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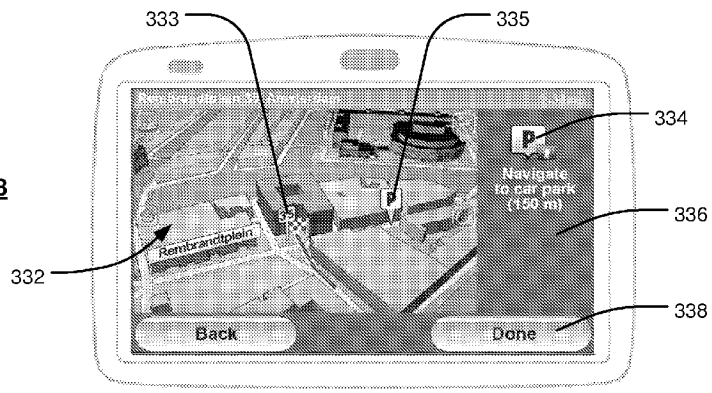
(54) **Title**: NAVIGATION APPARATUS AND METHOD OF ROUTE CONFIGURATION

Figure 13



(57) **Abstract**: A navigation apparatus (200) comprises a processing resource (202) arranged to support, when in use, a user interface. The user interface is arranged to permit selection of a location and comprises a view generation engine (268). The processing resource (202) is also arranged to query a database (228) comprising point of interest data in order to find a point of interest within a predetermined vicinity of the location selected. The view generation engine (268) is also arranged to generate a view (332) identifying 10 the point of interest in response to the point of interest being found.

NAVIGATION APPARATUS AND METHOD OF ROUTE CONFIGURATION

Field of the Invention

The present invention relates to a navigation apparatus of the type that, for example, is capable of providing a suggestion of a point of interest near a selected location. The present invention also relates to a method of configuring a route, the method being of the type that, for example, provides a suggestion of a point of interest information near a selected location in relation to a route to be configured.

Background to the Invention

Portable computing devices, for example Portable Navigation Devices (PNDs) that include GPS (Global Positioning System) signal reception and processing functionality are well known and are widely employed as in-car or other vehicle navigation systems.

In general terms, a modern PND comprises a processor, memory and map data stored within said memory. The processor and memory cooperate to provide an execution environment in which a software operating system is typically established, and additionally it is commonplace for one or more additional software programs to be provided to enable the functionality of the PND to be controlled, and to provide various other functions.

Typically, these devices further comprise one or more input interfaces that allow a user to interact with and control the device, and one or more output interfaces by means of which information may be relayed to the user. Illustrative examples of output interfaces include a visual display and a speaker for audible output. Illustrative examples of input interfaces include one or more physical buttons to control on/off operation or other features of the device (which buttons need not necessarily be on the device itself but could be on a steering wheel if the device is built into a vehicle), and a microphone for detecting user speech. In one particular arrangement, the output interface display may be configured as a touch sensitive display (by means of a touch sensitive overlay or otherwise) additionally to provide an input interface by means of which a user can operate the device by touch.

Devices of this type will also often include one or more physical connector interfaces by means of which power and optionally data signals can be transmitted to and received from the device, and optionally one or more wireless transmitters/receivers to allow communication over cellular telecommunications and other signal and data networks, for example Bluetooth, Wi-Fi, Wi-Max, GSM, UMTS and the like.

PNDs of this type also include a GPS antenna by means of which satellite-broadcast signals, including location data, can be received and subsequently processed to determine a current location of the device.

The PND may also include electronic gyroscopes and accelerometers which produce signals that can be processed to determine the current angular and linear acceleration, and in turn, and in conjunction with location information derived from the GPS signal, velocity and relative displacement of the device and thus the vehicle in which it is mounted. Typically, such features are most commonly provided in in-vehicle navigation systems, but may also be provided in PNDs if it is expedient to do so.

The utility of such PNDs is manifested primarily in their ability to determine a route between a first location (typically a start or current location) and a second location (typically a destination). These locations can be input by a user of the device, by any of a wide variety of different methods, for example by postcode, street name and house number, previously stored “well known” destinations (such as famous locations, municipal locations (such as sports grounds or swimming baths) or other points of interest), and favourite or recently visited destinations.

Typically, the PND is enabled by software for computing a "best" or "optimum" route between the start and destination address locations from the map data. A "best" or "optimum" route is determined on the basis of predetermined criteria and need not necessarily be the fastest or shortest route. The selection of the route along which to guide the driver can be very sophisticated, and the selected route may take into account existing, predicted and dynamically and/or wirelessly received traffic and road information, historical information about road speeds, and the driver's own preferences for the factors determining road choice (for example the driver may specify that the route should not include motorways or toll roads).

The device may continually monitor road and traffic conditions, and offer to or choose to change the route over which the remainder of the journey is to be made due to changed conditions. Real time traffic monitoring systems, based on various technologies (e.g. mobile phone data exchanges, fixed cameras, GPS fleet tracking), are being used to identify traffic delays and to feed the information into notification systems.

PNDs of this type may typically be mounted on the dashboard or windscreen of a vehicle, but may also be formed as part of an on-board computer of the vehicle radio or indeed as part of the control system of the vehicle itself. The navigation device may also be part of a hand-held system, such as a PDA (Portable Digital Assistant), a media player, a mobile phone or the like, and in these cases, the normal functionality of the hand-held system is extended by means of the installation of software on the device to

perform both route calculation and navigation along a calculated route.

Route planning and navigation functionality may also be provided by a desktop or mobile computing resource running appropriate software. For example, the Royal Automobile Club (RAC) provides an on-line route planning and navigation facility at http://www.rac.co.uk, which facility allows a user to enter a start point and a destination whereupon the server with which the user's computing resource is communicating calculates a route (aspects of which may be user specified), generates a map, and generates a set of exhaustive navigation instructions for guiding the user from the selected start point to the selected destination. The facility also provides for pseudo three-dimensional rendering of a calculated route, and route preview functionality which simulates a user travelling along the route and thereby provides the user with a preview of the calculated route.

In the context of a PND, once a route has been calculated, the user interacts with the navigation device to select the desired calculated route, optionally from a list of proposed routes. Optionally, the user may intervene in, or guide the route selection process, for example by specifying that certain routes, roads, locations or criteria are to be avoided or are mandatory for a particular journey. The route calculation aspect of the PND forms one primary function, and navigation along such a route is another primary function.

During navigation along a calculated route, it is usual for such PNDs to provide visual and/or audible instructions to guide the user along a chosen route to the end of that route, i.e. the desired destination. It is also usual for PNDs to display map information on-screen during the navigation, such information regularly being updated on-screen so that the map information displayed is representative of the current location of the device, and thus of the user or user's vehicle if the device is being used for in-vehicle navigation.

An icon displayed on-screen typically denotes the current device location, and is centred with the map information of current and surrounding roads in the vicinity of the current device location and other map features also being displayed. Additionally, navigation information may be displayed, optionally in a status bar above, below or to one side of the displayed map information, examples of navigation information include a distance to the next deviation from the current road required to be taken by the user, the nature of that deviation possibly being represented by a further icon suggestive of the particular type of deviation, for example a left or right turn. The navigation function also determines the content, duration and timing of audible instructions by means of which the user can be guided along the route. As can be appreciated a simple instruction such

as “turn left in 100 m” requires significant processing and analysis. As previously mentioned, user interaction with the device may be by a touch screen, or additionally or alternately by steering column mounted remote control, by voice activation or by any other suitable method.

A further important function provided by the device is automatic route re-calculation in the event that: a user deviates from the previously calculated route during navigation (either by accident or intentionally); real-time traffic conditions dictate that an alternative route would be more expedient and the device is suitably enabled to recognize such conditions automatically, or if a user actively causes the device to perform route re-calculation for any reason.

It is also known to allow a route to be calculated with user defined criteria. For example, the user may prefer a scenic route to be calculated by the device, or may wish to avoid any roads on which traffic congestion is likely, expected or currently prevailing. The device software would then calculate various routes and weigh more favourably those that include along their route the highest number of points of interest (known as POIs) tagged as being for example of scenic beauty, or, using stored information indicative of prevailing traffic conditions on particular roads, order the calculated routes in terms of a level of likely congestion or delay on account thereof. Other POI-based and traffic information-based route calculation and navigation criteria are also possible.

Although the route calculation and navigation functions are fundamental to the overall utility of PNDs, it is possible to use the device purely for information display, or “free-driving”, in which only map information relevant to the current device location is displayed, and in which no route has been calculated and no navigation is currently being performed by the device. Such a mode of operation is often applicable when the user already knows the route along which it is desired to travel and does not require navigation assistance.

Devices of the type described above, for example the GO 930 Traffic model manufactured and supplied by TomTom International B.V., provide a reliable means for enabling users to navigate from one position to another. Such devices are of great utility when the user is not familiar with the route to the destination to which they are navigating.

As indicated above, one or more POIs can be selected by a user of the PND in respect of a journey to be embarked upon or during a journey. To select a POI during a journey, a user typically negotiates a menu structure of a user interface of the PND in order to select a category of POI desired, for example a supermarket or a petrol station. The application software of the PND then identifies, using locally stored data, a number

of POIs of the type selected by the user and presents the identified POIs to the user via the user interface. To assist the user, the application software typically orders the POIs identified by distance from a current location of the PND and indicates an associated distance value adjacent the POI listed. The user can then select one of the POIs identified by the user interface and the application software. In response to selection of one of the POIs, the application software either sets the POI selected as a waypoint or an ultimate destination and the PND then calculates a route either via the POI selected or to the POI selected, as appropriate. The selection of the POI as a destination or a waypoint can similarly be made in relation to functionality of the PND to prepare a route or an itinerary. Of course, if the user is already en-route and the PND is already providing navigation assistance, the PND, integrates the POI chosen into an existing route calculated, for example by recalculating the existing route to take into account the selection made by the user.

On the whole, this technique works quite well and provides satisfactory results for the user. However, a disadvantage of this technique is that a user, wishing to navigate to or via a given point of interest, has to negotiate a menu structure and undergo a dedicated POI selection procedure, typically including selection of a category of POI. This procedure is more time consuming than a simple route selection procedure where a user simply selects a destination, and possibly a starting point and/or a waypoint, without negotiating a menu structure dedicated to POI selection. Additionally, when navigating to a location selected, the user can be unaware of a POI in the vicinity of the location selected that is of interest or use to the user, resulting in a missed opportunity to navigate to a more convenient or appropriate location. Furthermore, when a POI is selected and the POI selected is relation to visiting another location nearby, the user is unable to determine easily the relative positions of the POI and the location nearby.

Summary of the Invention

According to a first aspect of the present invention, there is provided a navigation apparatus comprising: a processing resource arranged to support, when in use, a user interface, the user interface being arranged to permit selection of a location; wherein the user interface comprises a view generation engine; the processing resource is arranged to query a database comprising point of interest data in order to find a point of interest within a predetermined vicinity of the location selected; and the view generation engine is arranged to generate a view identifying the point of interest in response to the point of interest being found.

The view generation engine may be arranged to generate the view so as to

identify both the location selected and the point of interest.

Identification of the location selected and the point of interest may comprise visually identifying the locations of both the location selected and the point of interest.

The user interface may be arranged to provide a route creation procedure, the route creation procedure permitting the selection of the location.

The location selected may be a destination of a route for calculation. The location selected may be an intermediate location in a route for calculation.

The processing resource may be arranged to support a route calculation procedure; the route calculation procedure may comprise the route creation procedure.

The route calculation procedure may be initiated in response to a request to navigate to or via a location to be selected; the request to navigate to or via the location to be selected may be received via the user interface.

The processing resource may be arranged to support a route planning procedure; the route planning procedure may comprise the route creation procedure.

The route planning procedure may be initiated in response to a request to prepare a route including a location to be selected as a destination; the request to prepare the route may be received via the user interface.

The route planning procedure may be initiated in response to a request to create an itinerary; the request to create the itinerary may be received via the user interface.

The user interface may be arranged to support display of a selectable user interface element in response to the processing resource finding the point of interest; the identification of the point of interest may comprise provision of the selectable user interface element.

The route creation procedure may be arranged to replace the location selected with a location associated with the point of interest in response to an indication of selection of the point of interest.

The indication of selection of the point of interest may be by interaction with the selectable user interface element.

The route calculation procedure or the route planning procedure may use the point of interest in place of the location selected in response to the indication of selection of the point of interest.

The selection may be a user selection. The selectable user interface element may be a button or selectable icon indicative of the point of interest.

The view generation engine may be arranged to generate another view in response to the indication of selection, the another view comprising the point of interest.

The another view may be substantially centred on the point of interest. The view

generated may be a rendered three-dimensional view. The another view may be another rendered three-dimensional view. The three-dimensional view and/or the another three-dimensional view may be a static bird's eye view.

A level of magnification may be employed in relation to the view such that both the location selected and the point of interest may be visible on a screen displaying, when in use, the view.

The user interface may be arranged to permit user selection of a category of the point of interest to be found. The point of interest may be a parking facility.

The processing resource may be arranged to calculate a measure relating to a separation of the location selected from the point of interest.

The measure may be estimated. The measure may be a distance. The measure may be a straight line distance. The measure may be a travel time. The measure may be an arrival time.

The user interface may be arranged to display the measure calculated in the view generated.

The user interface may be arranged to permit user selection of the predetermined vicinity.

According to a second aspect of the present invention, there is provided a portable navigation device comprising the navigation apparatus as set forth above in relation to the first aspect of the invention.

According to a third aspect of the present invention, there is provided a method of route configuration, the method comprising: permitting user selection of a location via a user interface; querying a database comprising point of interest data in order to find a point of interest within a predetermined vicinity of the location selected; and a view generation engine generating a view identifying the point of interest in response to the point of interest being found.

According to a fourth aspect of the present invention, there is provided a computer program element comprising computer program code means to make a computer execute the method as set forth above in relation to the third aspect of the invention.

The computer program element may be embodied on a computer readable medium.

Advantages of these embodiments are set out hereafter, and further details and features of each of these embodiments are defined in the accompanying dependent claims and elsewhere in the following detailed description.

It is thus possible to provide a navigation apparatus and a method of configuring

a route that obviates the need for a user to perform a dedicated search for a POI, thereby simplifying user interface interaction. The provision of an indication of a POI within the predetermined vicinity of the location selected reduces the number of gestures required from a user in order to select the POI. In this respect, the user is provided with a mechanism for selecting the POI that is more convenient than having to specifically negotiate a part of the user interface provided for POI selection. User interface interaction time is thus reduced. The apparatus and method also enable a user to have an overview in relation to the surroundings of the location selected. In relation to parking facilities, the identification of a parking facility near the location selected saves the user time seeking the parking facility or another, less optimum, parking facility within the vicinity of the location selected. Consequently, an optimum route is calculated from the outset of a journey. The route calculated is therefore likely to be more efficient than that followed when the POI is selected once the user arrives at the destination. In the context of travelling by road vehicle, the user is thus likely to reduce fuel consumption and hence save money. Also, temptation to park illegally is reduced. The apparatus and method thus provide an improved user experience in relation to the navigation apparatus, as well as the possibility of saving the user time, money and inconvenience.

Brief Description of the Drawings

At least one embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic illustration of an exemplary part of a Global Positioning System (GPS) usable by a navigation apparatus;

Figure 2 is a schematic illustration of electronic components of the navigation apparatus of Figure 1 or any other suitable navigation apparatus;

Figure 3 is a schematic diagram of an arrangement of mounting and/or docking a navigation apparatus;

Figure 4 is a schematic representation of an architectural stack employed by the navigation apparatus of Figure 2;

Figure 5 is flow diagram of a method of configuring a route used by the navigation apparatus of Figure 3 and constituting an embodiment of the invention; and

Figures 6 to 16 are screen shots from the navigation apparatus during performance of the method of Figure 5.

Detailed Description of Preferred Embodiments

Throughout the following description identical reference numerals will be used to

identify like parts.

One or more embodiments of the present invention will now be described with particular reference to a PND. It should be remembered, however, that the teachings herein are not limited to PNDs but are instead universally applicable to any type of processing device that is configured to execute navigation software in a portable and/or mobile manner so as to provide route planning and navigation functionality. It follows therefore that in the context of the embodiments set forth herein, a navigation apparatus is intended to include (without limitation) any type of route planning and navigation apparatus, irrespective of whether that device is embodied as a PND, a vehicle such as an automobile, or indeed a portable computing resource, for example a portable personal computer (PC), a mobile telephone or a Personal Digital Assistant (PDA) executing route planning and navigation software.

It should be appreciated that, in some circumstances, the "destination" location selected by a user need not have a corresponding start location from which the user wishes to start navigating, and as a consequence references herein to the "destination" location or indeed to a "destination" view should not be interpreted to mean that the generation of an initial route is essential, that travelling to the "destination" must occur, or indeed that the presence of a destination requires the designation of a corresponding start location.

With the above provisos in mind, the Global Positioning System (GPS) of Figure 1 and the like are used for a variety of purposes. In general, the 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 orbit 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 allows 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 100 comprises a plurality of satellites 102 orbiting about the earth 104. A GPS receiver 106 receives spread spectrum GPS satellite data signals 108 from a number of the plurality of satellites 102. The spread spectrum data signals 108 are continuously transmitted from each satellite 102, the spread spectrum data signals 108 transmitted each comprise a data stream including information identifying a particular satellite 102 from which the data stream originates. The GPS receiver 106 generally requires spread spectrum data signals 108 from at least three satellites 102 in order to be able to calculate a two-dimensional position. Receipt of a fourth spread spectrum data signal enables the GPS receiver 106 to calculate, using a known technique, a three-dimensional position.

In this example, the navigation apparatus 200 is a Bluetooth enabled navigation apparatus in order that the navigation apparatus 200 can be agnostic to the settings of a wireless communications terminal with which the navigation apparatus 200 can communicate, thereby enabling the navigation apparatus 200 to operate correctly with the ever changing spectrum of mobile telephone models, manufacturers, etc. Model/manufacturer specific settings may, for example, be stored on the navigation apparatus 200. The data stored for this information can be updated.

Although not shown, instead of requiring the wireless communications terminal to provide access to the communications network, the navigation apparatus 200 can, of course, comprise mobile telephone technology, including an antenna, for example, or optionally using an internal antenna of the navigation apparatus 200. The mobile telephone technology within the navigation apparatus 200 can also include an insertable card (e.g. Subscriber Identity Module (SIM) card). As such, mobile telephone technology within the navigation apparatus 200 can be used to establish a network connection between the navigation apparatus 200 and a server (not shown), via the Internet for example, in a manner similar to that of any wireless communications-enabled terminal.

Software stored in server memory provides instructions for a processor of the server to allow the server to provide services to the navigation apparatus 200. One service provided by the server can involve processing requests from the navigation apparatus 200 and transmitting navigation data to the navigation apparatus 200. Another service that can be provided by the server includes processing the navigation data using various algorithms for a desired application and sending the results of these

calculations to the navigation apparatus 200.

The establishing of the network connection between the mobile device (via a service provider) and another device such as the server, using the Internet for example, can be done in a known manner. In this respect, any number of appropriate data communications protocols can be employed, for example the TCP/IP layered protocol. Furthermore, the mobile device can utilize any number of communication standards such as CDMA2000, GSM, IEEE 802.11 a/b/c/g/n, etc.

Hence, it can be seen that the internet connection may be utilised, which can be achieved via a data connection using the mobile telephone or mobile telephone technology.

Alternatively, a personal computer may be connected between the navigation apparatus 200 and the server to establish an internet connection between the server and the navigation apparatus 200.

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

Referring to Figure 2, it should be noted that the block diagram of the navigation apparatus 200 is not inclusive of all components of the navigation apparatus, but is only representative of many example components. The navigation apparatus 200 is located within a housing (not shown). The navigation apparatus 200 includes a processing resource comprising, for example, the processor 202 mentioned above, the processor 202 being coupled to an input device 204 and a display device, for example a display screen 206. Although reference is made here to the input device 204 in the singular, the skilled person should appreciate that the input device 204 represents any number of input devices, including a keyboard device, voice input device, touch panel and/or any other known input device utilised to input information. Likewise, the display screen 206 can include any type of display screen such as a Liquid Crystal Display (LCD), for example.

In one arrangement, one aspect of the input device 204, the touch panel, and the display screen 206 are integrated so as to provide an integrated input and display

device, including a touchpad or touchscreen input 250 (Figure 3) to enable both input of information (via direct input, menu selection, etc.) and display of information through the touch panel screen so that a user need only touch a portion of the display screen 206 to select one of a plurality of display choices or to activate one of a plurality of virtual or "soft" buttons. In this respect, the processor 202 supports a Graphical User Interface (GUI) that operates in conjunction with the touchscreen.

In the navigation apparatus 200, the processor 202 is operatively connected to and capable of receiving input information from input device 204 via a connection 210, and operatively connected to at least one of the display screen 206 and the output device 208, via respective output connections 212, to output information thereto. The navigation apparatus 200 may include an output device 208, for example an audible output device (e.g. a loudspeaker). As the output device 208 can produce audible information for a user of the navigation apparatus 200, it is should equally be understood that input device 204 can include a microphone and software for receiving input voice commands as well. Further, the navigation apparatus 200 can also include any additional input device 204 and/or any additional output device, such as audio input/output devices for example. The processor 202 is operatively connected to memory 214 via connection 216, the memory 214 storing a POI database 228 comprising details concerning identities and locations of POIs of differing categories, for example shops, museums and parking facilities. The processor 202 is further adapted to receive/send information from/to input/output (I/O) ports 218 via connection 220, wherein the I/O port 218 is connectible to an I/O device 222 external to the navigation apparatus 200. The external I/O device 222 may include, but is not limited to an external listening device, such as an earpiece for example. The connection to I/O device 222 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 earpiece or headphones, and/or for connection to a mobile telephone for example, wherein the mobile telephone connection can be used to establish the data connection between the navigation apparatus 200 and the server 150 via the Internet or any other network for example.

Figure 2 further illustrates an operative connection between the processor 202 and an antenna/receiver 224 via connection 226, wherein the antenna/receiver 224 can be a GPS antenna/receiver for example. It should be understood that the antenna and receiver designated by reference numeral 224 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.

It will, of course, be understood by one of ordinary skill in the art that the electronic components shown in Figure 2 are powered by one or more 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 contemplated. For example, the components shown in Figure 2 can be in communication with one another via wired and/or wireless connections and the like. Thus, the navigation apparatus 200 described herein can be 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 vehicle such as a bicycle, a motorbike, a car or a boat for example. Such a navigation device 200 is then removable from the docked location for portable or handheld navigation use.

Referring to Figure 3, the navigation apparatus 200 can be a unit that includes the integrated input and display device 206 and the other components of Figure 2 (including, but not limited to, the internal GPS receiver 224, the microprocessor 202, a power supply (not shown), memory systems 214, etc.).

The navigation apparatus 200 can sit on an arm 252, which itself can be secured to a vehicle dashboard/window/etc. using a suction cup 254. This arm 252 is one example of a docking station to which the navigation apparatus 200 can be docked. The navigation apparatus 200 can be docked or otherwise connected to the arm 252 of the docking station by snap connecting the navigation apparatus 200 to the arm 252 for example. The navigation apparatus 200 can then be rotatable on the arm 252. To release the connection between the navigation apparatus 200 and the docking station, a button (not shown) on the navigation apparatus 200 can be pressed, for example. Other equally suitable arrangements for coupling and decoupling the navigation apparatus 200 to a docking station are well known to persons of ordinary skill in the art.

Turning to Figure 4, the processor 202 and memory 214 cooperate to support a BIOS (Basic Input/Output System) 262 that functions as an interface between functional hardware components 260 of the navigation apparatus 200 and the software executed by the device. The processor 202 then loads an operating system 264 from the memory 214, which provides an environment in which application software 266 (implementing some or all of the above described route planning and navigation functionality) can run. The application software 266 provides an operational environment including the user interface that supports core functions of the navigation apparatus 200, for example map viewing, route planning, navigation functions and any other functions associated therewith, including a method of route configuration set out below. In this respect, part of the user interface comprises a view generation engine 268.

Operation of the above navigation apparatus 200 will now therefore be described in the context of a user of the navigation apparatus 200 wishing to travel between two locations in The Netherlands. However, the skilled person should appreciate that other equally applicable examples are conceivable and the choice of locations is not intended to be limiting.

In operation (Figure 5), the user, a visitor to the offices of the European Patent Office in The Hague, located at Patentlaan 2, Rijswijk, requires navigation assistance to the offices of TomTom International BV located at Rembrandtplein 35, Amsterdam.

In order to implement navigation to the POI using the navigation apparatus 200, the user configures a route for calculation as follows. Referring to Figures 6 to 16, the user undertakes (Step 400) an illustrative destination location input process described hereinbelow using a location browser function supported by the user interface. Although not shown, the user uses a settings menu option supported by the application software 266 in order to select view generation in a three-dimensional mode.

When the user powers-up the navigation apparatus 200, the apparatus 200 acquires a GPS fix and performs a self-location determination by calculating (in a known manner) the current location of the navigation apparatus 200. The user is then presented, as shown in Figure 6, with a display 300 showing in pseudo three-dimensions: a local environment 302 in which the navigation apparatus 200 is determined to be located and, in a region 304 of the display 300 below the local environment 302, a set of control and status messages.

By touching the display at the local environment 302, the navigation apparatus 200, through the user interface, updates the display 300 by displaying (as shown in Figure 7) a series of virtual or soft buttons 306 by means of which the user can, inter alia, input a destination to which the user wishes to navigate.

By touching the “Navigate to” virtual button 308, the navigation device 200 initiates a route calculation procedure, a part of which comprises a route creation procedure. In accordance with the route creation procedure, the navigation apparatus 200 displays (as shown in Figure 8) a plurality of virtual buttons that are each associated with a different category of selectable destinations. In this instance, the display shows a “home” button that if pressed would set the destination to a stored home location. The “favourite” button, if pressed, reveals a list of destinations that the user has previously stored in the navigation device 200 and if one of these destinations is then selected the destination for the route to be calculated is set to the selected previously stored destination. The “recent destination” soft button, if pressed, reveals a list of selectable destinations held in the memory of the navigation device 200 and to which the user has

recently navigated. Selection of one of the destinations populating this list would set the destination location for this route to the selected (previously visited) location. The "point of interest" button, if pressed, reveals a number of options by means of which a user can opt to navigate to any of a plurality of locations, such as Automatic Teller Machines (ATMs), petrol stations or tourist attractions for example, that have been pre-stored in the navigation device 200 as locations to which a user of the navigation device 200 might want to navigate to. The triangular "arrow" shaped virtual button provides access to additional sub-menu options relating to the "Navigate to ..." menu option, and an "address" button 310 commences a process by which the user can input the street address of the destination to which the user wishes to navigate.

Since the user, in this example, knows the street address of the destination to which the user wishes the navigation device 200 to navigate, it is assumed that the "address" button 310 is operated (by touching the button displayed on the touchscreen) in order to select (Step 402) a location as the destination, whereupon (as shown in Figure 9) the user is presented with a series of address input options – in particular for address input by "city centre", by "postcode", by "crossing or intersection" (for example a junction of two roads) and by "street and house number".

In this example, the user knows the street address and house number of the destination and hence selects a "street and house number" virtual button 312 whereupon the user is then presented, as shown in Figure 10, with: a prompt 314 to enter the name of the city to which they wish to navigate, a flag button 316 by means of which the user can select the country in which the desired city is located, and a virtual keyboard 318 that may be operated by the user, if necessary, to input the name of the destination city. In this instance the user begins to type the word "Amsterdam" and the navigation device 200 therefore responds by providing the user with a list 320 of selectable cites.

The user in this instance wishes to navigate to Amsterdam, and on selection of Amsterdam from the list 320 the navigation device 200 displays, as shown in Figure 11, the virtual keyboard 318 again by means of which the user can input street names, a prompt 322 for entry of a street name. In this instance, the user begins to type the name of the street in which the destination is located and the navigation apparatus 200 responds by providing the user with a list 324 of selectable street names.

In this example, the user wishes to travel to the street Rembrandtplein and so the user selects "Rembrandtplein" from the displayed list 324.

Once a street has been selected, the navigation device 200 then displays (Figure 12) a restricted, largely numeric, virtual keypad 326 and prompts the user, by means of prompt 328, to enter the street number in the selected street and city to which the user

wishes to navigate. If the user has previously navigated to a building number in this street, then that number is initially shown. If, as in this instance, the user wishes to navigate to No. 35, Rembrandtplein, then the user simply needs to type the street number ("35") using the virtual keypad 326 and then touch a "done" virtual button 330 displayed at the bottom right hand corner of the display 300. If the user should wish to navigate to a different building number in Rembrandtplein, then all the user needs do is operate the virtual keypad 326 to input an appropriate building or street number.

Once the building number has been input or selected, the application software 266 searches (Step 404) the POI database 228 in order to find a POI within a predetermined vicinity from the location selected in the manner described above. In this respect, the application software 266 is configured to search for POIs in a particular category. In this example, the category is parking facilities. The predetermined vicinity is set to a radius of 1km with respect to the location selected. However, if desired, the application software 266 can be configured to allow the user to specify the predetermined vicinity. Hence, the application software 266 searches for parking facilities within 1km of Rembrandtplein ,35.

Referring to Figure 13, in the event that a parking facility has been found by the application software 266 within the predetermined vicinity, the view generation engine 268 of the application software 266 renders (Step 408) a three-dimensional preview of the location selected 333 and the parking facility 335 found in a main display pane 332 and a virtual button 334, or other selectable element or icon, is displayed in a side pane 336. In this example, the three-dimensional view is a bird's eye view.

The virtual button 334 is an example of a user interface element and is selectable by the user. The virtual button 334 has a label: "Navigate to car park", and specifies in parenthesis a distance between the location selected and the POI, in this example the parking facility, for example 150m. The user is thus provided with a suggestion of a potentially suitable parking facility. Alternatively, in the event that the application software is unable to find a POI conforming to the criteria mentioned above, the virtual button 334 is deactivated or greyed-out in order to prevent selection of the virtual button 334 by the user. In this example, the label of the virtual button is: "No parking nearby" when unselectable. Assuming, however, in the present instance, that the POI is found in the POI database 228, the application software 266 monitors (Step 410) for "actuation" of the virtual button 334 and, in the event that the user touches the virtual button 334 in order to select the functionality of navigation to the parking facility, the view generation engine 268 renders (Step 412) another preview (Figure 14) showing, in this example, the parking facility found as described above. The second preview is centred upon the POI,

but a level of zoom used to generate the view is set so that the location selected (Rembrandtplein, 35) is also visible in the second preview.

In the event that the user does not wish to be navigated to the POI suggested, the user can simply touch a "Done button" 338 (Figure 13). The application software 266 then proceeds with the route calculation procedure using the selected location as the destination for route calculation purposes. The application software 266 similarly proceeds, after confirmation from the user to do so, to execute the route calculation procedure when, as described above, no parking facilities can be found by the application software 266.

Referring to Figure 14, and assuming that a parking facility has been found and selected by the user, once the second preview has been generated, the preview shows the POI in the main pane, the view being centred upon the POI, in this example the parking facility. The preview generated also provides additional information concerning the POI, for example a telephone number, and an identity of the POI. In this example, the telephone number is shown as a selectable virtual button 340 that can be selected, "actuation" of the selectable virtual button 340 permitting automation of a voice call initiation process using a voice communications terminal, for example a cellular telephone handset, in communication with the navigation apparatus 200, or via cellular communications hardware, if present, incorporated in the navigation apparatus 200. The identity of the POI is set out in an area 342 beneath the main pane 332. In this example, the parking facility is identified as "Rembrandtplein – Bakkerstraat, Amsterdam". In addition, a measure is indicated in the area 342 beneath the main pane 332 in order to assist the user in deciding whether to select the POI suggested by the application software 266. The measure can be any suitable measure of separation between the location selected and the POI that the user can find useful, for example distance, such as straight line distance, travel time, or arrival time. The label for the measure is identified as "Distance %s: x metres" in Figure 14. In this example, the measure is estimated.

In the event that the user decides that navigation to the POI suggested is required, the user touches a "Select" virtual button 344 and the selection is detected (Step 414) by the application software 266 which responds by the route creation procedure replacing (Step 416) the location previously selected as the destination with the location of the POI selected, in this example the parking facility. The application software 266 then causes the user interface to present an interrogation message 346 (Figure 15) asking the user whether a particular arrival time is required. If the user should touch a "yes" virtual button, then functionality is invoked that estimates the time

required to travel to the destination and advises the user when they should leave (or if they are running late, should have left) their current location in order to arrive at their destination on time. In this instance, the user is not concerned about arriving at a particular time and hence selects a "no" virtual button 348.

Selecting the "no" virtual button 348 causes the navigation apparatus 200 to calculate a route between the current location and the replacement selected destination, in this example the POI, and to display the route 350 calculated, as shown in Figure 16, on a relatively low magnification map that shows the entire route. The user is also provided with a "done" virtual button 352 which the user can press to indicate the calculated route is acceptable, a "find alternative" virtual button 354 that the user can press to cause the navigation device 200 to calculate another route to the selected destination, and a "details" virtual button 356 that a user can press to reveal selectable options for the display of more detailed information concerning the currently displayed route 350.

In this instance, it is assumed that the user considers the displayed route acceptable, and once the "done" button 352 has been pressed the user is presented, with a three-dimensional view (not shown) of the current, start, location for the navigation device 200.

The user then commences (Step 418) their journey and the navigation device 200 guides the user, in a known manner, by updating the map in accordance with determined changes in location of the navigation device 200, and by providing the user with visual and, optionally, audible navigation instructions until the destination, namely the parking facility selected, is reached.

In another embodiment, the category of the POI can be selected as an option instead of or in addition to the option provided to navigate to the POI of the pre-configured category mentioned above. In one example, the "Navigate to car park" virtual button 334 (Figure 334) is replaced with a "Navigate to POI" virtual button (not shown). Upon selection of the "Navigate to POI" virtual button, the application software 266 causes the view generation engine 268 to present the user with a number of POI categories for selection and/or an option to specify a POI category via a virtual keypad. Once the user has selected the POI category in this way, the application software 266 proceeds to find the POI of the category selected in the POI database 228 in the manner already described above and, instead of the "Navigate to POI" or "Navigate to car park" button mentioned above, a "Navigate to [POI Category]" virtual button is generated, "[POI Category]" being indicative of the POI category selected, for example "Shop" or "Museum". As in the case of the previous embodiment, the "Navigate to [POI Category]"

button can be supplemented with a label that provides further information, for example a straight line distance to the POI found in the POI database 228.

In this and the previous embodiment, where the POI is selected by the user to replace the location originally selected, and a database or a list of "recent destinations" is maintained by the application software 266, the record of "recent destinations" can be updated with both the location originally selected and the POI selected.

In the embodiments described above, the application software 266 finds the closest POI to the location initially selected by the user that conforms to the predetermined vicinity criterion. However, the skilled person should appreciate that other POIs complying with the predetermined vicinity criterion can exist. In a further embodiment, the application software 266 can cause the view generation engine 268 to provide an interactive selection screen permitting the user to select one of a number of POIs found to comply with the predetermined vicinity criterion. In this respect, if the database 228 contains additional information concerning the POIs selected, the POIs identified can be sorted according to one or more sorting criteria, for example rating as best, cost, and/or user needs, for example good wheelchair access. The user is then at liberty to select one of the POIs, for example parking facilities, listed and the selected POI can then be viewed as described above in relation the second preview generated and the POI can then be selected as the new destination, rejected outright or rejected but providing the user with another opportunity to select another POI, for example by means of a "Back" virtual button.

It will also be appreciated that whilst various aspects and embodiments of the present invention have heretofore been described, the scope of the present invention is not limited to the particular arrangements set out herein and instead extends to encompass all arrangements, and modifications and alterations thereto, which fall within the scope of the appended claims.

For example, although the above embodiments have largely been described in the context of a process for setting a destination, the above examples can be employed in relation to setting one or more POI whilst en-route and following a route already calculated by the navigation apparatus. Similarly, any of the above described embodiments can be employed in relation to setting an intermediated location, for example a so-called "waypoint".

It should be appreciated that although the above examples have been described in the context of straightforward route selection and calculation, the above embodiments can be implemented in relation to other functional aspects of the application software 266. For example, the application software 266 can support a route planning procedure

that allows a user to prepare a route in advance of imminent departure and/or creation of an itinerary. In such examples, the user can request, via the user interface, to prepare a route or create an itinerary, and the functionality described above in relation to any of the preceding embodiments can be employed to select a POI near a location selected as part of the route planning or itinerary creation functions mentioned above.

Whilst embodiments described in the foregoing detailed description refer to GPS, it should be noted that the navigation apparatus may utilise any kind of position sensing technology as an alternative to (or indeed in addition to) GPS. For example the navigation apparatus may utilise using other global navigation satellite systems such as the European Galileo system. Equally, it is not limited to satellite based but could readily function using ground based beacons or any other kind of system that enables the device to determine its geographic location.

Alternative embodiments of the invention can be implemented as a computer program product for use with a computer system, the computer program product being, for example, a series of computer instructions stored on a tangible data recording medium, such as a diskette, CD-ROM, ROM, or fixed disk, or embodied in a computer data signal, the signal being transmitted over a tangible medium or a wireless medium, for example, microwave or infrared. The series of computer instructions can constitute all or part of the functionality described above, and can also be stored in any memory device, volatile or non-volatile, such as semiconductor, magnetic, optical or other memory device.

It will also be well understood by persons of ordinary skill in the art that whilst the preferred embodiment implements certain functionality by means of software, that functionality could equally be implemented solely in hardware (for example by means of one or more ASICs (application specific integrated circuit)) or indeed by a mix of hardware and software. As such, the scope of the present invention should not be interpreted as being limited only to being implemented in software.

Lastly, it should also be noted that whilst the accompanying claims set out particular combinations of features described herein, the scope of the present invention is not limited to the particular combinations hereafter claimed, but instead extends to encompass any combination of features or embodiments herein disclosed irrespective of whether or not that particular combination has been specifically enumerated in the accompanying claims at this time.

CLAIMS

1. A navigation apparatus comprising:

a processing resource arranged to support, when in use, a user interface, the user interface being arranged to permit selection of a location; wherein

the user interface comprises a view generation engine;

the processing resource is arranged to query a database comprising point of interest data in order to find a point of interest within a predetermined vicinity of the location selected; and

the view generation engine is arranged to generate a view identifying the point of interest in response to the point of interest being found.

2. An apparatus as claimed in Claim 1, wherein the view generation engine is arranged to generate the view so as to identify both the location selected and the point of interest.

3. An apparatus as claimed in Claim 2, wherein identification of the location selected and the point of interest comprises visually identifying the locations of both the location selected and the point of interest.

4. An apparatus as claimed in Claim 1 or Claim 2 or Claim 3, wherein the user interface is arranged to provide a route creation procedure, the route creation procedure permitting the selection of the location.

5. An apparatus as claimed in any one of the preceding claims, wherein the location selected is a destination of a route for calculation.

6. An apparatus as claimed in any one of Claims 1 to 4, wherein the location selected is an intermediate location in a route for calculation.

7. An apparatus as claimed in Claim 4, wherein the processing resource is arranged to support a route calculation procedure, the route calculation procedure comprising the route creation procedure.

8. An apparatus as claimed in Claim 4, wherein the processing resource is arranged to support a route planning procedure, the route planning procedure

comprising the route creation procedure.

9. An apparatus as claimed in any one of the preceding claims, wherein the user interface is arranged to support display of a selectable user interface element in response to the processing resource finding the point of interest, the identification of the point of interest comprising provision of the selectable user interface element.

10. An apparatus as claimed in Claim 4 or Claim 7 or Claim 8, wherein the route creation procedure is arranged to replace the location selected with a location associated with the point of interest in response to an indication of selection of the point of interest.

11. An apparatus as claimed in Claim 10, wherein the view generation engine is arranged to generate another view in response to the indication of selection, the another view comprising the point of interest.

12. An apparatus as claimed in Claim 11, wherein the another view is substantially centred on the point of interest.

13. An apparatus as claimed in any one of the preceding claims, wherein the view generated is a rendered three-dimensional view.

14. An apparatus as claimed in Claim 10, wherein the another view is another rendered three-dimensional view.

15. An apparatus as claimed in any one of the preceding claims, wherein a level of magnification employed in relation to the view is such that both the location selected and the point of interest are visible on a screen displaying, when in use, the view.

16. An apparatus as claimed in any one of the preceding claims, wherein the user interface is arranged to permit user selection of a category of the point of interest to be found.

17. An apparatus as claimed in any one of Claims 1 to 15, wherein the point of interest is a parking facility.

18. An apparatus as claimed in any one of the preceding claims, wherein the processing resource is arranged to calculate a measure relating to a separation of the location selected from the point of interest.

19. An apparatus as claimed in Claim 18, wherein the user interface is arranged to display the measure calculated in the view generated.

20. An apparatus as claimed in any one of the preceding claims, wherein the user interface is arranged to permit user selection of the predetermined vicinity.

21. A portable navigation device comprising the navigation apparatus as claimed in any one of the preceding claims.

22. A method of route configuration, the method comprising:

permitting user selection of a location via a user interface;

querying a database comprising point of interest data in order to find a point of interest within a predetermined vicinity of the location selected; and

a view generation engine generating a view identifying the point of interest in response to the point of interest being found.

23. A computer program element comprising computer program code means to make a computer execute the method as claimed in Claim 22.

24. A computer program element as claimed in Claim 23, embodied on a computer readable medium.

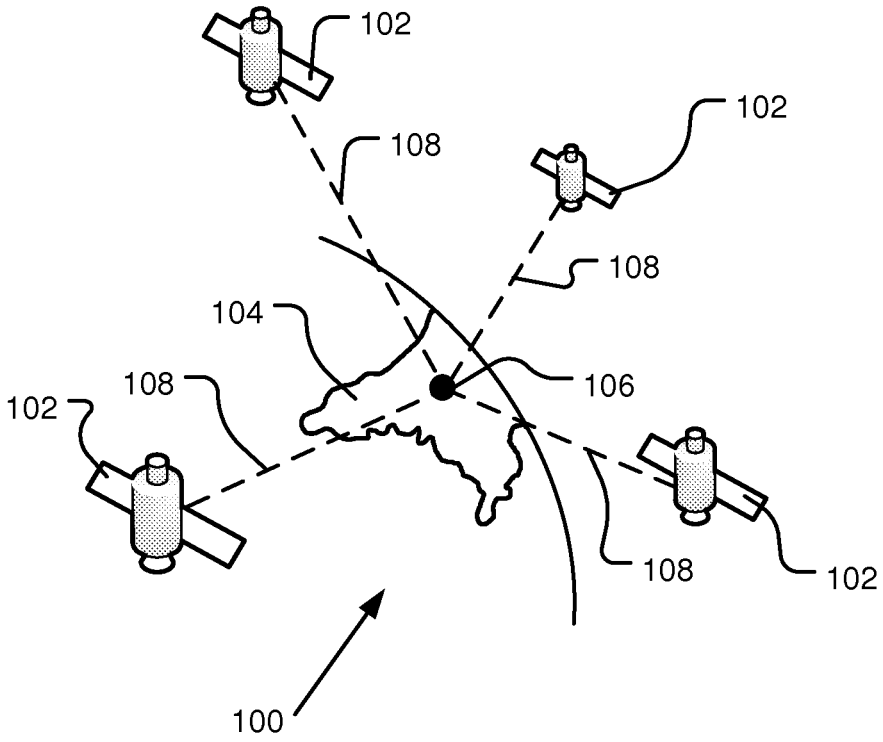


Figure 1

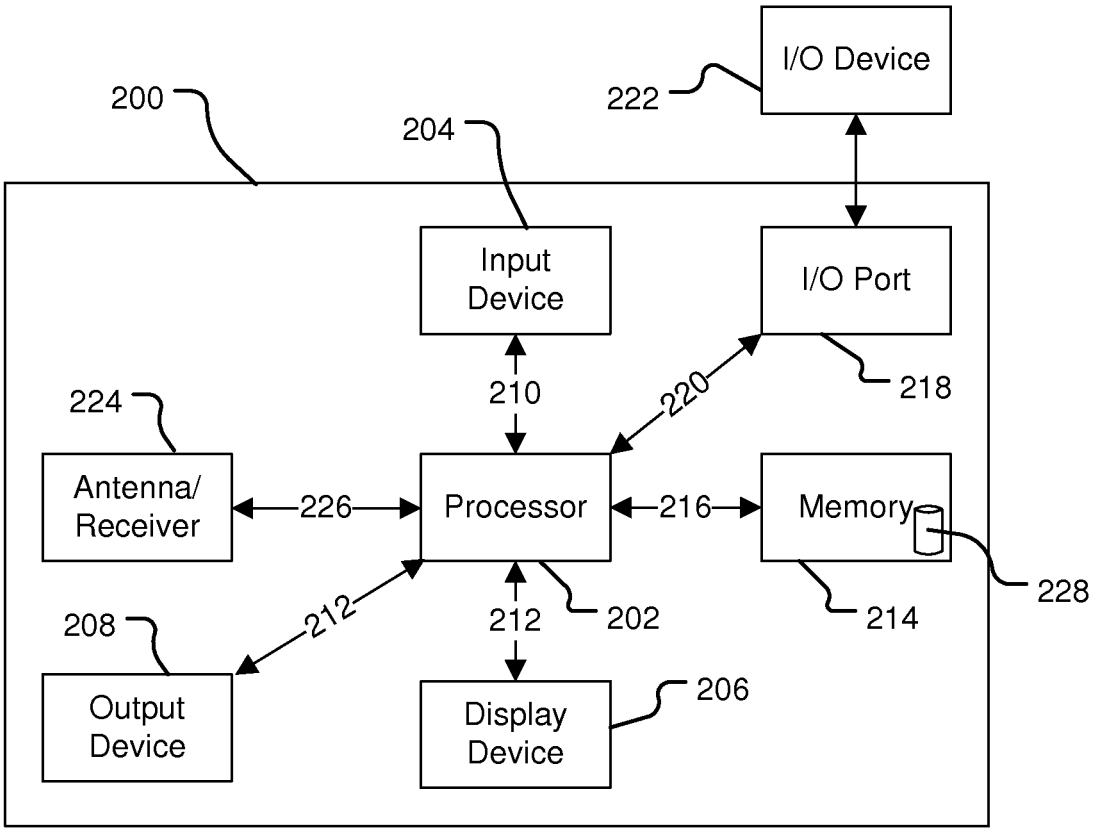


Figure 2

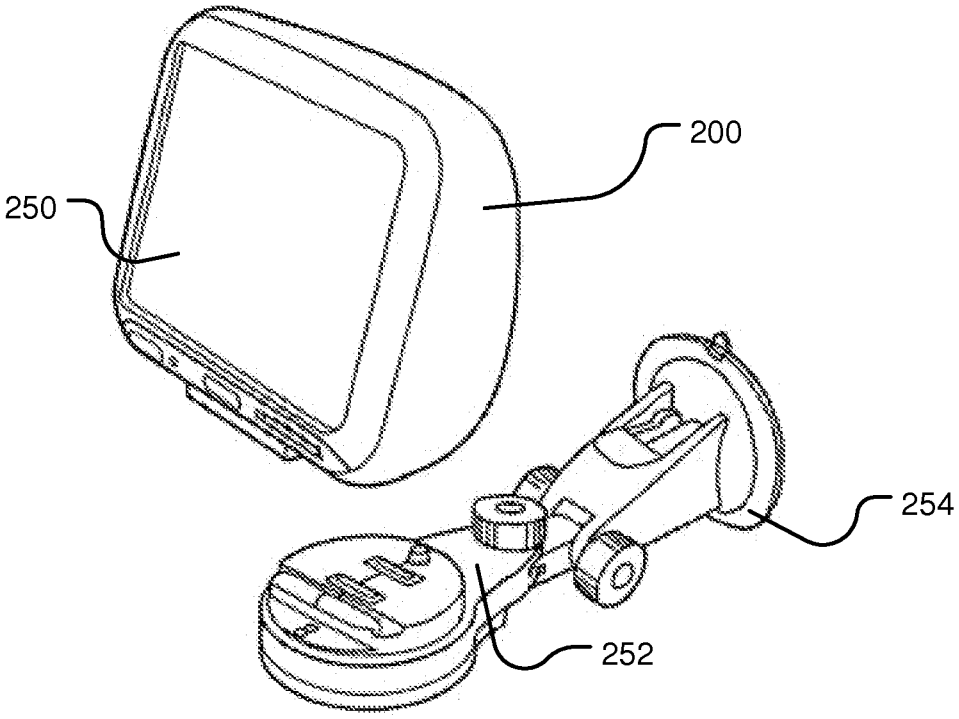


Figure 3

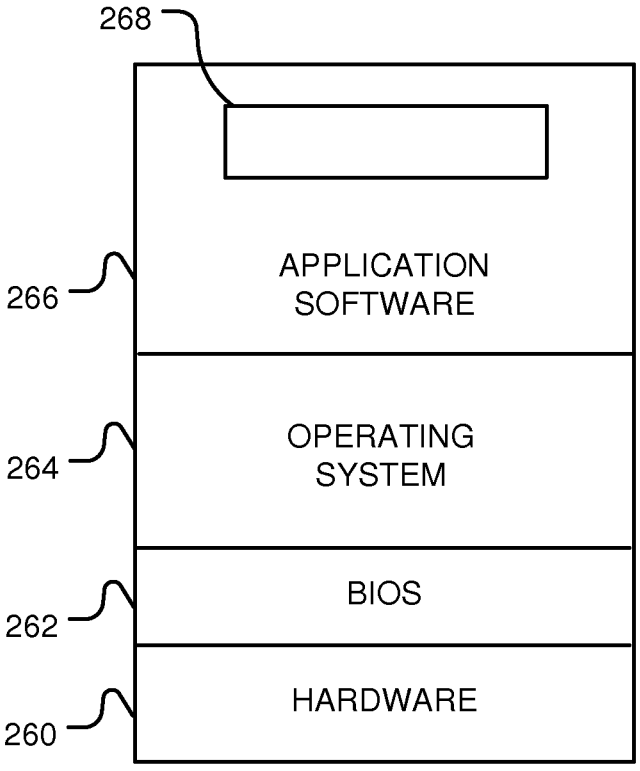


Figure 4

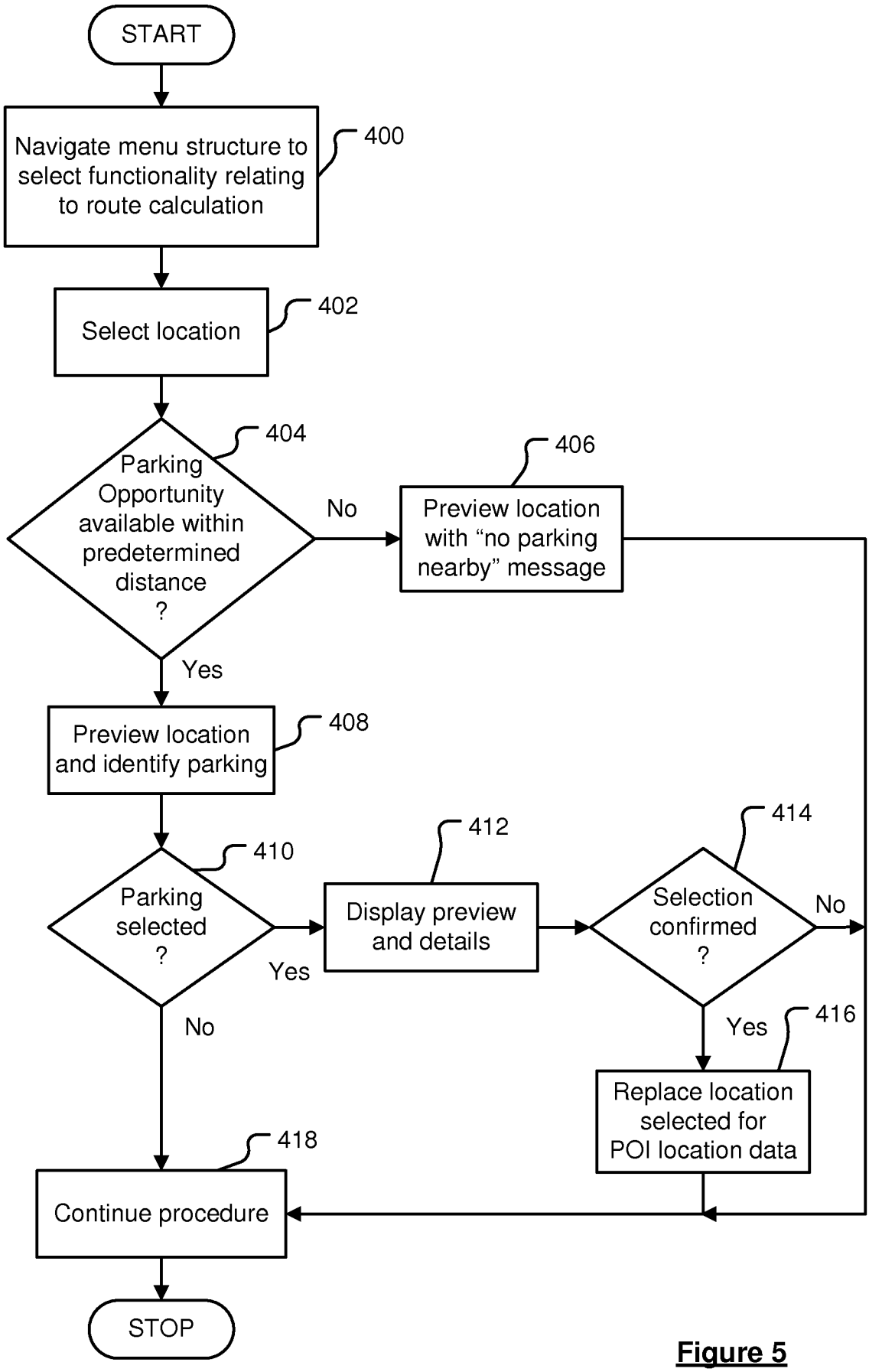

START
Navigate menu structure to select functionality relating to route calculation
400
Select location
402
Parking Opportunity available within predetermined distance ?
404
No
Preview location with "no parking nearby" message
406
Yes
Preview location and identify parking
408
Parking selected ?
410
Yes
Display preview and details
412
Selection confirmed ?
414
No
Yes
No
Replace location selected for POI location data
416
Continue procedure
418
STOP

Figure 5

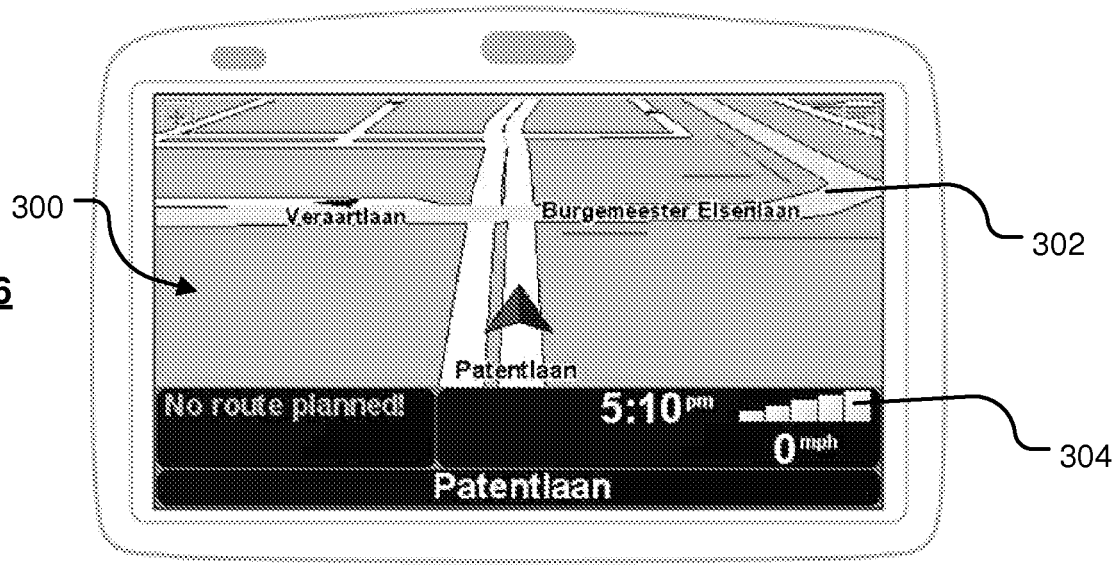


Figure 6

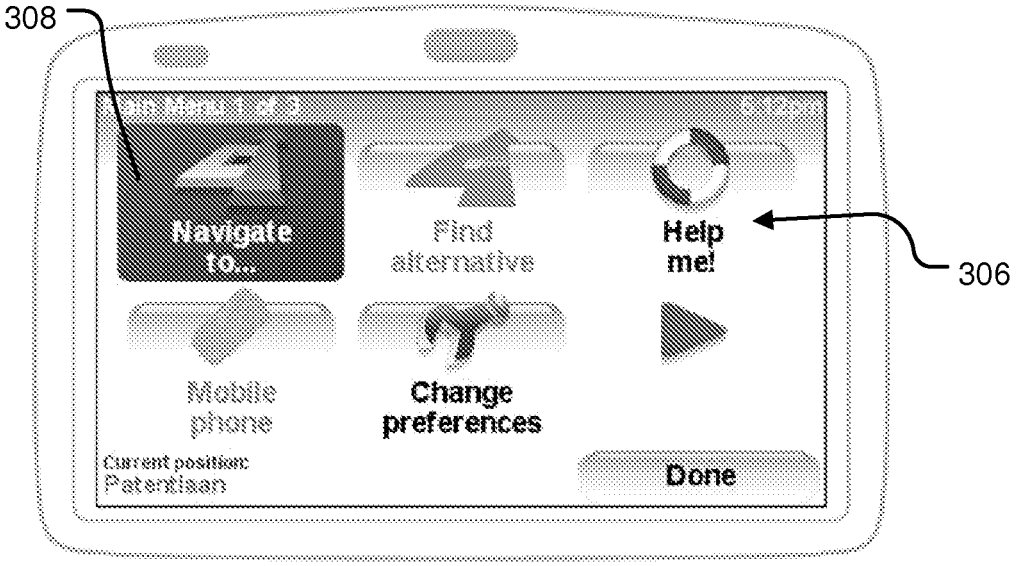


Figure 7

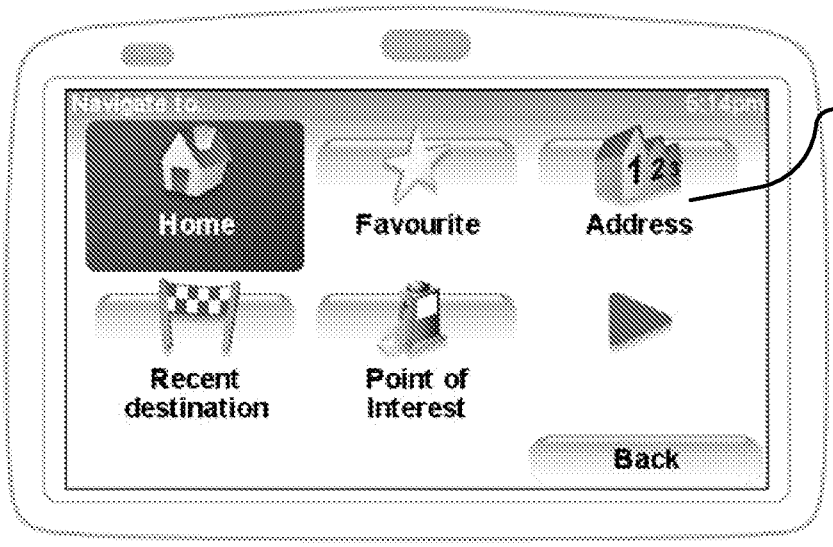


Figure 8

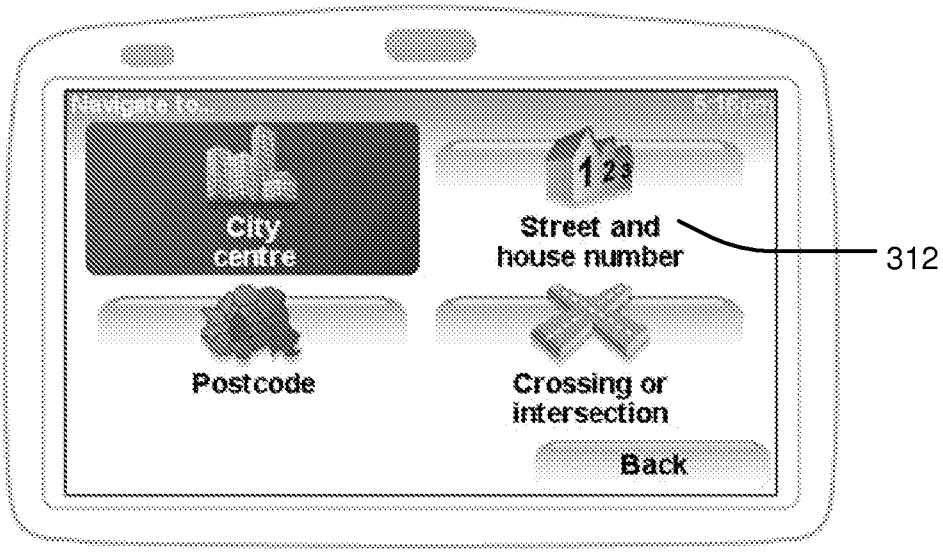


Figure 9

Figure 10

Figure 11

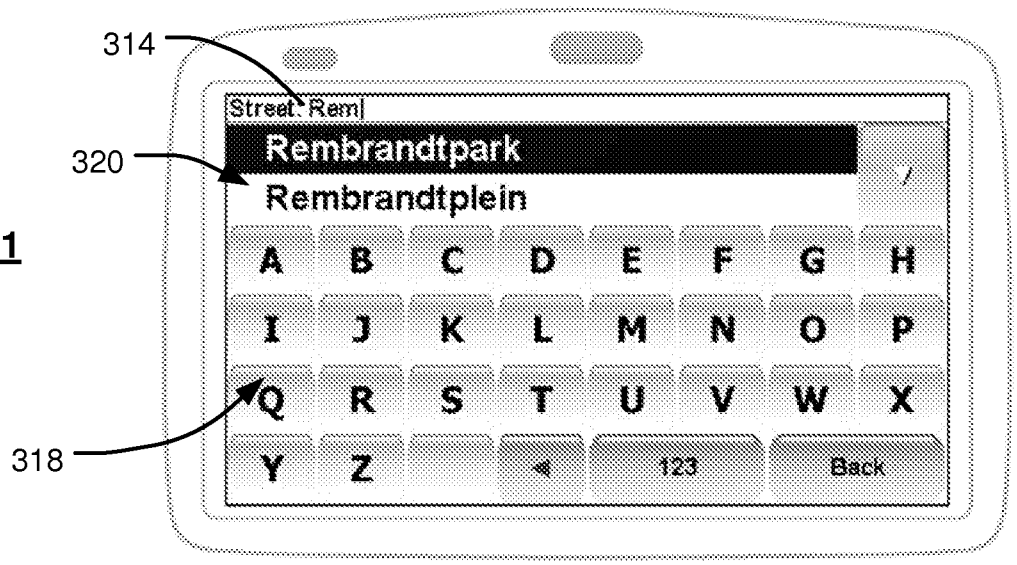


Figure 12

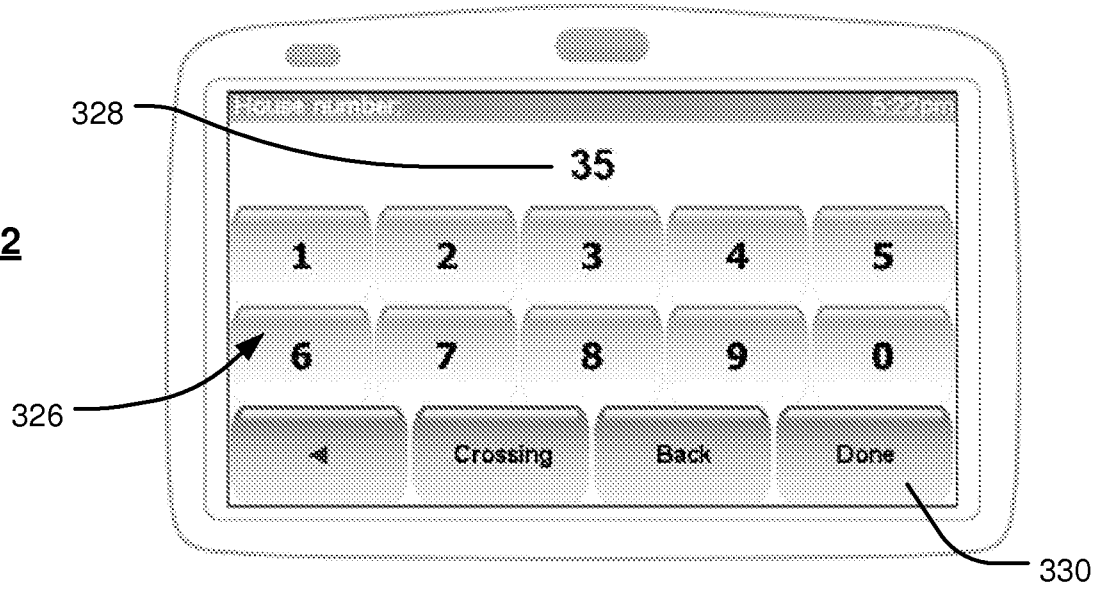


Figure 13

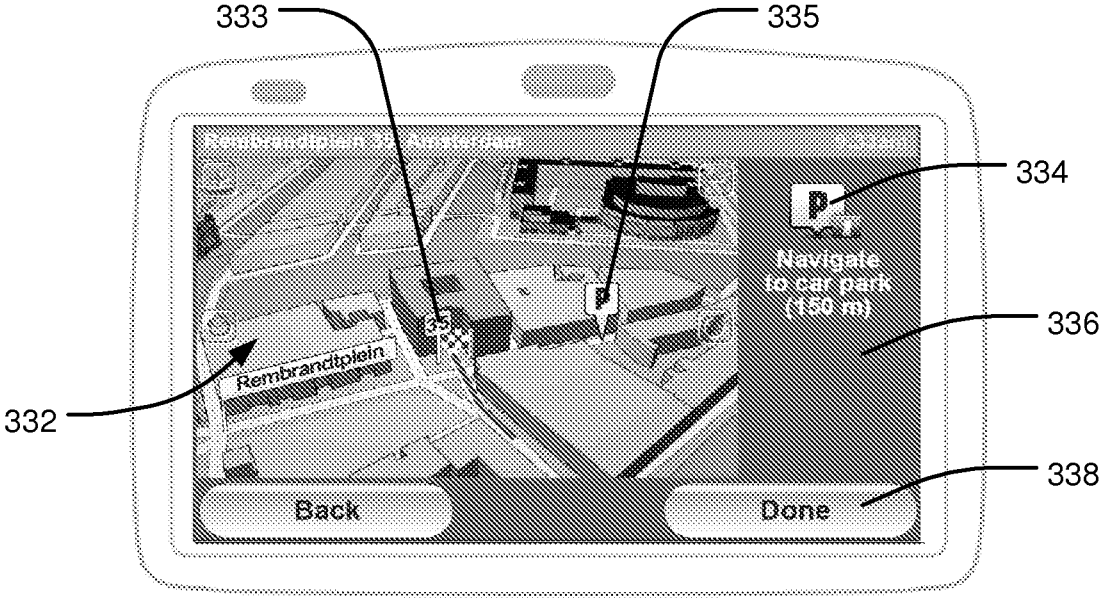


Figure 14

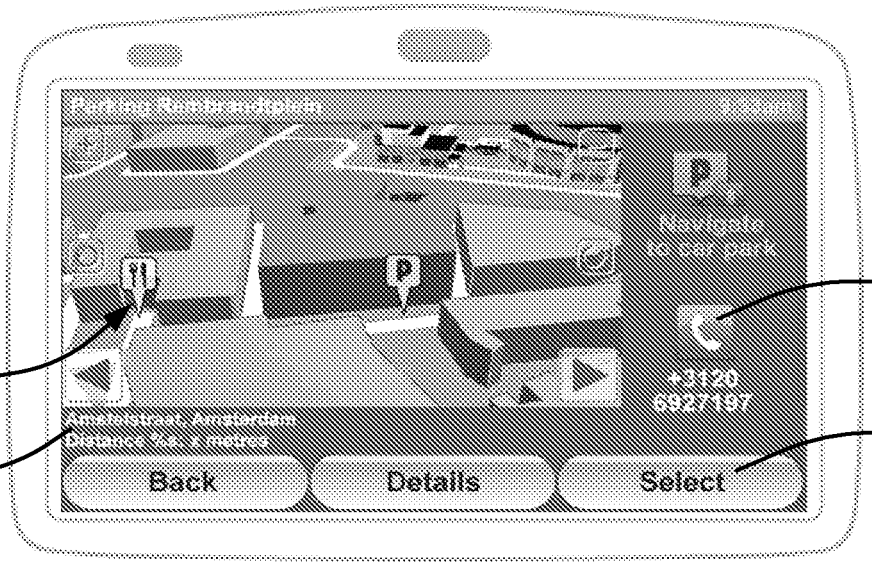


Figure 15

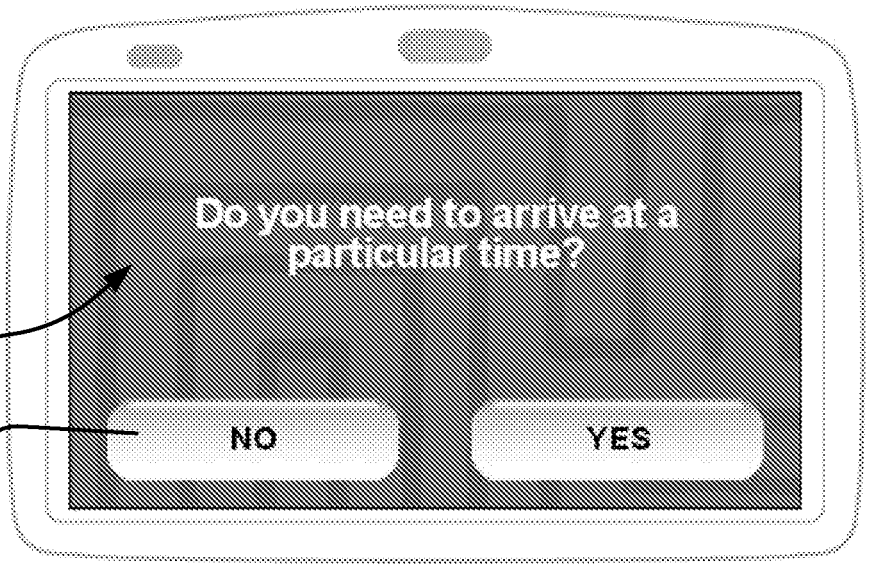
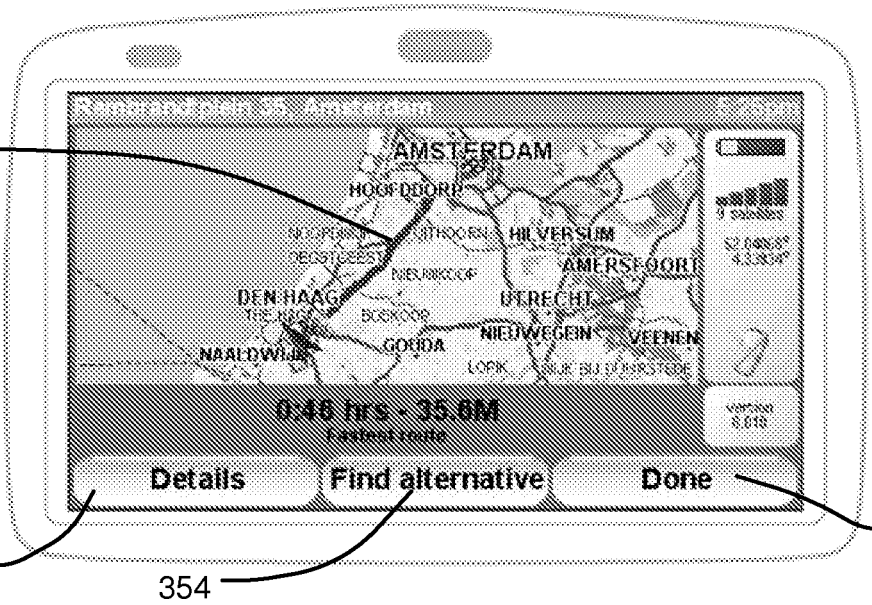


Figure 16



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/063561

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01C21/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/021227 A1 (MATSUMOTO SHUICHI [JP] ET AL) 27 January 2005 (2005-01-27) figures 4,17-19 paragraph [0062] paragraphs [0082] - [0089] paragraphs [0101] - [0105], [0115]	1-24
X	JP 2005 326202 A (KENWOOD CORP) 24 November 2005 (2005-11-24) the whole document	1-24
X	JP 2000 146613 A (MATSUSHITA ELECTRIC IND CO LTD; TOYOTA MOTOR CORP; AISIN AW CO; DENSO) 26 May 2000 (2000-05-26) the whole document	1-24

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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 June 2009	25/06/2009

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bruinsma, Maarten

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/063561

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2006/041379 A1 (BRULLE-DREWS CHRISTIAN [DE] BRUELLE-DREWS CHRISTIAN [DE]) 23 February 2006 (2006-02-23) paragraphs [0024], [0029], [0033] - [0039], [0042] - [0044]	1-24

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2008/063561

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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JP 2005326202 A	24-11-2005	NONE	
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