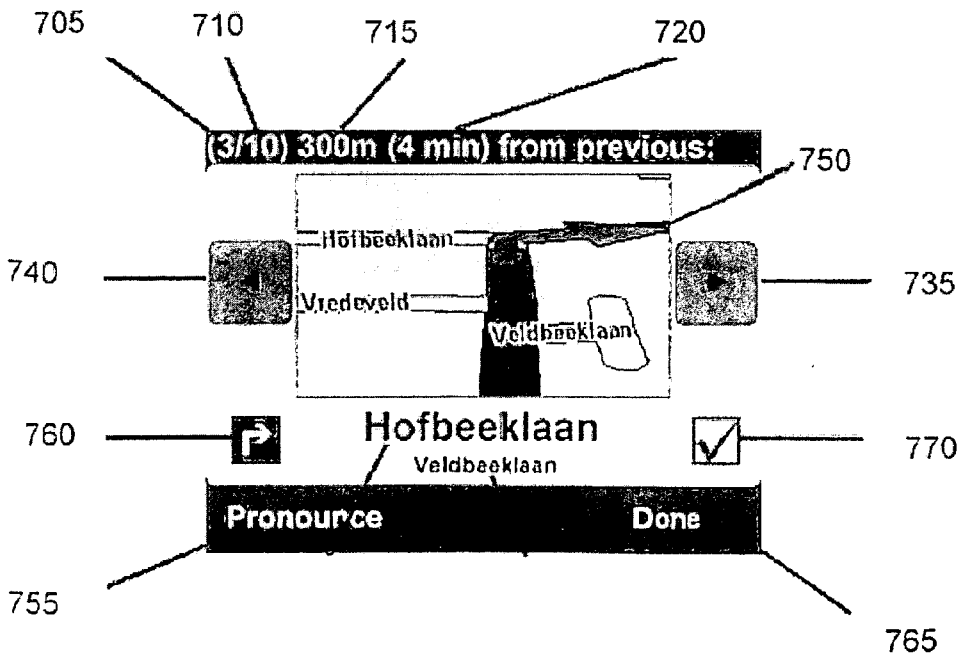

50
100
150
200m
Pomeroy Street
Briant Street
300 meters
Hofbeeklaan
Done

Fig. 7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710
715
720
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Hofbeeklaan
740
Vredeveld
Veldbeeklaan
735
760
Hofbeeklaan
Veldbeeklaan
770
Pronource
Done
755
765

Fig. 8

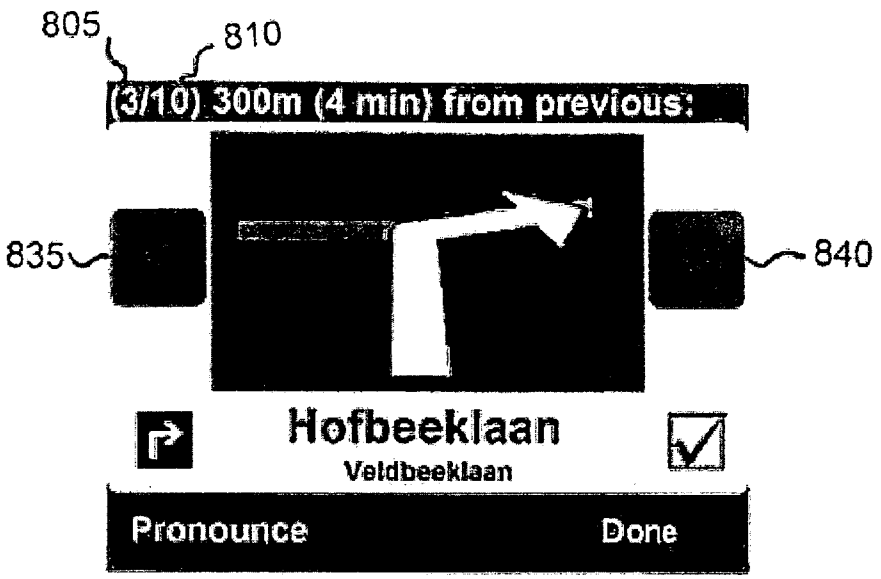
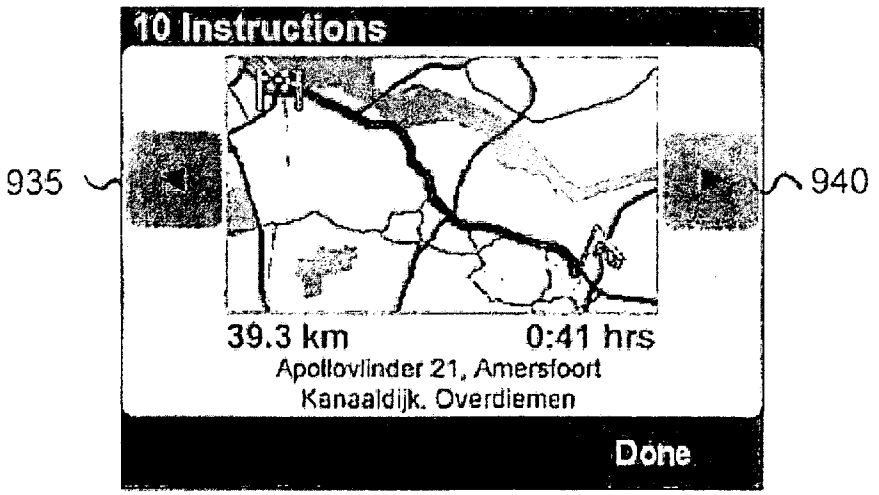

805
810
(3/10) 300m (4 min) from previous:
835
840
Hofbeeklaan
Veldbeeklaan
Pronounce
Done

Fig. 9


10 Instructions
935
940
39.3 km
0:41 hrs
Apollovlinder 21, Amersfoort
Kanaaldijk, Overdiemen
Done