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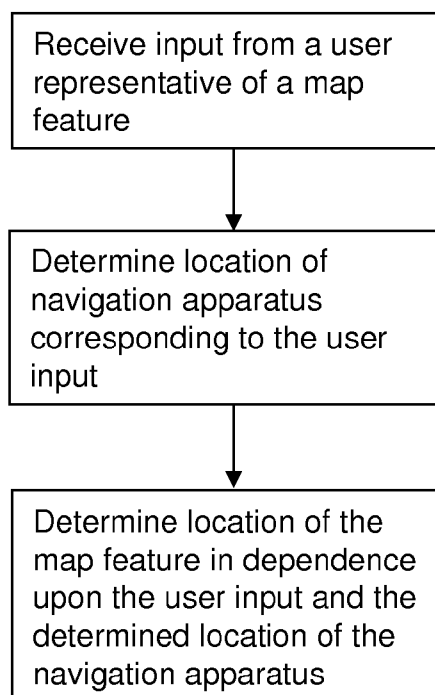
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(54) Title: MAPPING SYSTEM AND METHOD



(57) Abstract: A navigation or mapping system comprises a portable navigation or mapping apparatus (200) that comprises a location determination unit (250, 255, 210) for determining the location of the apparatus (200), and a user input device (220, 240) for receiving input from a user representative of a map feature observed by the user, and a processor (210) operable to identify the observed map feature in dependence on the determined location of the apparatus (200) and to process the user input to obtain user observation data representative of at least one property of the observed map feature.

Fig.7



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Mapping system and method**Field of the Invention**

5 The present invention relates to a navigation or mapping system and method and in particular to the correction or amendment of map data and/or the correction of a locations determined by a navigation apparatus or method. The invention relates in particular to portable navigation devices.

Background to the Invention

10 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 (at least one of volatile and non-volatile, and commonly both), and map data stored within said
15 memory. The processor and memory cooperate to provide an execution environment in which a software operating system may be 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
20 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
25 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 arrangement the output interface display may be configured as a touch sensitive display (by means of a touch sensitive overlay or otherwise) to additionally provide an input interface by means of which a user can operate the device by touch.

30 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 Wi-Fi, Wi-Max GSM and the like.

35 PND devices 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 device 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 PND devices 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).

In addition, 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 to which the user's PC is connected 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
5 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
10 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
15 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
20 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 720T model manufactured
25 and supplied by TomTom International B.V., provide a reliable means for enabling users to navigate from one position to another.

Although the devices of the type described can be of great utility, uncertainty in the position of a user or errors or omissions in map data can result in missing, ambiguous or even incorrect turn instructions being issued, or in unnecessary rerouting
30 of a user or inaccurate estimation of a time of arrival.

Navigation and map matching relies on an accurate GPS position being determined and on the accuracy of underlying map data.

It is known to use additional sensors, for example accelerometers or gyroscopes, to determine location when GPS signals are weak or unavailable. However such
35 additional sensors are usually less accurate in determining location than a GPS system. It is also known to correct map data centrally, when errors become known. However,

map data is usually laborious to correct and has a long time-to-market, making correction difficult, expensive and time consuming.

Summary of the Invention

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According to a first aspect of the present invention, there is provided a navigation or mapping system comprising:- a portable navigation or mapping apparatus that comprises a location determination unit for determining the location of the apparatus, and a user input device for receiving input from a user representative of a map feature
10 observed by the user; and a processor operable to identify the observed map feature in dependence on the determined location of the apparatus and to process the user input to obtain user observation data representative of at least one property of the observed map feature.

The processor may be included in the portable navigation or mapping apparatus
15 or may be included in a separate apparatus, which may be remote from the portable navigation or mapping apparatus, for example a server. The portable navigation or mapping apparatus may be a portable navigation device (PND) or a mobile phone. The processor may comprise a map feature determination module for identifying the observed map feature and to processing the user input to obtain user observation data

20 The system may further comprise a memory for storing map data, and the processor may be operable to compare the user observation data to map data representative of the observed map feature.

A map feature may be any feature whose location is identified by map data or a map. The map feature may comprise at least one of:- a road feature, for example a
25 traffic lane, a roundabout, a traffic light or a traffic junction; a point of interest (POI); a building; or a natural geographical feature for example a hill, mountain or river.

The processor may be configured to modify the map data in dependence upon the comparison.

The at least one property of the observed map feature may comprise the location
30 of the map feature. Alternatively or additionally the at least one property may comprise at least one aspect of the appearance, size or function of the map feature.

The user input may be representative of at least one of:- the presence or absence of a map feature; the location of the map feature relative to the user and/or relative to at least one other map feature; or at least one aspect of the appearance, size
35 or function of the map feature.

The processor may be configured to process the user input in dependence upon

a location of the apparatus determined by the location determination unit to obtain the user observation data, and the user observation data may comprise a user-determined location of the map feature.

5 The processor may be configured to compare a location of the map feature obtained from map data with the user-determined location of the map feature. The processor may be configured to offset a location determined by the location determination unit in dependence upon the comparison.

10 The processor may be operable to determine the user determined location of the map feature from a plurality of user inputs representative of the map feature and a corresponding plurality of determined apparatus locations, obtained from a plurality of navigation apparatuses, and to determine a location offset for the map feature in dependence on a comparison between the user determined location and a location represented by map data.

15 The processor may be operable to determine a distribution of locations of the map feature determined from the plurality of user inputs and determined apparatus locations, and to determine the location of the map feature from the distribution.

20 The processor may be configured to determine the user determined location of a plurality of map features from user input to the navigation apparatus, to compare the user determined location for each map feature with a location of that map feature obtained from stored map data, and to determine a location offset representative of the difference between locations obtained from the map data and user determined locations.

The processor may be configured to modify at least one of map data and locations determined using the location determination unit in dependence on the location offset.

25 The processor may be configured to select the map feature and the apparatus may further comprise an output device for requesting the user input representative of the selected map feature. The output device may comprise an audio and/or video device for providing an audible and/or visible output. The output device may be configured to provide a visual or audible identification of the map feature. The output device may be configured to request the user to provide an input at the location of the map feature.

30 The input device and the output device may be combined in a single input/output device.

The user input device may be sensitive to at least one of speech, text, and touch. The input device may comprise at least one of a touch screen device, an electro-mechanical device and a microphone.

The processor may be operable to control the output device to request the user

input at a time determined in dependence on the location and/or speed of travel of the apparatus.

The processor may be configured to select or identify the map feature in dependence upon the location of the apparatus and/or in dependence upon a route
5 selected by the user.

The processor may be configured to select at least one map region, and to select the map feature to be within the selected at least one map region.

The processor may be configured to select the map feature and/or the or an at least one map region in dependence upon navigation errors and/or resolution of map
10 data associated with the map feature and/or the or an at least one map region. The navigation errors may be historical navigation errors made by the user and/or other users or other navigation apparatus. The processor may be arranged to receive data representative of the navigation errors from a server.

The navigation apparatus may comprise communication circuitry for transmitting
15 data to and/or receiving data from a server, and the processor is configured to use the communication circuitry to transmit data to the server representative of at least one of the determined location of map feature, the user input and the determined location of the apparatus.

The apparatus may be a portable navigation device (PND). The processor,
20 memory and/or output device may be included in the portable navigation device.

In a further, independent aspect of the invention there is provided a portable navigation or mapping apparatus comprising:- a location determination unit for determining the location of the apparatus; a user input device for receiving input from a user representative of a map feature observed by the user; and a processor operable to
25 identify the observed map feature in dependence on the determined location of the apparatus and to process the user input to obtain user observation data representative of at least one property of the observed map feature.

In another, independent aspect of the invention there is provided a method of mapping or navigation comprising:- determining the location of a user; receiving input
30 from the user representative of a map feature observed by the user; identifying the observed map feature in dependence on the determined location of the user; and processing the user input to determine at least one property of the observed map feature.

In a further, independent aspect of the invention there is provided a computer
35 program product comprising computer readable instructions executable to perform a method as claimed or described herein.

Any feature in one aspect of the invention may be applied to other aspects of the invention, in any appropriate combination. In particular, apparatus features may be applied to method features and vice versa.

5 **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 a Global Positioning System (GPS) usable by a navigation device;

10 Figure 2 is a schematic illustration of electronic components of a navigation device;

Figure 3 is a schematic diagram of a communications system including a wireless communication channel for communication with the navigation device;

Figures 4a and 4b are illustrative perspective views of a navigation device;

15 Figure 5 is a schematic representation of an architectural stack of the navigation device of Figure 2;

Figure 6 is a an illustrative screenshot from the navigation device of Figure 2;

Figure 7 is a flow chart illustrating in overview a mapping method based upon user input;

20 Figure 8 is a schematic illustration of a situation in which the location of a map feature is determined from user input;

Figure 9 is a schematic illustration of a situation in which the location of a road layout feature is determined from user input;

25 Figure 10 is a schematic diagram showing map features for which user input is desired, within a selected region relative to a route.

Detailed Description of Preferred Embodiments

Preferred embodiments of the present invention will now be described with particular reference to a PND. It should be remembered, however, that the teachings of
30 the present invention are not limited to PNDs but are instead universally applicable to any type of processing device that is configured to execute navigation software so as to provide route planning and navigation functionality. It follows therefore that in the context of the present application, a navigation device is intended to include (without limitation) any type of route planning and navigation device, irrespective of whether that
35 device is embodied as a PND, a navigation device built into a vehicle, or indeed a computing resource (such as a desktop or portable personal computer (PC), mobile

telephone or portable digital assistant (PDA)) executing route planning and navigation software.

It will also be apparent from the following that the teachings of the present invention even have utility in circumstances where a user is not seeking instructions on how to navigate from one point to another, but merely wishes to be provided with a view of a given location. In such circumstances the "destination" location selected by the 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 a 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, Fig. 1 illustrates an example view of Global Positioning System (GPS), usable by navigation devices. 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 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 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 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 is an illustrative representation of electronic components of a navigation device 200 according to an embodiment of the present invention, 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, touch panel and/or any other known input device utilised to input information; and the display screen 240 can include any type of display screen such as an LCD display, for example. In one arrangement the input device 220 and display screen 240 are integrated into an integrated input and display device, including a touchpad or touchscreen input so that 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.

The navigation device may include an output device 260, for example an audible output device (e.g. a loudspeaker). As output device 260 can produce audible information for a user of the navigation device 200, it is should equally be understood that input device 240 can 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 220 via a connection 225, and operatively connected to at least one of display screen 240 and output device 260, via output connections 245, to output information thereto. Further, the processor 210 is operably coupled to a memory resource 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 memory resource 230 comprises, for example, a volatile memory, such as a Random Access Memory (RAM) and a non-volatile memory, for example a digital memory, such as a flash memory. The external I/O device 280 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.

Fig. 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 Fig. 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 Fig. 2 are considered to be within the scope of the present application. For example, the components shown in Fig. 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 Fig. 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 now to Fig. 3, the navigation device 200 may establish a "mobile" or telecommunications network connection with a server 302 via a mobile device (not shown) (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 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.

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

10 As such, an internet connection may be utilised 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)-
15 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, and eventually with the internet and server 302, via existing Bluetooth technology for example, in a known manner, wherein the data protocol can utilize any
20 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, or optionally using the internal antenna of the navigation device 200). The mobile phone technology within
25 the navigation device 200 can include internal components as specified above, and/or can include an insertable card (e.g. Subscriber Identity Module or SIM 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
30 internet for example, in a manner similar to that of any mobile device.

 For GPRS phone settings, a Bluetooth enabled navigation device may be used to correctly work with the ever changing spectrum of mobile phone models, manufacturers, etc., model/manufacture specific settings may be stored on the navigation device 200 for example. The data stored for this information can be updated.

35 In Fig. 3 the navigation device 200 is depicted as being in communication with the server 302 via a generic communications channel 318 that can be implemented by

any of a number of different arrangements. The server 302 and a navigation device 200 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 Fig. 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. 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. 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
5 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
10 links that use a variety of technology. For example, 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, fibre optic cables, converters, radio-frequency (RF)
15 waves, the atmosphere, empty space, etc. Furthermore, the communication channel 318 can include intermediate devices such as routers, repeaters, buffers, transmitters, and receivers, for example.

In one illustrative arrangement, the communication channel 318 includes telephone and computer networks. Furthermore, the communication channel 318 may
20 be capable of accommodating wireless communication such as radio frequency, microwave frequency, infrared communication, etc. Additionally, 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
25 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. These signals may
30 be modulated, encrypted and/or compressed signals as may be desirable for the communication technology.

The server 302 includes a remote server accessible by the navigation device 200 via a wireless channel. The server 302 may include a network server located on a local area network (LAN), wide area network (WAN), virtual private network (VPN), etc.

35 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
5 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 automatically or upon a user connecting navigation device 200 to the server 302 and/or may be more dynamic
10 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
15 independent of a connection to a server 302.

As indicated above in Fig. 2, a navigation device 200 includes a processor 210, an input device 220, and a display screen 240. 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
20 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. Further, the navigation device 200 can also include any additional input device 220 and/or any additional output device 241, such as audio input/output devices for example.

Figs 4A and 4B are perspective views of a navigation device 200. As shown in
25 Fig. 4A, the navigation device 200 may be a unit that includes an integrated input and display device 290 (a touch panel screen for example) and the other components of fig. 2 (including but not limited to internal GPS receiver 250, microprocessor 210, a power supply, memory systems 230, etc.).

The navigation device 200 may sit on an arm 292, which itself may be secured to
30 a vehicle dashboard/window/etc. using a suction cup 294. This arm 292 is one example of a docking station to which the navigation device 200 can be docked.

As shown in Fig. 4B, the navigation device 200 can be docked or otherwise connected to an arm 292 of the docking station by snap connecting the navigation device 292 to the arm 292 for example. The navigation device 200 may then be
35 rotatable on the arm 292, as shown by the arrow of Fig. 4B. To release the connection between the navigation device 200 and the docking station, a button on the navigation

device 200 may be pressed, for example. Other equally suitable arrangements for coupling and decoupling the navigation device to a docking station are well known to persons of ordinary skill in the art.

Referring now to Fig. 5 of the accompanying drawings, the memory resource 230
5 stores a boot loader program (not shown) that is executed by the processor 210 in order to load an operating system 470 from the memory resource 230 for execution by functional hardware components 460, which provides an environment in which application software 480 can run. The operating system 470 serves to control the functional hardware components 460 and resides between the application software 480
10 and the functional hardware components 460. The application software 480 provides an operational environment including the GUI that supports core functions of the navigation device 200, for example map viewing, route planning, navigation functions and any other functions associated therewith. In accordance with the embodiment described in more detail below, the application software 480 includes a map feature determination module
15 490.

When the user switches on the device 200, the device 200 acquires a GPS fix and calculates (in a known manner) the current location of the device 200. The location is calculated using a location determination unit comprising the antenna/receiver 250, the connection 255 and a position determining module (not shown) included in the
20 processor 210. The user is then presented, as shown in Figure 6, with a view in pseudo three dimensions on a touch screen display 240 of the local environment 502 in which the navigation device 200 is determined to be located, and in a region 504 of the display 240 below the local environment a series of control and status messages. The device 200 provides route planning, mapping and navigation functions to the user, in
25 dependence on user input provided by a series of interlinked soft or virtual buttons and menu screens that can be displayed on the display 240.

The user is able to select a destination using the buttons and menu screens, and the device 200 calculates a route to the destination. Once the user commences their journey the device 200 updates the map in accordance with determined changes in the
30 location of the device 200 and, if a destination or route has been selected, provides the user with visual and, optionally, audible navigation instructions.

It has been found that in practice there can be uncertainty in the position of the navigation device displayed on the display 240, either because of errors or uncertainties in map data or because of poor GPS reception in particular areas and/or due to
35 atmospheric conditions or other factors, which means that the ability to determine

position using the GPS signals can be lost or can be of reduced accuracy for periods of time.

Additional sensors, for example accelerometers and gyroscopes (not shown), can be included in or associated with the device 200. In operation, if a GPS fix is lost for a period of time the processor 202 is programmed to determine the relative movement of the navigation device 200 since the last GPS fix using the additional sensors. However, the estimated position using the additional sensors becomes increasingly less accurate the longer the GPS fix is lost.

In light of the possibility of potentially inaccurate map data, and potential inaccuracies in position determination by the navigation device 200, the device 200 is configured to receive user input concerning map features and to modify its operation or to modify map data in dependence upon such user input. For example, an offset can be applied to the position as determined from signals received by the antenna/receiver 250, to offset GPS uncertainty to give a more accurate location. Those functions of the device 200 are controlled by the map feature determination module 490 included in the application software 480 of the processor 210.

The map feature determination module 490 is operably connected to the integrated input and display device in the form of touch screen display 240, to the output device 260, and to the memory 230. The antenna/receiver 250 and components of the processor 210 are arranged to co-operate to operate as a location determination unit to determine the location of the device 200 using GPS signals received by the antenna/receiver 250, and to provide the location of the device to the map feature determination module 490. The touch screen display device 240 includes a microphone for receiving voice input from a user, as well or instead of touch screen input, and the map feature determination module 490 includes speech recognition software for processing speech input received via the microphone, to provide automatic speech recognition (ASR). In operation, the map feature determination module 490 is able to receive and process user inputs received via the touch screen display 240, and to control output of instructions, requests or other information to the user via the output device 260. The map feature determination module 490 includes text to speech (TTS) software that can be used to provide speech output via the output device 260.

The map feature determination module 490 is also able to receive data, in particular map data, stored in the memory 230 and location data that is representative of the location of the device 200 from the location determination unit, to determine the location of the device 200 in relation to a map. The map feature determination module 490 is also able to correlate user input with a location.

In operation the map feature determination module 490 receives map data from the memory 230 for the area around the current location of the device 200 and/or along a route that the user is following and selects map features near the current location or route for which user input is desired.

5 The device 200 is usually installed in a vehicle. As the vehicle travels, the map feature determination module 490 selects a map feature that is near the current location or that is approaching on the current route and sends a signal to the output device 260 to cause the output device to identify the selected map feature to the user and request user input concerning the selected map feature.

10 The timing and content of the output from the output device is controlled by the map feature determination module 490 in dependence on the speed and/or trajectory of the device 200 and the location of the map feature obtained from map data, relative to the trajectory and/or relative to other map features. For example if the device 200 is travelling fast, then the map feature determination module 490 outputs a request
15 concerning an approaching map feature in advance of the expected arrival time of the map feature to ensure that the user does not miss the map feature.

 The map feature determination module 490 monitors input from the user in response to the output from the output device 260, and associates the input with a location of the device 200 determined by the location determination unit at the time of
20 receipt of the input from the user. Operation of the device 200 relating to the verification of map data is illustrated in overview in the flow chart of Figure 7.

 An example of the request for input from a user concerning a map feature and the receipt and processing of the input is illustrated in overview in Figure 8. In this example, the device 200 is installed in a vehicle 510 that is travelling along a road 512.
25 The map feature determination module 490 selects a map feature, in this case a church, that has an expected location 514 determined from the map data that is along the route of the vehicle 510. The expected location 514 is next to a junction 516 of the road 512 with another road 518.

 The map feature determination module 490 causes the output device 260 to
30 output a message to the user "Please say 'now' when you pass a church to your left adjacent to a junction". The message is output to the user at a time dependent on the current speed and trajectory of the device 200. In this example the message is output at a time 10 seconds before the expected arrival time of the vehicle at the position B which is the expected closest point of the device 200 to the church. The content of the
35 message in this example is dependent both on the location and trajectory of the device

200 (the message identifies that the church will be on the left) and on other map features (the message identifies that the church is adjacent to a junction).

The map feature determination module 490 monitors and processes the input at the microphone of the touch screen display 240 and identifies the time of user input, in this case the time at which the user observes the church and says "now". The map feature determination module 490 determines the location of the device 200 at that time from location data received from the location determination unit, and thus obtains the location of the map feature from user input. The user-determined location is stored as user observation data.

In the example of Figure 8, the user input is received when the vehicle is at position A, and the position of the church determined from the user input 520 is different from the position 514 obtained from the map data.

The map feature determination module 490 is able to compare the location of the map feature determined from user input 520 with the expected location 514 of the map feature from map data and to determine an offset between the two positions.

The determined offset can subsequently be used to modify the map data or to modify locations determined by the location determination unit of the device 200.

In the situation where a GPS fix has been lost and the navigation device 200 is determining its location in dependence upon measurements by the accelerometer and/or gyroscope or other sensors, the location determination by the device 200 would be expected to be less accurate than the stored map data and in those circumstances the determined offset would usually be used to correct the position of the device 200 determined using the accelerometer and/or gyroscope.

If GPS data is being received normally then an offset between a location of a map feature determined from user input and a location of the map feature from the map data may indicate either an operational error or offset in the GPS measurements of that navigation device 200 or an error in the map data for the position of that map feature.

The location of a single map feature obtained from a single user input may not be accurate, in particular if the vehicle is moving quickly at the time of the user input. Therefore, many user inputs and/or user inputs concerning many different map features would usually be obtained before modifying map data to correct the location of a particular map feature, or before correcting operation of a particular device 200.

In the case of map data correction, although map data stored in memory 214 may be updated or corrected locally, it is more usual for the server 302 to perform map data correction in dependence upon user observation data representative of the location or other attribute of a particular map feature obtained from many different users. In the

example of Figure 8, the offset between the location of the church determined from user input 520 and the location 514 obtained from the map data is sent to the server 302 via communication channel 318 together with a map feature identifier identifying the church. Similar offset data concerning the location of the church is received from many other users and the server 318 combines the data from all of the users, and analyses the distribution of the offsets. If the mean of the distribution of the offsets is different to zero that may indicate that the map data representative of the location of the church is incorrect, and the server 318 corrects the map data and sends corrected map data to the device 200.

In the case of correction of operation of a particular device 200, user input would usually be requested in respect of the location of many different map features under normal GPS conditions before determining that the location determination unit was not determining the location of the device 200 correctly. If the map feature determination module 490 determines that there is a consistent offset between locations of different map features represented by user observation data and by map data then the map feature determination module 490 either instructs the location determination unit to apply an offset to all determined locations or, more usually, provides an error message and/or instructs the user to have the device 200 serviced.

The example described in relation to Figure 8 concerned the position of a church, but the device 200 may be used to determine or verify the position of any type of map feature, including for example a road feature, for example a traffic lane, a roundabout, a traffic light, a traffic junction or the relative position of lanes on a road; a landmark; a point of interest (POI); a building; and/or a natural geographical feature for example a hill, mountain or river.

An example is illustrated in Figure 9 in which the device 200 is used to determine the location of a road layout feature. The navigation device 200 is installed in a vehicle that is at position 520 on a dual carriageway road 522 (having two lanes in each direction) at a first time and at a position 524 on an exit lane 526 from the road 522 at a second, later time.

When the vehicle is at position 520, the map feature determination module 490 controls the output device to output the question "Are you in the left hand or right hand lane" to the user. The map feature determination module 490 monitors the response from the user and determines if the user has indicated that he or she is in the left hand lane or the right hand lane. The map feature determination module 490 determines the position of the device obtained from a GPS fix by the location determination unit at the time of the user response and thus determines an accurate position for the left hand lane

or right hand lane. In the example of Figure 9, the vehicle is in the right hand lane of the eastbound carriageway.

At the second, later time when the vehicle is in position 524 the map feature determination module 490 determines based upon a GPS fix and map data that the vehicle is in a region of a bifurcation (in this case an exit lane) of the road 522. The map feature determination module 490 controls the output device 260 to ask the user "Are you in the exit lane?". If the user answers "yes", then the map feature determination module 490 is able to determine the position of the exit lane based upon a GPS fix by the location determination unit at the time of the response. Alternatively if the user answers "no" then the map feature determination module 490 is able to determine the position of the main carriageway of the road 522. In other examples relating to road layout, user input may be requested when road are multi-level, for example at major freeway intersections, or where transit lanes exist. In those other examples, the user may be asked "Are you in an express lane?" or "Have you taken the off ramp?".

The data representative of the GPS fixes, the user responses and/or processed user observation data is usually transmitted back to the server 302. The server 302 analyses responses from many different users in order to obtain a high resolution representation of lane, slip road or other road features. Map data usually does not provide a detailed representation of the relative positions of lanes, slip roads and other road features. Therefore user input obtained concerning such features can be used to augment map data with additional information.

Additional information concerning map features observed by a user that can be obtained from user input also includes, for example, the function of a particular building (for example an indication that the building is a shop, garage, restaurant, school or church), a rating of a map feature (for example a rating of a restaurant, tourist attraction or other POI), and the size or shape of a map feature (for example, the number of storeys of a building). Such additional information may otherwise be unavailable to the device 200.

The map feature determination module 490 is usually configured to ask for user input concerning a relatively small number of map features in such a way as to avoid annoyance or distraction of the user. User input may be requested at times spaced apart by a predetermined minimum time, and/or may be requested at a predetermined maximum rate. The user is also able to configure the device to switch off requests for input or to limit the number of requests.

The map feature determination module 490 usually asks for input, or otherwise elicits a response from the user to give feedback as to the correct position, if the current

map matched position is uncertain (for example if a GPS fix is unavailable or weak) and/or if a user is approaching a critical position on a route, such as a turning. The map feature determination module 490 also usually asks for input in regions where map data is less reliable or of lower resolution.

5 In one variant of the embodiment of Figure 2, the map data stored in the memory 214 includes indications of which regions of the map and/or which map features may be of lower resolution or reliability. The map feature determination module 490 is configured to request input from the user in respect of such map features or in respect of map features falling within such regions. The indications of which regions of the map
10 and/or which map features may be of lower resolution or reliability can be provided by the server 302.

An example of the selection of map features is illustrated in Figure 10, which shows a route 530 passing through a region 532 which is represented by relatively low resolution map data. The map feature determination module 490 identifies map features
15 534, 536, 538, 540, 542 that are present in the low resolution region 532. The map feature determination module 490 also identifies that one of the map features 542 is on or near the route 530. The map feature determination module 490 requests input from the user concerning the presence or absence and/or location of the map feature 472 as the user's vehicle approaches the expected position of the map feature 472.

20 In the examples described above the user input is used to determine or verify the location of a particular map feature, or to provide additional information concerning a map feature. The user input may also be used to determine whether a map feature is observable. For example, if all or most users indicate that a particular expected map feature is not visible then map data may be updated to remove that feature from the
25 map.

It will 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
30 the appended claims.

For example, although the present invention may be exemplified as a portable navigation device, it would be appreciated that 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-
35 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.

Whilst embodiments described in the foregoing detailed description refer to GPS, it should be noted that the navigation device may utilise any kind of position sensing technology as an alternative to (or indeed in addition to) GPS. For example the navigation device may utilise using other global navigation satellite systems such as the European Galileo system, the Russian GLONASS system, the Chinese Beidou system or the Indian IRNSS 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, for example cell tower triangulation.

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 embodiments described herein implement 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.

It will be understood that the present invention has been described above purely by way of example, and modifications of detail can be made within the scope of the invention.

Each feature disclosed in the description, and (where appropriate) the claims and drawings may be provided independently or in any appropriate combination.

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 or mapping system comprising:-
a portable navigation or mapping apparatus (200) that comprises a location
5 determination unit (250, 255, 210) for determining the location of the apparatus (200),
and a user input device (220, 240) for receiving input from a user representative of a
map feature observed by the user; and
a processor (210) operable to identify the observed map feature in dependence
on the determined location of the apparatus (200) and to process the user input to obtain
10 user observation data representative of at least one property of the observed map
feature.
2. A navigation or mapping system according to Claim 1, further comprising a
memory (240) for storing map data, wherein the processor (210) is operable to compare
15 the user observation data to map data representative of the observed map feature.
3. A system according to Claim 1 or 2, wherein the processor (210) is configured to
modify the map data in dependence upon the comparison.
- 20 4. A system according to any preceding claim, wherein the at least one property of
the observed map feature comprises the location of the map feature.
5. A system according to any preceding claim, wherein the processor (210) is
configured to process the user input in dependence upon a location of the apparatus
25 (200) determined by the location determination unit (250, 255, 210) to obtain the user
observation data, and the user observation data comprises a user-determined location
of the map feature.
6. A system according to Claim 5, wherein the processor (210) is configured to
30 compare a location of the map feature obtained from map data with the user-determined
location of the map feature.
7. A system according to Claim 6, wherein the processor (210) is operable to
determine the user determined location of the map feature from a plurality of user inputs
35 representative of the map feature and a corresponding plurality of determined apparatus
locations, obtained from a plurality of navigation apparatuses (200), and to determine a

location offset for the map feature in dependence on a comparison between the user determined location and a location represented by map data.

8. A system according to any preceding claim, wherein the processor (210) is configured to determine the user determined location of a plurality of map features from user input to the navigation apparatus (200), to compare the user determined location for each map feature with a location of that map feature obtained from stored map data, and to determine a location offset representative of the difference between locations obtained from the map data and user determined locations.

10

9. A system according to Claim 7 or 8, wherein the processor (210) is configured to modify at least one of map data and locations determined using the location determination unit (250, 255, 210) in dependence on the location offset.

15 10. A system according to any preceding claim, wherein the processor (210) is configured to select the map feature and the apparatus (200) further comprises an output device (240, 260) for requesting the user input representative of the selected map feature.

20 11. A system according to Claim 10, wherein the processor (210) is operable to control the output device (240, 260) to request the user input at a time determined in dependence on the location and/or speed of travel of the apparatus (200).

25 12. A system according to any preceding claim, wherein the processor (210) is configured to select the map feature in dependence upon the location of the apparatus (200) and/or in dependence upon a route selected by the user.

30 13. A system according to any preceding claim, wherein the processor (210) is configured to select at least one map region, and to select the map feature to be within the selected at least one map region.

35 14. A system according to any preceding claim, wherein the processor (210) is configured to select the map feature and/or the or an at least one map region in dependence upon navigation errors and/or resolution of map data associated with the map feature and/or the or an at least one map region.

15. A system according to any preceding claim, wherein the apparatus (200) is a portable navigation device (PND).
16. A portable navigation or mapping apparatus (200) comprising:-
5 a location determination unit (250, 255, 210) for determining the location of the apparatus (200);
a user input device (220, 240) for receiving input from a user representative of a map feature observed by the user; and
a processor (210) operable to identify the observed map feature in dependence
10 on the determined location of the apparatus (200) and to process the user input to obtain user observation data representative of at least one property of the observed map feature.
17. A method of mapping or navigation comprising:-
15 determining the location of a user;
receiving input from the user representative of a map feature observed by the user;
identifying the observed map feature in dependence on the determined location of the user; and
20 processing the user input to determine at least one property of the observed map feature.
18. A computer program product comprising computer readable instructions executable to perform a method according to Claim 17.

1/8

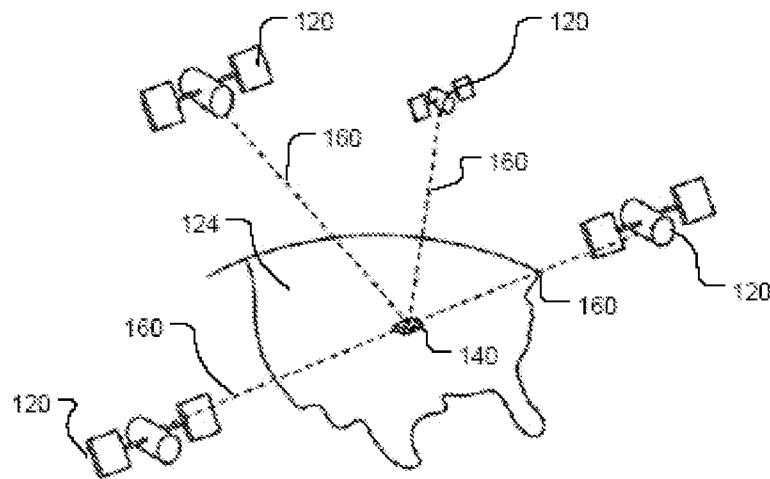


FIG. 1

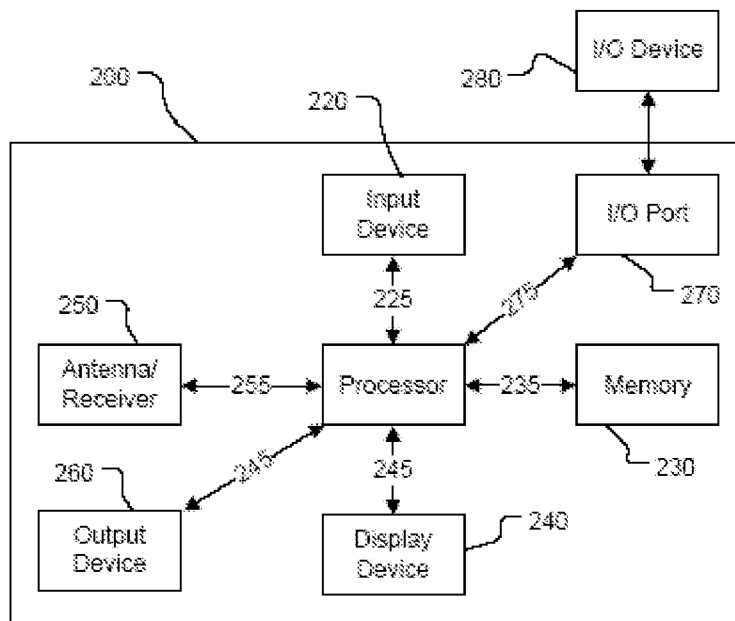


FIG. 2

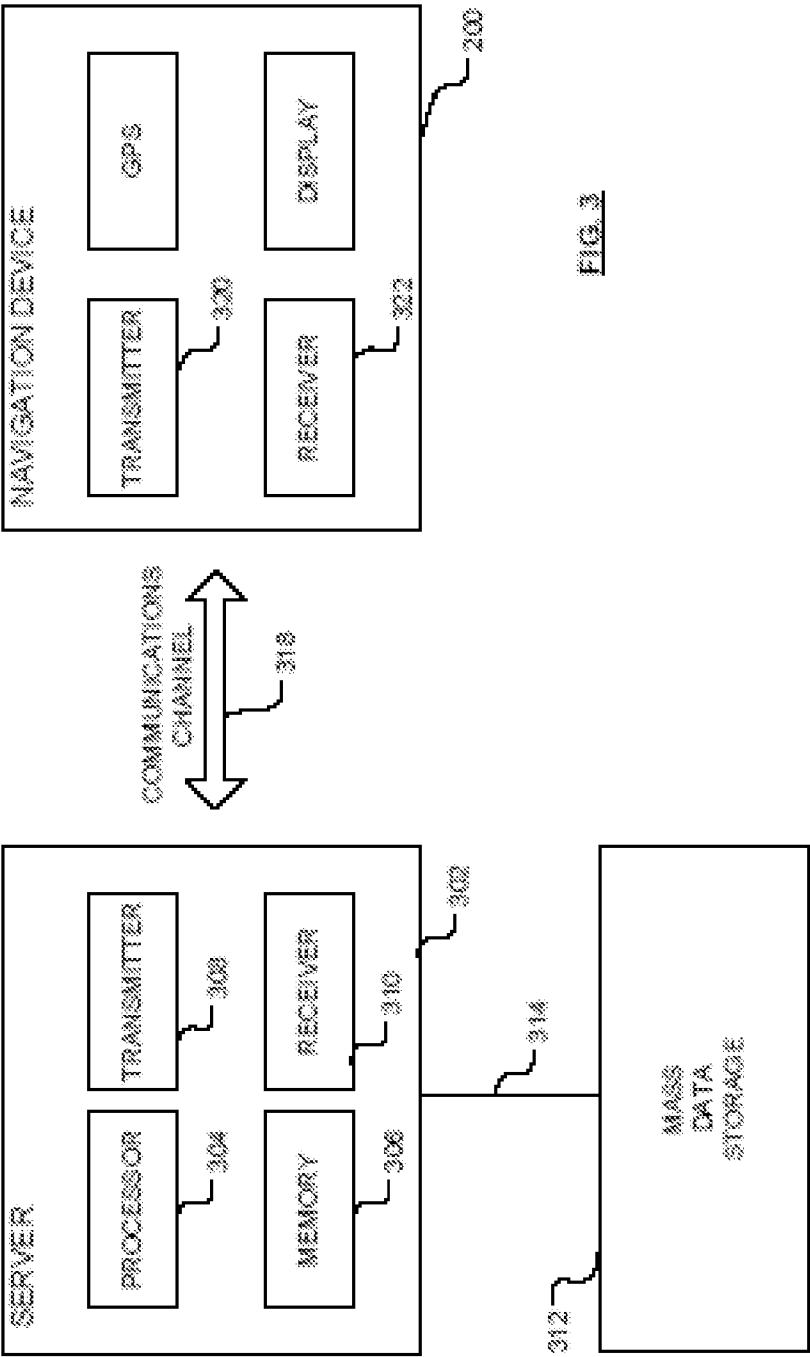


FIG. 3

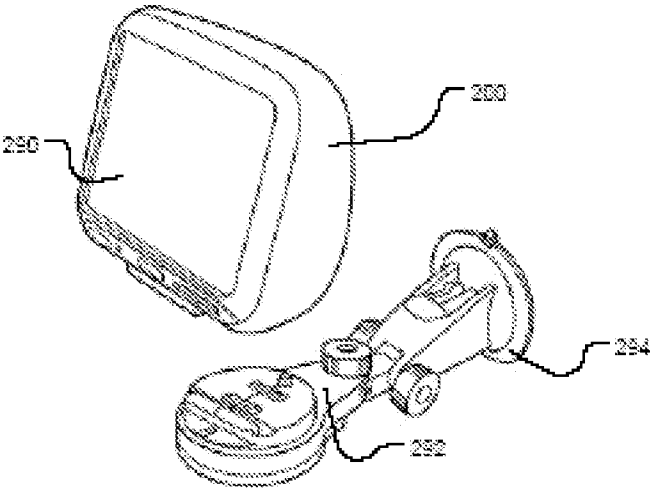


FIG. 4a

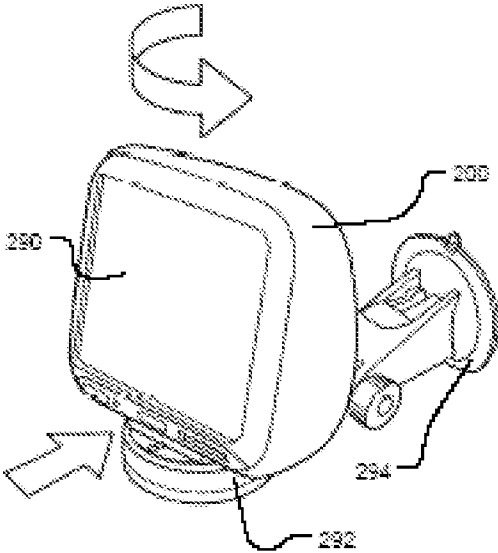


FIG. 4b

4/8

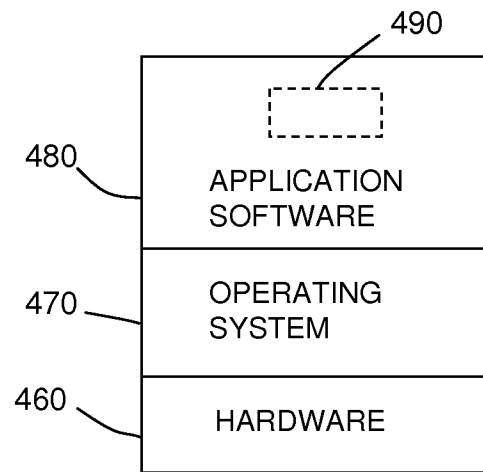


Fig.5

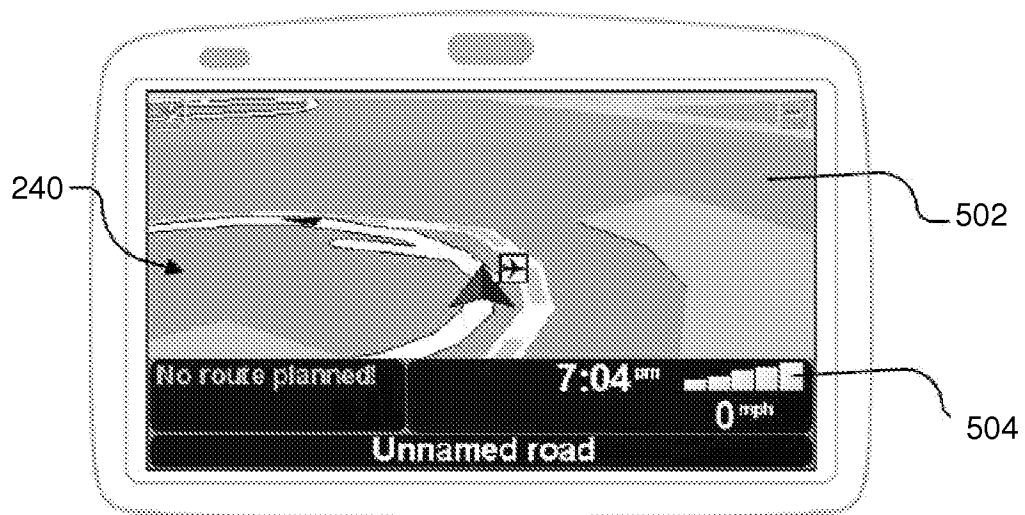
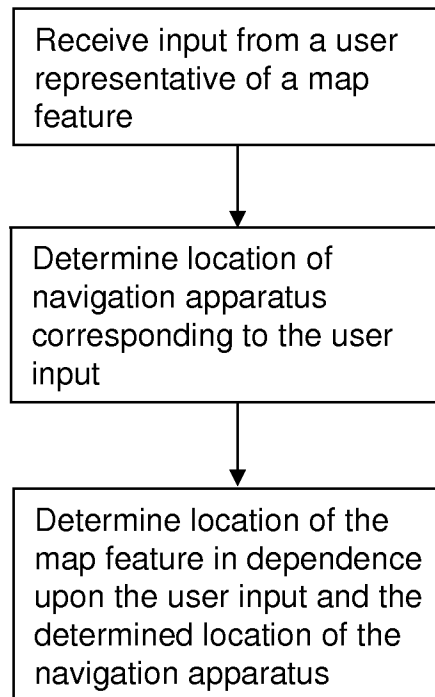


Fig.6

5/8

**Fig.7**

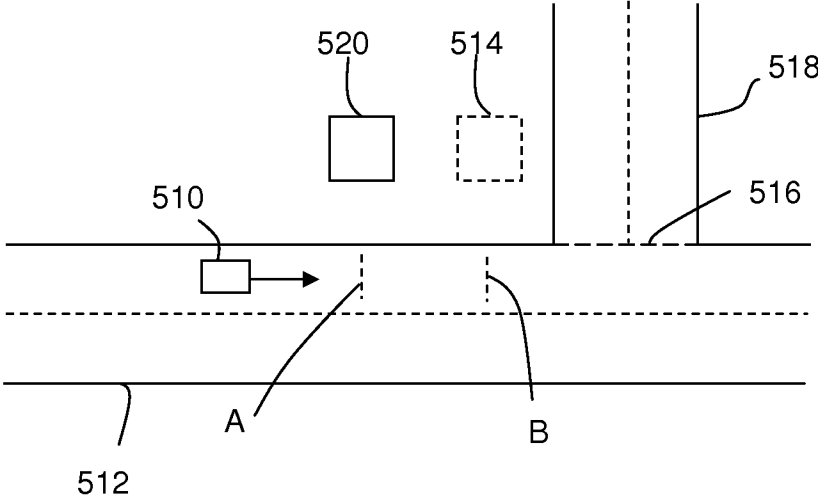


Fig.8

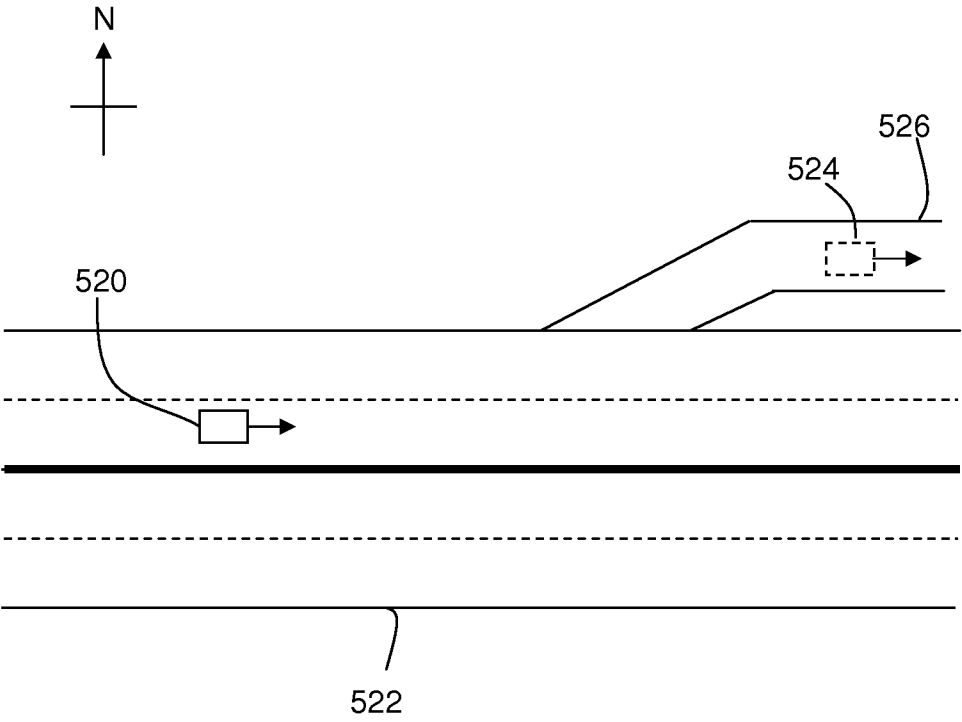


Fig.9

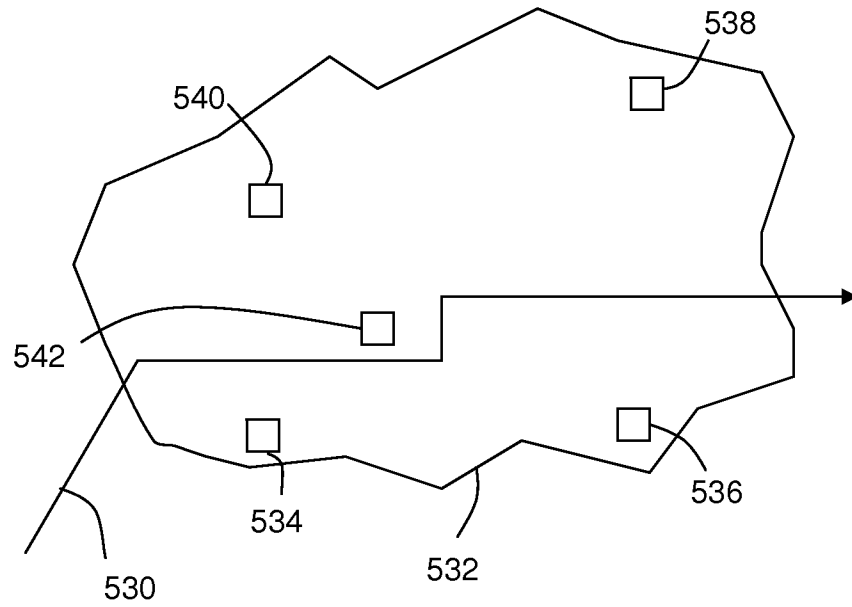


Fig.10

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2009/050374

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 G08G G09B

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	WO 2008/019879 A (TOMTOM INT BV [NL]; GEELEN PIETER [NL]; JURGENS SVEN [CA]; JONES RORY) 21 February 2008 (2008-02-21) page 11, line 1 - page 14, line 26 page 27, line 3 - page 28, line 10 page 8, line 15 - page 9, line 26 page 7, lines 15-25 page 3, line 1 - page 4, line 28 page 31, line 1 - page 32, line 5; figures 1A,1B,2	1-7, 10-18
X	US 2004/204830 A1 (ESAKI MOTOHARU [JP] ET AL) 14 October 2004 (2004-10-14) abstract; figures 1,2 paragraphs [0003], [0022], [0024]; figure 8 ----- -/--	1,2,4-6, 8,9, 15-18

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"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

15 October 2009

Date of mailing of the international search report

27/10/2009

Name and mailing address of the ISA/

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Authorized officer

de la Rosa Rivera, E

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2009/050374

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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