(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
25 September 2014 (25.09.2014)

WIPO | PCT

(10) International Publication Number
WO 2014/151084 A1

(51) International Patent Classification:
G01C 21/34 (2006.01) *G08G 1/0969* (2006.01)
G01C 21/36 (2006.01) *G09B 29/00* (2006.01)

(21) International Application Number:
PCT/US2014/024944

(22) International Filing Date:
12 March 2014 (12.03.2014)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
13/839,613 15 March 2013 (15.03.2013) US

(71) Applicant *(for all designated States except US)*: **INTEL CORPORATION** [US/US]; 2200 Mission College Boulevard, Santa Clara, California 95054 (US).

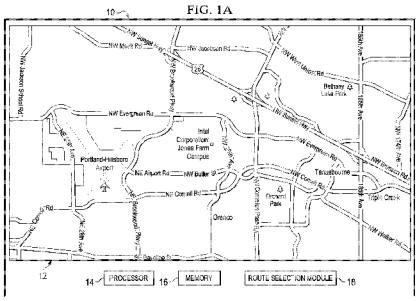
(72) Inventor; and
(71) Applicant *(for US only)*: **RAFFA, Giuseppe B.** [IT/US]; 4185 NW 176th Avenue, Portland, Oregon 97229 (US).

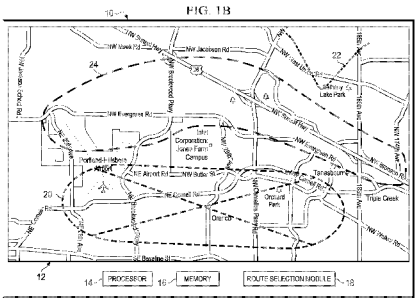
(74) Agent: **PEMBERTON, John D.**; Patent Capital Group, c/o CPA Global, P.O. Box 52050, Minneapolis, Minnesota 55402 (US).

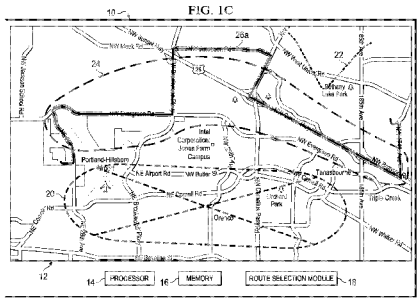
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,

[Continued on next page]

(54) Title: SKETCH AIDED ROUTE SELECTION FOR NAVIGATION DEVICES AND APPLICATIONS







(57) Abstract: One particular example includes a system, comprising a processor and a memory to store instructions that when executed by the processor performs operations, comprising displaying a map of a first area on a display; receiving an instruction to designate a second area on the map to be avoided; displaying the second area to be avoided on the map; and generating a route from a first point to a second point, where the route does not go through the second area to be avoided.

WO 2014/151084 A1

KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

SKETCH AIDED ROUTE SELECTION FOR NAVIGATION DEVICES AND APPLICATIONS

TECHNICAL FIELD

Examples described herein generally relate to sketch aided route selection for navigation devices and applications.

BACKGROUND

Navigation systems, electronic maps (also known as digital maps), and geographical positioning devices are increasingly used by travelers to assist with various navigation functions, such as to find destinations and addresses, calculate optimal routes, and provide real-time driving guidance. Typically, the navigation system includes a small display screen or graphic user interface that portrays a network of roads and a general visual display of an area. To find a route to a specific place or address, typically a user will enter the specific place or address and the navigation system will calculate a route to the specific place or address. Then the navigation system will plan a route based on the software used by the navigation system. However, sometimes a user may not want the route to pass through a certain area or may want the route to go through a certain area. Also, a user may have information about an area that the navigation system does not have, such as a new construction area. It would be beneficial if the user could designate areas to be avoided and/or areas that are preferred.

BRIEF DESCRIPTION OF THE DRAWINGS

Examples are illustrated in the figures of the accompanying drawings, in which like references indicate similar elements and in which:

FIGURE 1A is a simplified diagram illustrating an example of an electronic device;

FIGURE 1B is a simplified block diagram illustrating an example of an electronic device;

FIGURE 1C is a simplified block diagram illustrating an example of an electronic device;

FIGURES 2A is a simplified block diagram illustrating an example of an electronic device;

FIGURE 2B is a simplified block diagram illustrating an example of an electronic device;

FIGURE 2C is a simplified block diagram illustrating an example of an electronic device;

FIGURE 2D is a simplified block diagram illustrating an example of an electronic device;

FIGURES 2E is a simplified block diagram illustrating an example of an electronic device;

FIGURE 2F is a simplified block diagram illustrating an example of an electronic device;

FIGURE 2G is a simplified block diagram illustrating an example of an electronic device;

FIGURE 3 is a simplified block diagram illustrating an example of an electronic device;

FIGURE 4 is a simplified block diagram illustrating an example of an electronic device;

FIGURE 5 illustrates an example flow diagram in accordance with at least one example of the present disclosure;

FIGURE 6 is a simplified block diagram associated with an example ecosystem system on chip (SOC) of the present disclosure; and

FIGURE 7 is a simplified block diagram illustrating example logic that may be used to execute activities associated with the present disclosure.

The FIGURES of the drawings are not necessarily drawn to scale or proportion, as their dimensions, arrangements, and specifications can be varied considerably without departing from the scope of the present disclosure.

DETAILED DESCRIPTION

The following detailed description sets forth examples of apparatuses, methods, and systems relating to single touch or dual touch surface multiple function input devices. Features, such as structure(s), function(s), and/or characteristic(s) for example, are described with reference to one example as a matter of convenience; various examples may be implemented with any suitable one or more described features.

FIGURE 1A is a simplified diagram illustrating an example of a navigation device 10. Navigation device 10 can include a display 12, a processor 14, a memory 16, and a route selection module 18. The example illustration of FIGURE 1A is merely representing one (of the many) possible configurations of an electronic configuration. For example, the number of electrical components may vary, the placement of the electrical components may vary, and/or the like.

Display 12 can be configured to offer a screen on which navigation data can be rendered for a user. Note that as used herein in this Specification, the term 'display' is meant to connote any element that is capable of displaying a digital map of an area to the user. This would necessarily be inclusive of any panel, plasma element, television (which may be high-definition), monitor, computer interface, screen, projector, Telepresence devices (inclusive of Telepresence

boards, panels, screens, surfaces, etc.), touch screens, or any other suitable element that is capable of delivering/rendering/projecting such information.

Processor 14 can include one or more processing cores and one or more graphics cores. Processor 14 can execute any type of instructions associated with the data to achieve the operations detailed herein in this Specification. In one example, processor 14 could transform an element or an article (e.g., data) from one state or thing to another state or thing. In another example, the activities outlined herein may be implemented with fixed logic or programmable logic (e.g., software/computer instructions executed by the processor) and the elements identified herein could be some type of a programmable processor, programmable digital logic (e.g., a field programmable gate array [FPGA], an erasable programmable read only memory (EPROM), an electrically erasable programmable ROM (EEPROM)) or an ASIC that can include digital logic, software, code, electronic instructions, or any suitable combination thereof. Route selection module 18 can be configured to receive input regarding areas on a map (shown on display 12) that are to be avoided, are preferred, are acceptable, etc. It could also receive input as to designating a particular a route (or an interim route) through which the pathway should traverse on the way to the destination.

User interfaces in navigation devices and applications are cumbersome to use when selecting a route based on being given a starting and ending point on a map. In addition, in many scenarios, the navigation system selects a best route from a route optimization perspective, which is only a few minutes better than the route that the user would prefer for personal preferences or based on knowledge that the navigation system does not have. However, interacting with modern navigation systems and providing the correct input, information, and desires that allows for personal preferences or knowledge that the navigation system does not have is challenging. Further, particular touch capabilities of modern navigation systems are not fully exploited.

In an example, navigation device 10 can be configured to allow a user to approximately sketch or draw a desired (or undesired) route on display 12. The sketched route can basically give a hint to the system for which route the user prefers (or does not prefer). For example, using symbols and/or colors, areas on the map can be marked as areas to be avoided or areas that are preferred. The symbols and/or colors may include various shapes, color-coded, or some other type of representation that can distinguish one area from another area, or they can be automatically assigned or set by the user as personal preferences. The sketching activity can be performed by the user to approximately indicate the route on the map regardless of the zoom level selected. In an example, navigation device 10 can be configured to allow the user to either

select a preferred route, areas that are okay to consider during planning but not preferred, or sections to be avoided.

More specifically, when planning a route, route selection module 18 may take a sketched route and areas that are preferred or to be avoided into consideration and try to accommodate the user's requests. For example, a heuristic-based approach may be utilized to compare the possible routes with the user identified areas or routes that are preferred or are to be avoided. If a route to a destination crosses an area that is to be avoided, that route may be discarded. In a case where all the routes travel through an area to be avoided, the route with the least amount of overlap in the area to be avoided may be proposed to the user first. In an example, a function may be used to penalize routes that are closer to the undesirable area and distant from a desired area.

In another example, a penalty or weight factor may be assigned to each point on a map, depending on the type of area or vicinity of the route at which the point is located (that would be computationally expensive). As an alternative, voronoi diagrams may be used, where a penalty or weight factor is assigned to each voronoi polygon according to its overlap with an area that is to be avoided and/or an area that is preferred or acceptable. Voronoi diagrams are commonly used in spatial systems to perform space decomposition and spatial queries. To have a measure of how close a computer route is to a user sketched route, an algorithm such as dynamic time warping (DTW) may be utilized to compare the two routes. DTW is commonly used in time series, such as handwriting, to compare two time-varying and/or space-varying signals.

FIGURE 1B is a simplified diagram illustrating an example of navigation device 10. As illustrated in FIGURE 1B, an avoid area symbol 20 has been drawn in one area, an acceptable area symbol 22 has been drawn in another area, and a preferred area symbol 24 has been drawn in yet another area. Avoid area symbol 20, acceptable area symbol 22, and preferred area symbol 24 are merely representations, as they reflect any symbol the user may use to designate an area. For example, while acceptable area symbol 22 is shown having a "v" profile, a check mark, the word "OK", or some other symbol may be used to designate the area as an acceptable area. Appropriate algorithms, such as DTW, Hidden Markov Model (HMM), or other methods can be used to recognize the symbol being drawn. For example, the user can select (or draw) the symbol(s) during a training phase and put those symbols in a dictionary. An algorithm, at runtime, can detect the most similar symbol in the dictionary and attach a label accordingly the surrounding area that is comprised in the closed convex shape drawn by the user.

Avoid area symbol 20 indicates an area that the user does not want the route pass through. For example, the area covered by avoid area symbol 20 may have heavy construction

or may be particularly busy at a certain time of day or experience very dynamic or unpredictable conditions. Acceptable area symbol 22 indicates an area that is acceptable for the route to pass through. For example, the area covered by acceptable area symbol 22 may be an area that the user would not mind if the route passed through the area. Preferred are symbol 24 indicates a preferred area for the route to pass through. For example, the area covered by preferred area symbol 24 may be scenic, have well-maintained roads, smooth roads, typically not have very much traffic, etc. The term "road" is used to encompass a street, highway, interstate, or any other thoroughfare, route, or way between two places, which has been paved or otherwise improved to allow travel.

FIGURE 1C is a simplified diagram illustrating an example of navigation device 10. As illustrated in FIGURE 1C, route selection module 18 has generated route 26a. Route 26a is mostly within the area around preferred area symbol 24 and a small portion of generated route 26a extends into the acceptable area designated with acceptable are symbol 22. Route 26a does not extend into the area around avoid area symbol 20.

FIGURE 2A is a simplified diagram illustrating an example of navigation device 10. As illustrated in FIGURE 2A, a relatively large and not very detailed map is displayed on display 12. The relatively large map may be used when it is desired that the route go through a general area. For example, if the route was to start in Alexandria, Virginia and the destination was someplace in Mississippi, then a preferred area symbol 24 could be drawn between the start and destination point. If it was preferable for the route to pass through the state of Tennessee, then preferred area symbol 24 could be drawn to include Tennessee, as shown. If for some reason it was preferable for the route to not pass through Georgia, then avoid area symbol 20 could be drawn around Georgia. A zoom out selector 28 may be used to increase area shown on display 12. A zoom in selector 26 may be used to decrease the area shown on display 12.

In another example, shown in FIGURE 2B, if the route was to start in Raleigh, North Carolina and the destination was Alexandria, Virginia, and it did not really matter the route taken (e.g., there are no areas to avoid), then a preferred area symbol 24 could be drawn between the start and destination point. Because preferred area symbol 24 was drawn on a relatively large and not very detailed map, as illustrated in FIGURE 2C, a route 26b generated by route selection module 18 may be displayed on display 12. If more control over the route is desired, then zoom in selector 26 may be used to zoom on the map, as shown in FIGURE 2D.

FIGURE 2D is a simplified diagram illustrating an example of navigation device 10. As illustrated in FIGURE 2D, a more detailed map than shown in FIGURE 2B is displayed on display 12. The map may be used when it is desired that the route go through a specific general

area. For example, if the route was to start in Raleigh, North Carolina and the destination was Alexandria, Virginia, and it was desirable for the route to go through a bay area that is close to Richmond, Virginia and off of Interstate 95, then avoid area symbol 20 could be drawn to include the area around Interstate 95 that should be avoided and preferred area symbol 24 could be drawn between the start and destination point and could include the desired bay area. Because avoid area symbol 20 was drawn to include the area around Interstate 95 that should be avoided and preferred area symbol 24 was drawn that included the bay area that is preferred, as illustrated in FIGURE 2E, a route 26c may be generated by route selection module 18 that includes the bay area but not Interstate 95 and the route can be displayed on display 12. If more control over the route is desired, then zoom in selector 26 may be used to zoom on the map, as shown in FIGURE 2F.

FIGURE 2F is a simplified diagram illustrating an example of navigation device 10. As illustrated in FIGURE 2F, a more detailed map than shown in FIGURE 2D is displayed on display 12. The map may be used when it is desired that the route go through a specific area or use a specific road. For example, a desirable route may include a specific road, (e.g., Highway 5 outside of Richmond, Virginia) and/or a specific area (e.g., an area that is west of Williamsburg, Virginia). If such a route is desired, then preferred area symbol 24 may be used to designate the preferred area. A specific road symbol 30 may be used to designate the preferred road. Avoid area symbol 20 may be used to designate areas the route should not pass through. Because preferred area symbol 24 was drawn that included the area west of Williamsburg and specific road symbol 30 was drawn on (or close to Highway 5), as illustrated in FIGURE 2G, a route 26d may be generated by route selection module 18 that includes Highway 5 and goes through an area that is west of Williamsburg and the route can be displayed on display 12.

FIGURE 3 is a simplified diagram illustrating an example of navigation device 10. As illustrated in FIGURE 3, color instead of a symbol may be used to designate areas on the map shown on display 12. For example, area select menu 32 may be used to designate an area. More specifically, an area to avoid may be designated with the color red. By selecting a red box in area election menu 32 and then selecting the area to avoid on the map shown on display 12, an avoid area 34 indication can be used to designate an area to avoid. Similarly, the color green can be used to designate a preferred area as illustrated by a preferred area 36 and the color yellow can be used to designate an acceptable area as illustrated by an acceptable area 38. The colors used to designate the area(s) to avoid, acceptable area(s), and preferred area(s) are merely representations and may be any color the user may use to designate an area. For example, while

acceptable area is shown as being the color yellow, the color orange, purple, pink, or some other color may be used to designate the area as an acceptable area.

FIGURE 4 is a simplified diagram illustrating an example of navigation device 10. As illustrated in FIGURE 4, a voronoi type diagram having voronoi cells 54a-l (or some other representation that can be assigned a penalty or weight factor) can be used. For example, voronoi polygons 54h-l may have a high penalty factor and/or low or negative weight factor because they are in or include at least a portion of the area covered by avoid area indicator 40.

An acceptable area indicator 44 may not have any penalty factor, a low penalty factor, or a relatively low weight factor. A preferred area indicator 42 may not have any penalty factor and a relatively high weight factor or one that is higher than acceptable area 44. A preferred road indicator 48 may not have any penalty factor and a relatively high weight factor or one that is higher than preferred area 42. Using the penalty or weight factors, an algorithm (or some other analysis) may be used to determine a preferred route. Areas not covered by an indicator may not have any penalty factor or weight value assigned and may be considered neutral.

FIGURE 5 is a simplified flowchart 500 illustrating example activities of a sketch aided route selection system. At 502, a map of an area is displayed. At 504, the system determines if there is a specific area on the map that should be avoided. If there is a specific area on the map that should be avoided, then an avoid area symbol and/or an avoid area color is displayed in the area that should be avoided, as in 506. For example, a user may draw or place a symbol or color around an area that should be avoided and the symbol or color will be displayed on the map in the area that should be avoided. If there is not a specific area on the map that should be avoided, then the system determines if there is a specific area on the map that is more acceptable than other areas on the map, as in 508.

If there is a specific area on the map that is more acceptable than other areas on the map, then an acceptable area symbol and/or an acceptable area color is displayed in the area that is more acceptable than other areas on the map, as in 510. For example, a user may draw or place a symbol or color around an area that is more acceptable than other areas on the map and the symbol or color will be displayed on the map in the area that is more acceptable than other areas on the map. If there is not a specific area on the map that is more acceptable than other areas on the map, then the system determines if there is a specific area on the map that is preferred, as in 512.

If there is an area on the map that is preferred, then a preferred area symbol and/or a preferred area color is displayed in the area that is preferred, as in 514. For example, a user may draw or place a symbol or color around an area that is preferred and the symbol or color will be

displayed on the map in the area that is preferred. If there is not a specific area on the map that is preferred, then the system determines if there is a specific road on the map that is preferred, as in 516.

If there is a specific road on the map that is preferred, then a specific road symbol and/or a specific road color is displayed in the road that is preferred, as in 520. For example, a user may draw or place a symbol or color on a road that is preferred and the symbol or color will be displayed on the map in the road that is preferred. If there is not a specific road on the map that is preferred, then one or more routes are generated based on the symbols and/or colors (if any) on the map, as in 522. It should be understood that the "level" of preference might not be constrained to preferred/neutral/avoid but can include any scale of preference (e.g., areas could be assigned a number from one to ten). Also, any input method that enables the super imposition of a map and user defined areas or any other method that would facilitate the functionalities described herein are included in the spirit of this application.

FIGURE 6 is a simplified block diagram associated with an example ecosystem SOC 600 of the present disclosure. At least one example implementation of the present disclosure can include an integration of the route generation features discussed herein and a component. For example, the example of FIGURE 6 can be associated with any core (e.g., A-9, A-15, etc.). Further, the architecture can be part of any type of navigation system, tablet, smartphone (inclusive of Android™ phones, i-Phones™), i-Pad™, Google Nexus™, Microsoft Surface™, personal computer, server, mobile internet device, video processing components, laptop computer (inclusive of any type of notebook), Ultrabook™ system, any type of touch-enabled input device, etc.

In this example of FIGURE 6, ecosystem SOC 600 may include multiple cores 606-607, an L2 cache control 608, a bus interface unit 609, an L2 cache 610, a graphics processing unit (GPU) 615, an interconnect 602, a video codec 620, and a liquid crystal display (LCD) I/F 625, which may be associated with mobile industry processor interface (MIPI)/ high-definition multimedia interface (HDMI) links that couple to an LDC.

Ecosystem SOC 600 may also include a subscriber identity module (SIM) I/F 630, a boot read-only memory (ROM) 635, a synchronous dynamic random access memory (SDRAM) controller 640, a flash controller 645, a serial peripheral interface (SPI) master 650, a suitable power control 655, a dynamic RAM (DRAM) 660, and flash 665. In addition, one or more examples include one or more communication capabilities, interfaces, and features such as instances of Bluetooth™ 670, a 3G modem 675, a global positioning system (GPS) 680, and an 802.11 WiFi 685.

In operation, the example of FIGURE 6 can offer processing capabilities, along with relatively low power consumption to enable computing of various types (e.g., mobile computing, high-end digital home, servers, wireless infrastructure, etc.). In addition, such an architecture can enable any number of software applications (e.g., Android™, Adobe® Flash® Player, Java Platform Standard Edition (Java SE), JavaFX, Linux, Microsoft Windows Embedded, Symbian and Ubuntu, etc.). In at least one example, the core processor may implement an out-of-order superscalar pipeline with a coupled low-latency level-2 cache.

FIGURE 7 is a simplified block diagram illustrating potential electronics and logic that may be associated with any of the route generation operations discussed herein. In at least one example, system 700 can include a touch controller 702, one or more processors 704, system control logic 706 coupled to at least one of processor(s) 704, system memory 708 coupled to system control logic 706, non-volatile memory and/or storage device(s) 732 coupled to system control logic 706, display controller 712 coupled to system control logic 732, display controller 712 coupled to a display device 710, power management controller 718 coupled to system control logic 706, and/or communication interfaces 716 coupled to system control logic 706.

System control logic 706, in at least one example, can include any suitable interface controllers to provide for any suitable interface to at least one processor 704 and/or to any suitable device or component in communication with system control logic 706. System control logic 706, in at least one example, can include one or more memory controllers to provide an interface to system memory 708. System memory 708 may be used to load and store data and/or instructions, for example, for system 700. System memory 708, in at least one example, can include any suitable volatile memory, such as suitable dynamic random access memory (DRAM) for example. System control logic 706, in at least one example, can include one or more I/O controllers to provide an interface to display device 710, touch controller 702, and non-volatile memory and/or storage device(s) 732.

Non-volatile memory and/or storage device(s) 732 may be used to store data and/or instructions, for example within software 728. Non-volatile memory and/or storage device(s) 732 may include any suitable non-volatile memory, such as flash memory for example, and/or may include any suitable non-volatile storage device(s), such as one or more hard disc drives (HDDs), one or more compact disc (CD) drives, and/or one or more digital versatile disc (DVD) drives for example.

Power management controller 718 may include power management logic 730 configured to control various power management and/or power saving functions disclosed herein or any part thereof. In at least one example, power management controller 718 is configured to reduce the

power consumption of components or devices of system 700 that may either be operated at reduced power or turned off when the electronic device is in a closed configuration. For example, in at least one example, when the electronic device is in a closed configuration, power management controller 718 performs one or more of the following: power down the unused portion of the display and/or any backlight associated therewith; allow one or more of processor(s) 704 to go to a lower power state if less computing power is required in the closed configuration; and shutdown any devices and/or components that are unused when an electronic device is in the closed configuration.

Communications interface(s) 716 may provide an interface for system 700 to communicate over one or more networks and/or with any other suitable device. Communications interface(s) 716 may include any suitable hardware and/or firmware. Communications interface(s) 716, in at least one example, may include, for example, a network adapter, a wireless network adapter, a telephone modem, and/or a wireless modem.

System control logic 706, in at least one example, can include one or more I/O controllers to provide an interface to any suitable input/output device(s) such as, for example, an audio device to help convert sound into corresponding digital signals and/or to help convert digital signals into corresponding sound, a camera, a camcorder, a printer, and/or a scanner.

For at least one example, at least one processor 704 may be packaged together with logic for one or more controllers of system control logic 706. In at least one example, at least one processor 704 may be packaged together with logic for one or more controllers of system control logic 706 to form a System in Package (SiP). In at least one example, at least one processor 704 may be integrated on the same die with logic for one or more controllers of system control logic 706. For at least one example, at least one processor 704 may be integrated on the same die with logic for one or more controllers of system control logic 706 to form a System on Chip (SoC).

For touch control, touch controller 702 may include touch sensor interface circuitry 722 and touch control logic 724. Touch sensor interface circuitry 722 may be coupled to detect touch input over a first touch surface layer and a second touch surface layer of a display (i.e., display device 710). Touch sensor interface circuitry 722 may include any suitable circuitry that may depend, for example, at least in part on the touch-sensitive technology used for a touch input device. Touch sensor interface circuitry 722, in one example, may support any suitable multi-touch technology. Touch sensor interface circuitry 722, in at least one example, can include any suitable circuitry to convert analog signals corresponding to a first touch surface layer and a second surface layer into any suitable digital touch input data. Suitable digital touch input data, for at least one example, may include, for example, touch location or coordinate data.

Touch control logic 724 may be coupled to help control touch sensor interface circuitry 722 in any suitable manner to detect touch input over a first touch surface layer and a second touch surface layer. Touch control logic 724, for at least one example, may also be coupled to output in any suitable manner digital touch input data corresponding to touch input detected by touch sensor interface circuitry 722. Touch control logic 724 may be implemented using any suitable logic, including any suitable hardware, firmware, and/or software logic (e.g., non-transitory tangible media), that may depend, for example, at least in part on the circuitry used for touch sensor interface circuitry 722. Touch control logic 724, for at least one example, may support any suitable multi-touch technology.

Touch control logic 724 may be coupled to output digital touch input data to system control logic 706 and/or at least one processor 704 for processing. At least one processor 704, for at least one example, may execute any suitable software to process digital touch input data output from touch control logic 724. Suitable software may include, for example, any suitable driver software and/or any suitable application software. As illustrated in FIGURE 7, system memory 708 may store suitable software 726 and/or non-volatile memory and/or storage device(s).

Note that in some example implementations, the functions outlined herein may be implemented in conjunction with logic that is encoded in one or more tangible, non-transitory media (e.g., embedded logic provided in an application-specific integrated circuit (ASIC), in digital signal processor (DSP) instructions, software [potentially inclusive of object code and source code] to be executed by a processor, or other similar machine, etc.). In some of these instances, memory elements can store data used for the operations described herein. This can include the memory elements being able to store software, logic, code, or processor instructions that are executed to carry out the activities described herein. A processor can execute any type of instructions associated with the data to achieve the operations detailed herein. In one example, the processors could transform an element or an article (e.g., data) from one state or thing to another state or thing. In another example, the activities outlined herein may be implemented with fixed logic or programmable logic (e.g., software/computer instructions executed by a processor) and the elements identified herein could be some type of a programmable processor, programmable digital logic (e.g., a field programmable gate array (FPGA), a DSP, an erasable programmable read only memory (EPROM), electrically erasable programmable read-only memory (EEPROM)) or an ASIC that can include digital logic, software, code, electronic instructions, or any suitable combination thereof.

Note that with the examples provided above, as well as numerous other examples provided herein, interaction may be described in terms of layers, protocols, interfaces, spaces, and environments more generally. However, this has been done for purposes of clarity and example only. In certain cases, it may be easier to describe one or more of the functionalities of a given set of flows by only referencing a limited number of components. It should be appreciated that the architectures discussed herein (and its teachings) are readily scalable and can accommodate a large number of components, as well as more complicated/sophisticated arrangements and configurations. Accordingly, the examples provided should not limit the scope or inhibit the broad teachings of the present disclosure, as potentially applied to a myriad of other architectures.

It is also important to note that the blocks in the flow diagrams illustrate only some of the possible signaling scenarios and patterns that may be executed by, or within, the circuits discussed herein. Some of these blocks may be deleted or removed where appropriate, or these steps may be modified or changed considerably without departing from the scope of teachings provided herein. In addition, a number of these operations have been described as being executed concurrently with, or in parallel to, one or more additional operations. However, the timing of these operations may be altered considerably. The preceding operational flows have been offered for purposes of example and discussion. Substantial flexibility is provided by the present disclosure in that any suitable arrangements, chronologies, configurations, and timing mechanisms may be provided without departing from the teachings provided herein.

It is also imperative to note that all of the Specifications, protocols, and relationships outlined herein (e.g., specific commands, timing intervals, supporting ancillary components, etc.) have only been offered for purposes of example and teaching only. Each of these data may be varied considerably without departing from the spirit of the present disclosure, or the scope of the appended claims. The specifications apply to many varying and non-limiting examples and, accordingly, they should be construed as such. In the foregoing description, examples have been described. Various modifications and changes may be made to such examples without departing from the scope of the appended claims. The description and drawings are, accordingly, to be regarded in an illustrative rather than a restrictive sense.

Numerous other changes, substitutions, variations, alterations, and modifications may be ascertained to one skilled in the art and it is intended that the present disclosure encompass all such changes, substitutions, variations, alterations, and modifications as falling within the scope of the appended claims. In order to assist the United States Patent and Trademark Office (USPTO) and, additionally, any readers of any patent issued on this application in interpreting

the claims appended hereto, Applicant wishes to note that the Applicant: (a) does not intend any of the appended claims to invoke paragraph six (6) of 35 U.S.C. section 112 as it exists on the date of the filing hereof unless the words "means for" or "step for" are specifically used in the particular claims; and (b) does not intend, by any statement in the Specification, to limit this disclosure in any way that is not otherwise reflected in the appended claims.

OTHER NOTES AND EXAMPLES

Note that all optional features of the apparatus described above may also be implemented with respect to the method or process described herein and specifics in the examples may be used anywhere in one or more embodiments.

Example A1 is an apparatus for route selection in navigation devices and applications, the apparatus comprising: at least one processor, at least one memory element, at least one module adapted, when executed by the processor, to perform operations including displaying a map of a first area on a display; receiving an instruction to designate a second area on the map to be avoided; displaying the second area to be avoided on the map; and generating a route from a first point to a second point, where the route does not go through the second area to be avoided.

In Example A2, the subject matter of Example A1 can optionally include where the user selects the area to be avoided on the map by using an avoid area symbol or an avoid area color.

In Example A3, the subject matter of any one of Examples A1-A2 can optionally include the at least one module further adapted, when executed by the processor, to: display a preferred area on the map, where the preferred area is selected by a user and is an area that the user prefers, and where the route from one point to another point passes through the preferred area.

In Example A4, the subject matter of Example A3 can optionally include where the user selects the preferred area on the map by using a preferred area symbol or a preferred area color.

In Example A5, the subject matter of any one of Examples A3-A4 can optionally include where the display is a touch display and the user selects the area to be avoided and the preferred area by drawing a preferred area symbol on the display.

In Example A6, the subject matter of any one of Examples A3-A5 can optionally include the at least one module further adapted, when executed by the processor, to: assign a first weight factor to the area to be avoided; and assign a second weight factor to the preferred area, where the first weight factor is less than the second weight factor, and where the route is generated using the first and second weight factor.

In Example A7, the subject matter of any one of Examples A3-A6 can optionally include where voronoi diagrams are used to assign the first weight factor to the area to be avoided and the second weight factor to the preferred areas.

In Example A8, the subject matter of any one of the Example A1-A7 can optionally include the at least one module further adapted, when executed by the processor, to: generate multiple routes from the one point to another point, where any route that crosses an area to be avoided is discarded.

In Example A9, the subject matter of any one of Examples A3-A8 can optionally include where an algorithm compares the multiple routes to determine the routes that pass through the area that is to be avoided and the routes that pass through the area that the user prefers.

In Example A10, the subject matter of any one of Example A9 can optionally include where the algorithm is a dynamic time warping (DTW) algorithm.

In Example A11 the subject matter of any one of Examples A1-A10 can optionally include the at least one module further adapted, when executed by the processor, to: display a preferred road on the map, where the preferred road is selected by a user and is a road that the user prefers, and where the route from one point to another point at least partially includes the preferred road.

In Example A12, the subject matter of Example A11 can optionally include where the user selects the preferred road on the map by using a preferred road symbol or a preferred road color.

In Example A13 the subject matter of any one of Examples A1-A12 can optionally include the at least one module further adapted, when executed by the processor, to zoom on the map of the area to provide a more detailed view of the area.

Example C1 is at least one machine readable storage medium having instructions stored thereon to manage an authentication confidence score, the instructions when executed by a processor cause the processor to: display a map of an area on a display; display an area to be avoided on the map, where the area to be avoided is selected by a user and is an area the user wants to avoid; and generate a route from one point to another point, where the route does not go through the displayed area to be avoided.

In Example C2, the subject matter of Example C1 can optionally include where the user selects the area to be avoided on the map by using an avoid area symbol or an avoid area color.

In Example C3, the subject matter of any one of Examples C1-C2 can optionally include the instructions when executed by the processor further cause the processor to: display a preferred area on the map, where the preferred area is selected by a user and is an area that the

user prefers, and where the route from one point to another point passes through the preferred area.

In Example C4, the subject matter of Example C3 can optionally include where the user selects the preferred area on the map by using a preferred area symbol or a preferred area color.

In Example C5, the subject matter of any one of Examples C3-C4 can optionally include where the display is a touch display and the user selects the area to be avoided and the preferred area by drawing a preferred area symbol on the display.

In Example C6, the subject matter of any one of Example C3-C5 can optionally include the instructions when executed by the processor further cause the processor to: assign a first weight factor to the area to be avoided and assign a second weight factor to the preferred area, where the first weight factor is less than the second weight factor, and where the route is generated using the first and second weight factor.

In Example C7, the subject matter of Example C6 can optionally include where voronoi diagrams are used to assign the first weight factor to the area to be avoided and the second weight factor to the preferred areas.

In Example C8, the subject matter of any one of Examples A3-C7 can optionally include the instructions when executed by the processor further cause the processor to: generate multiple routes from the one point to another point, where any route that crosses an area to be avoided is discarded.

In Example C9, the subject matter of Example C8 can optionally include where an algorithm compares the multiple routes to determine the routes that pass through the area that is to be avoided and the routes that pass through the area that the user prefers.

In Example C10, the subject matter of any one of Examples C1-C9 can optionally include the instructions when executed by the processor further cause the processor to: display a preferred road on the map, where the preferred road is selected by a user and is a road that the user prefers, and where the route from one point to another point at least partially includes the preferred road, where the user selects the preferred road on the map by using a preferred road symbol or a preferred road color.

Example M1 is a method for route selection in navigation devices and applications, comprising: displaying a map of an area on a display; displaying an area to be avoided on the map, where the area to be avoided is selected by a user and is an area the user wants to avoid; and generating a route from one point to another point, where the route does not go through the displayed area to be avoided.

In Example M2, the subject matter of Example M1 can optionally include displaying a preferred area on the map, where the preferred area is selected by a user and is an area that the user prefers, and where the route from one point to another point passes through the preferred area.

In example MP1, a system is provided (that can include a computing device such as a smartphone, a mobile device of any kind, a notebook computer, a laptop, etc.,) that can include a circuit board coupled to a plurality of electronic components (which includes any type of hardware, elements, circuitry, etc.). The system can be used for route selection in navigation devices and applications. The system can include means for displaying a map of a first area on a display; means for receiving an instruction to designate a second area on the map to be avoided; means for displaying the second area to be avoided on the map; and means for generating a route from a first point to a second point, where the route does not go through the second area to be avoided. The 'means for' in these instances (above and below) can include (but is not limited to) using any suitable processor, display, software, circuitry, hub, computer code, logic, algorithms, hardware, controller, interface, link, bus, communication pathway, etc.

In example MP2, the system as in any one of the preceding claims, where the memory comprises machine-readable instructions that when executed cause the system to perform the method of any of the preceding claims. In addition, the system as in any one of the preceding claims, where the system is a computing device. Additionally, other implementations may include at least one computer readable medium comprising instructions that, when executed, implement a method or realize an apparatus as claimed in any of the preceding claims.

WHAT IS CLAIMED IS:

1. An apparatus for route selection in navigation devices and applications, the apparatus comprising:

at least one processor;

at least one memory element;

at least one module adapted, when executed by the processor, to:

display a map of a first area on a display;

receive an instruction to designate a second area on the map to be avoided;

display the second area to be avoided on the map; and

generate a route from a first point to a second point, wherein the route does not go through the second area to be avoided.

2. The apparatus of Claim 1, wherein a user is provided an option to select the second area to be avoided on the map using an avoid area symbol or an avoid area color.

3. The apparatus as in any one of the preceding claims, wherein the at least one module is further adapted, when executed by the processor, to:

receive an instruction to designate a preferred area on the map; and

display the preferred area on the map, wherein the route passes through the preferred area.

4. The apparatus as in any one of the preceding claims, wherein a user is provided an option to select the preferred area on the map by using a preferred area symbol or a preferred area color.

5. The apparatus as in any one of the preceding claims, wherein the display is a touch display, and wherein a user is provided an option to select the preferred area by drawing a preferred area symbol on the display.

6. The apparatus as in any one of the preceding claims, wherein the at least one module is further adapted, when executed by the processor, to:

assign a first weight factor to the second area to be avoided; and

assign a second weight factor to the preferred area, wherein the first weight factor is less than the second weight factor, and wherein the route is generated based, at least in part, on the first and second weight factor.

7. The apparatus as in any one of the preceding claims, wherein voronoi diagrams are used to assign the first weight factor to the second area to be avoided.

8. The apparatus as in any one of the preceding claims, wherein the at least one module is further adapted, when executed by the processor, to:

generate multiple routes from the one point to another point, wherein a particular route that crosses an area to be avoided is discarded.

9. The apparatus as in any one of the preceding claims, wherein an algorithm compares the multiple routes to determine which of the multiple routes pass through the second area that is to be avoided.

10. The apparatus as in any one of the preceding claims, wherein the algorithm is a dynamic time warping (DTW) algorithm.

11. The apparatus as in any one of the preceding claims, wherein the at least one module is further adapted, when executed by the processor, to:

display a preferred road on the map, wherein the route from one point to another point at least partially includes the preferred road.

12. The apparatus as in any one of the preceding claims, wherein a user is provided an option to select the preferred road on the map by using a preferred road symbol or a preferred road color.

13. The apparatus as in any one of the preceding claims, wherein the at least one module is further adapted, when executed by the processor, to:

zoom on the map of the second area to provide a more detailed view of the second area.

14. One or more non-transitory tangible media that includes code for execution and when executed by a processor operable to perform operations comprising:

displaying a map of a first area on a display;

receiving an instruction to designate a second area on the map to be avoided;

displaying the second area to be avoided on the map; and

generating a route from a first point to a second point, wherein the route does not go through the second area to be avoided.

15. The media as in any one of the preceding claims, wherein a user is provided an option to select the second area to be avoided on the map using an avoid area symbol or an avoid area color.

16. The media as in any one of the preceding claims, the operations further comprising:

receiving an instruction to designate a preferred area on the map; and

displaying the preferred area on the map, wherein the route passes through the preferred area.

17. The media as in any one of the preceding claims, wherein a user is provided an option to select the preferred area on the map by using a preferred area symbol or a preferred area color.

18. The media as in any one of the preceding claims, wherein the display is a touch display, and wherein a user is provided an option to select the preferred area by drawing a preferred area symbol on the display.

19. The media as in any one of the preceding claims, the operations further comprising:

assigning a first weight factor to the second area to be avoided; and

assigning a second weight factor to the preferred area, wherein the first weight factor is less than the second weight factor, and wherein the route is generated based, at least in part, on the first and second weight factor.

20. The media as in any one of the preceding claims, wherein voronoi diagrams are used to assign the first weight factor to the second area to be avoided.

21. The media as in any one of the preceding claims, the operations further comprising:

generating multiple routes from the one point to another point, wherein a particular route that crosses an area to be avoided is discarded.

22. The media as in any one of the preceding claims, wherein an algorithm compares multiple routes to determine which of the multiple routes pass through the second area that is to be avoided.

23. A method for route selection in navigation devices and applications, comprising:

displaying a map of a first area on a display;

receiving an instruction to designate a second area on the map to be avoided;

displaying the second area to be avoided on the map; and

generating a route from a first point to a second point, wherein the route does not go through the second area to be avoided.

24. The method of Claim 23, wherein a user is provided an option to select the second area to be avoided on the map using an avoid area symbol or an avoid area color.

25. The method of Claim 23 or Claim 24, further comprising:

receiving an instruction to designate a preferred area on the map; and

displaying the preferred area on the map, wherein the route passes through the preferred area.

FIG. 1A

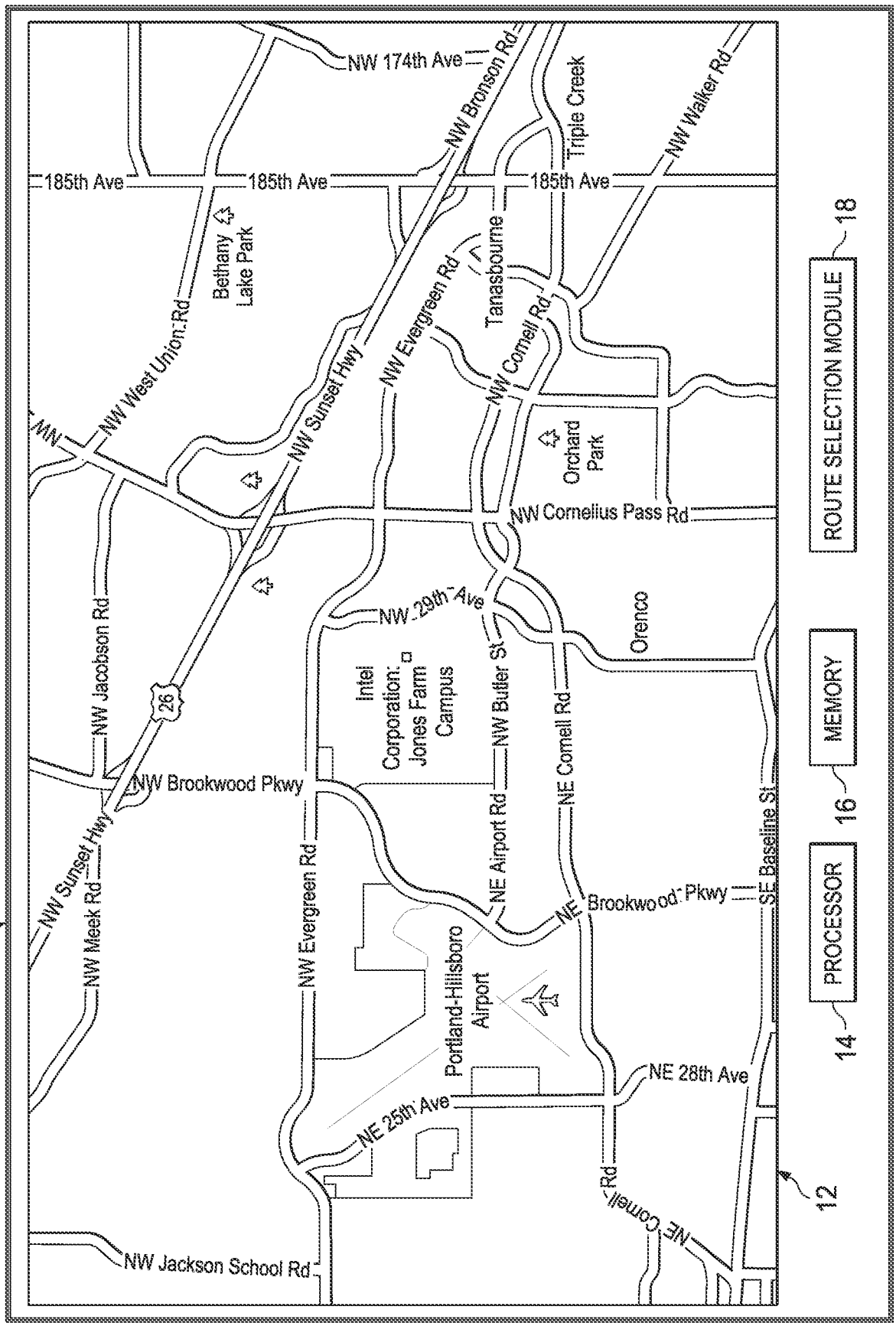

10
12
14
16
18
PROCESSOR
MEMORY
ROUTE SELECTION MODULE
NW 174th Ave
NW Bronson Rd
Triple Creek
NW Walker Rd
185th Ave
185th Ave
185th Ave
Bethany Lake Park
NW West Union Rd
NW Sunset Hwy
NW Evergreen Rd
Tanasbourne
NW Cornell Rd
Orchard Park
NW Cornelius Pass Rd
NW Jacobson Rd
NW 29th Ave
Orenco
Intel Corporation: Jones Farm Campus
NW Butler St
NE Cornell Rd
26
NW Brookwood Pkwy
NW Sunset Hwy
NW Meek Rd
NW Evergreen Rd
NE Airport Rd
NE Brookwood Pkwy
SE Baseline St
Portland-Hillsboro Airport
NE 28th Ave
NE 25th Ave
NE Cornell Rd
NW Jackson School Rd

FIG. 1B

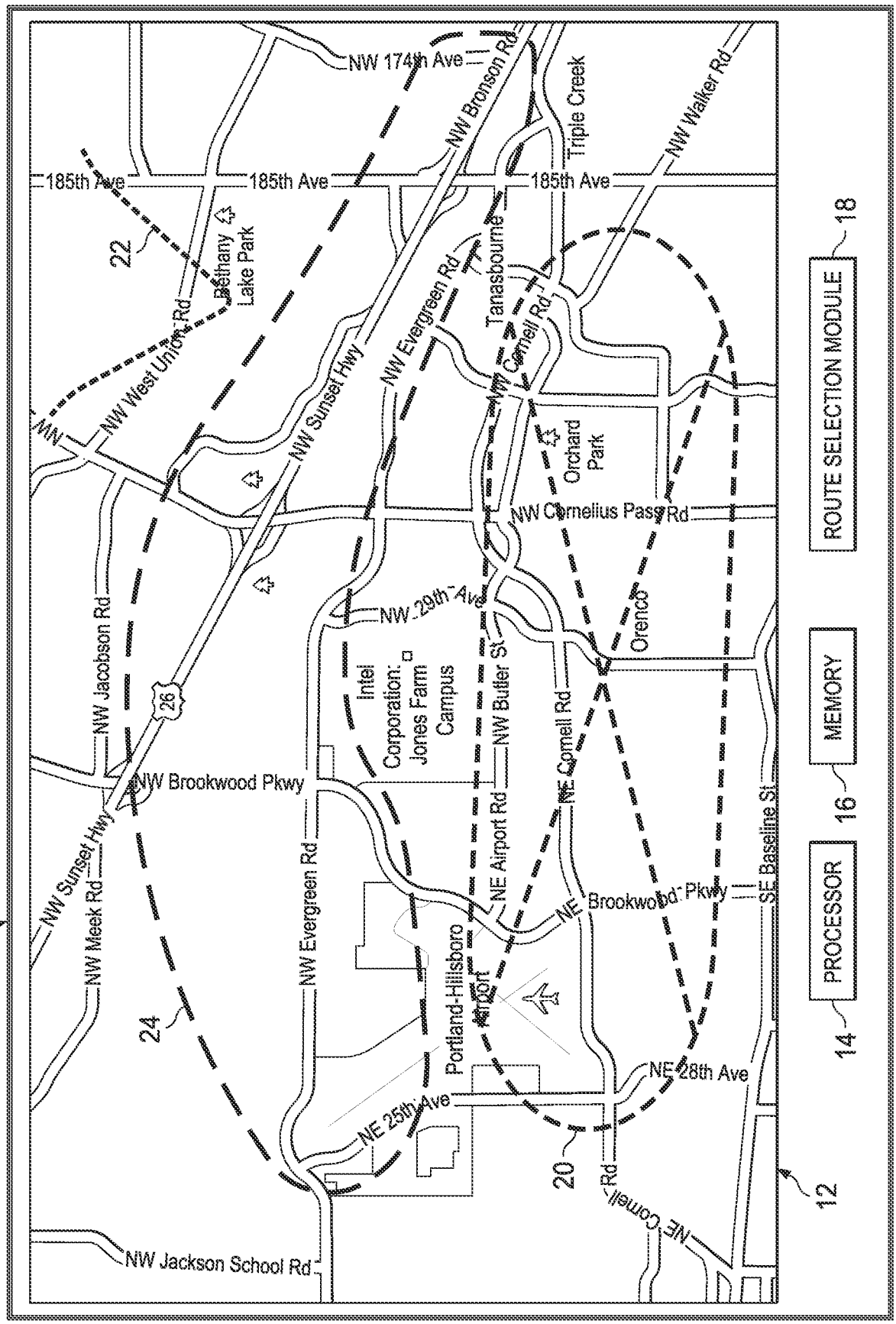

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
20
22
24
26
NW 174th Ave
NW Bronson Rd
Triple Creek
NW Walker Rd
185th Ave
185th Ave
185th Ave
Bethany Lake Park
NW West Union Rd
NW Sunset Hwy
NW Evergreen Rd
Tanasbourne
NW Cornell Rd
Orchard Park
NW Cornelius Pass Rd
NW 29th Ave
Intel Corporation: Jones Farm Campus
NW Butler St
NW Jacobson Rd
NW Brookwood Pkwy
NW Sunset Hwy
NW Meek Rd
NW Evergreen Rd
NE Airport Rd
NE Cornell Rd
NE Brookwood Pkwy
SE Baseline St
Portland-Hillsboro Airport
NE 25th Ave
NE 28th Ave
NE Cornell Rd
NW Jackson School Rd

FIG. 1C

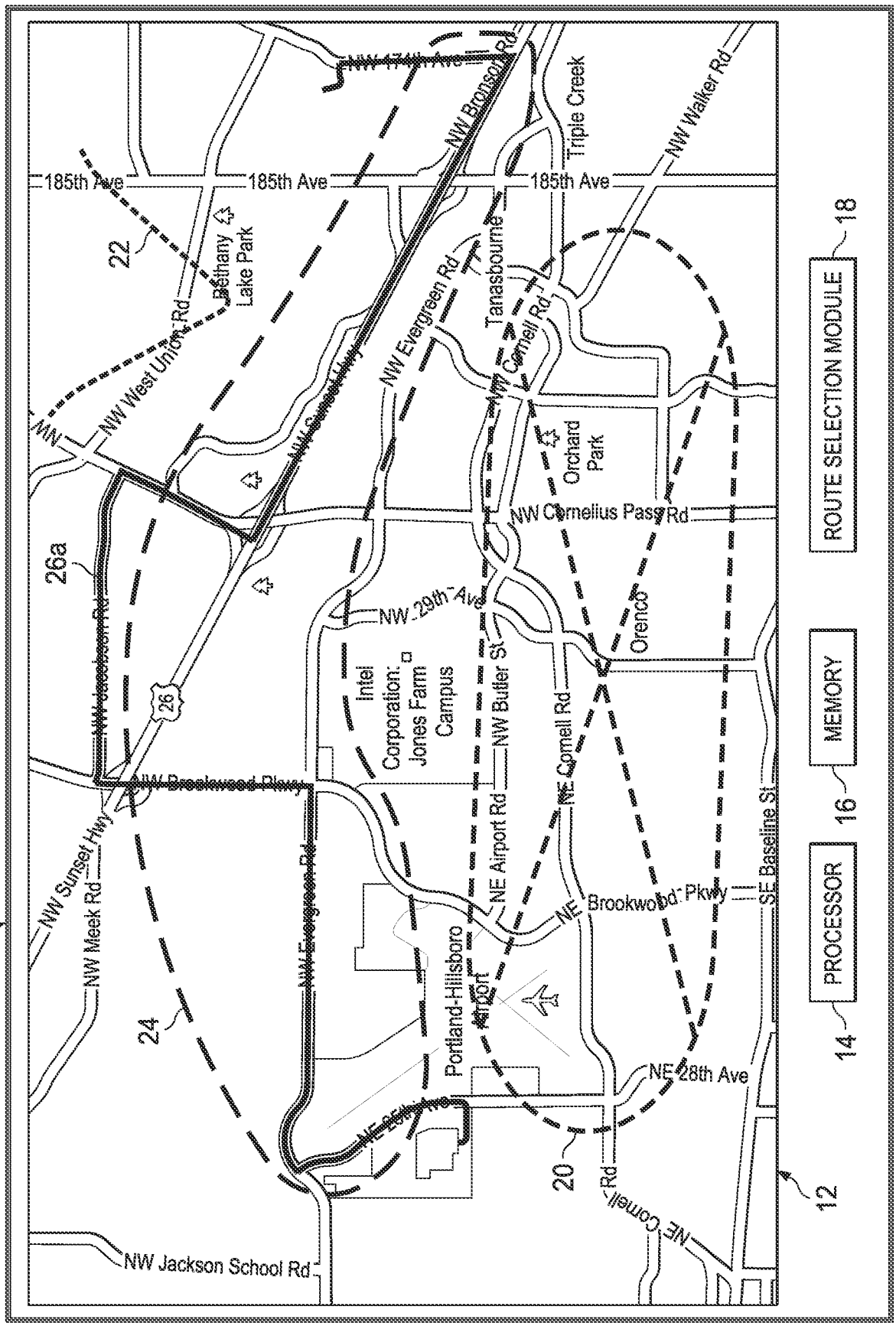

10
12
14
16
18
PROCESSOR
MEMORY
ROUTE SELECTION MODULE
20
22
24
26a
26
185th Ave
NW Bronson Rd
Triple Creek
NW Walker Rd
Bethany Lake Park
NW West Union Rd
NW Evergreen Rd
Tanasbourne
NW Cornell Rd
Orchard Park
NW Cornelius Pass Rd
NW 29th Ave
Intel Corporation: Jones Farm Campus
NW Butler St
Orenco
NW Jackson Rd
NW Brookwood Pkwy
NW Sunset Hwy
NW Meek Rd
NW Evergreen Rd
NE Airport Rd
NE Cornell Rd
NE Brookwood Pkwy
SE Baseline St
Portland-Hillsboro Airport
NE 28th Ave
NE Cornell Rd
NW Jackson School Rd

FIG. 2A

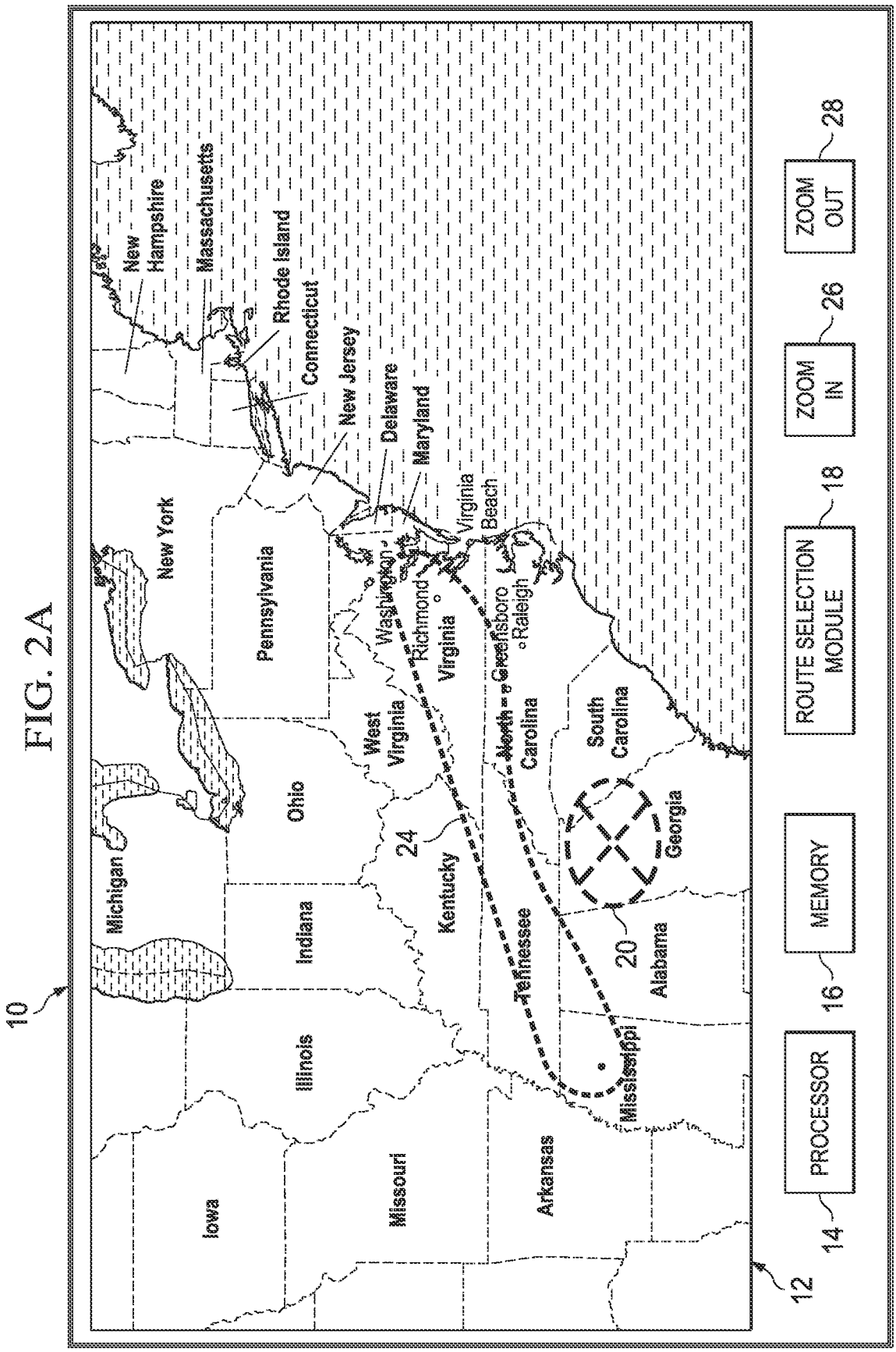

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
20
24
26
ZOOM IN
28
ZOOM OUT
New Hampshire
Massachusetts
Rhode Island
Connecticut
New Jersey
Delaware
Maryland
Virginia Beach
Washington
Richmond
Virginia
Greensboro
Raleigh
North Carolina
South Carolina
Georgia
Alabama
Mississippi
Tennessee
Kentucky
West Virginia
Ohio
Pennsylvania
New York
Michigan
Indiana
Illinois
Missouri
Iowa
Arkansas

FIG. 2B

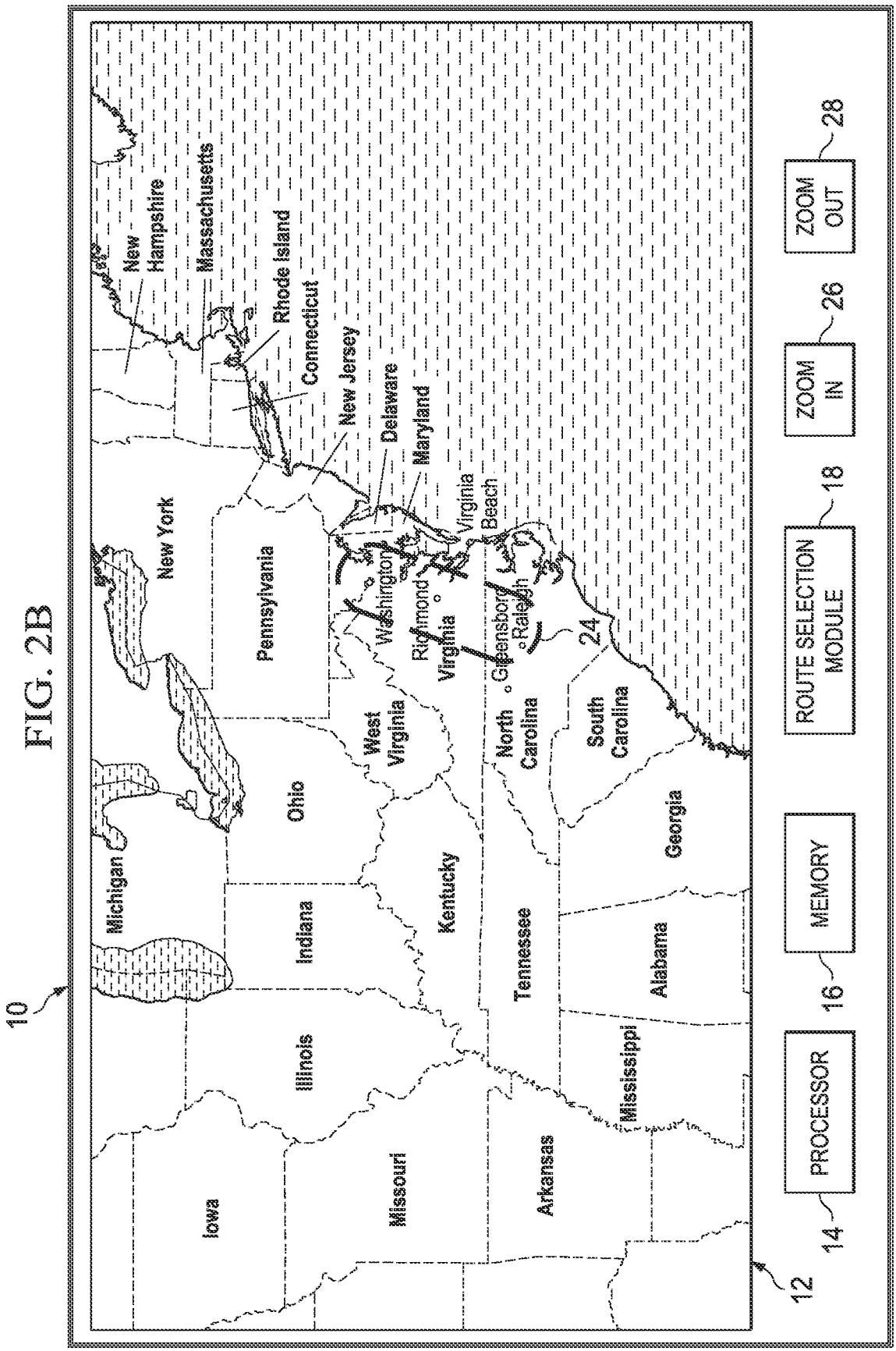

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
ZOOM IN
26
ZOOM OUT
28
24
Maine
New Hampshire
Massachusetts
Rhode Island
Connecticut
New Jersey
Delaware
Maryland
Virginia Beach
Washington
Richmond
Virginia
Greensboro
Raleigh
New York
Pennsylvania
West Virginia
North Carolina
South Carolina
Ohio
Kentucky
Tennessee
Georgia
Michigan
Indiana
Alabama
Illinois
Mississippi
Missouri
Arkansas
Iowa

FIG. 2C

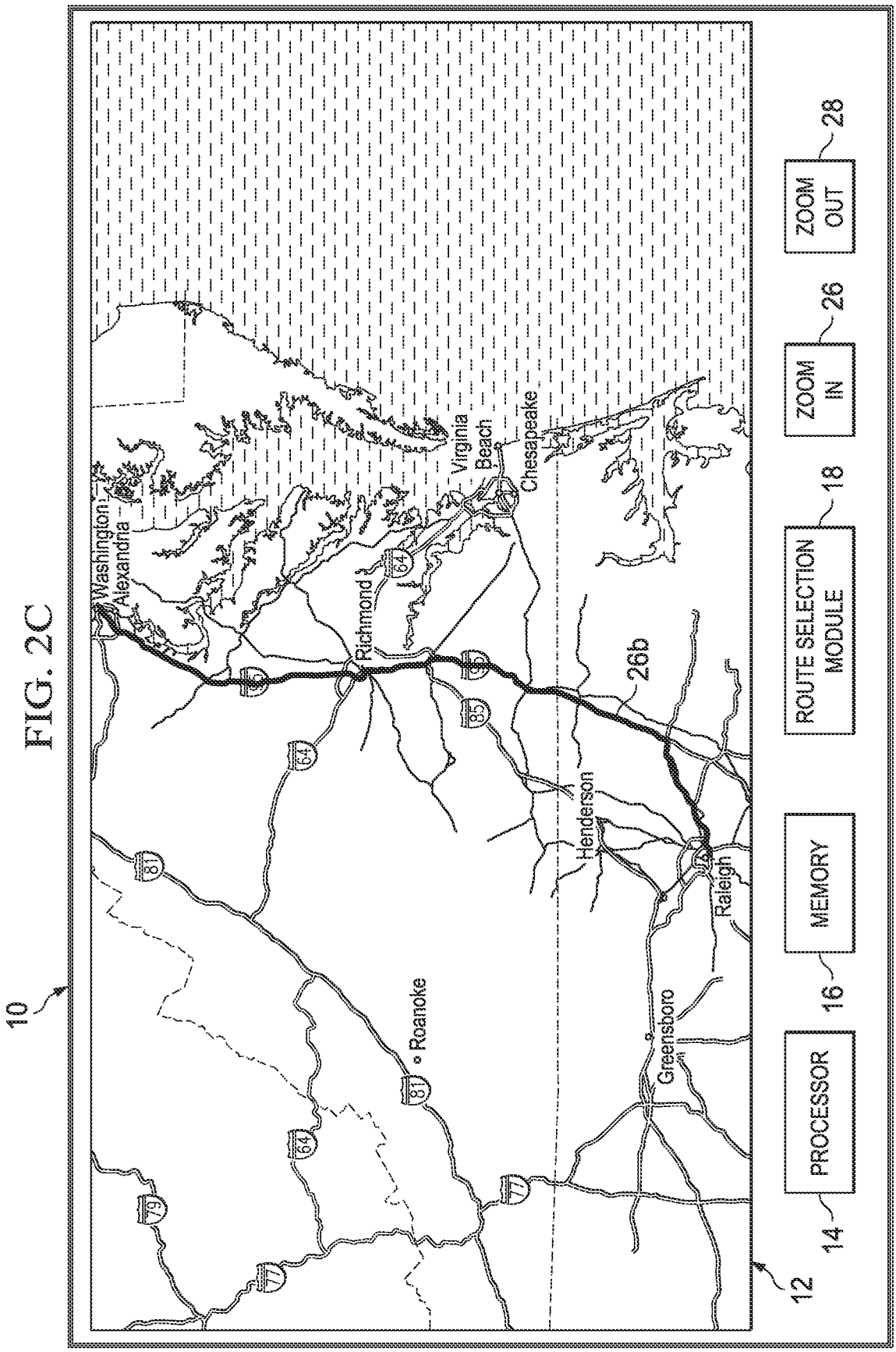

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
26
ZOOM IN
28
ZOOM OUT
Washington
Alexandria
Richmond
Virginia Beach
Chesapeake
Roanoke
Greensboro
Henderson
Raleigh
26b
95
64
85
81
77
79
40
87

FIG. 2D

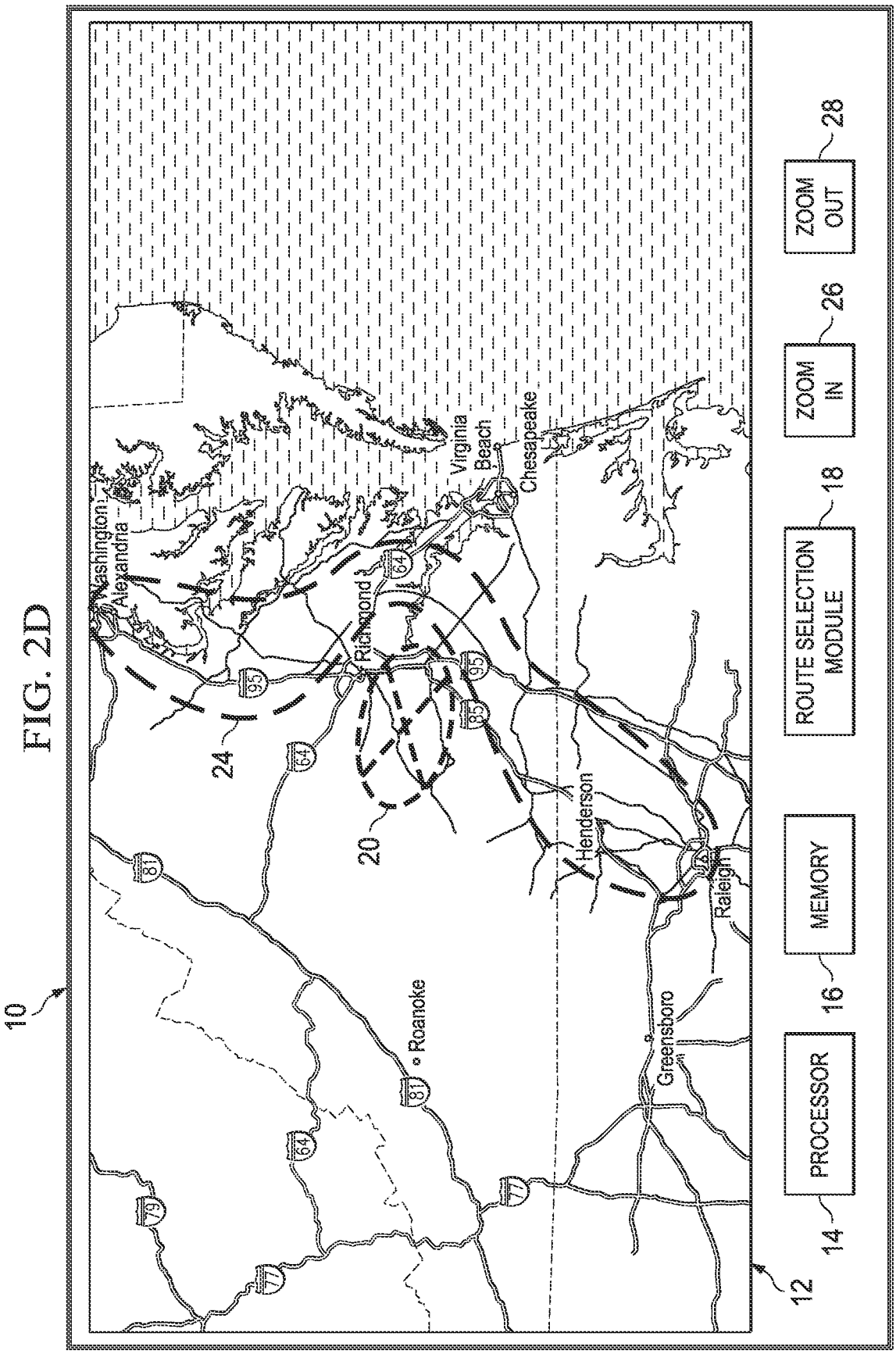

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
26
ZOOM IN
28
ZOOM OUT
20
24
Washington
Alexandria
Richmond
Virginia Beach
Chesapeake
Roanoke
Greensboro
Raleigh
Henderson
95
64
85
81
77
79
87
460

FIG. 2E

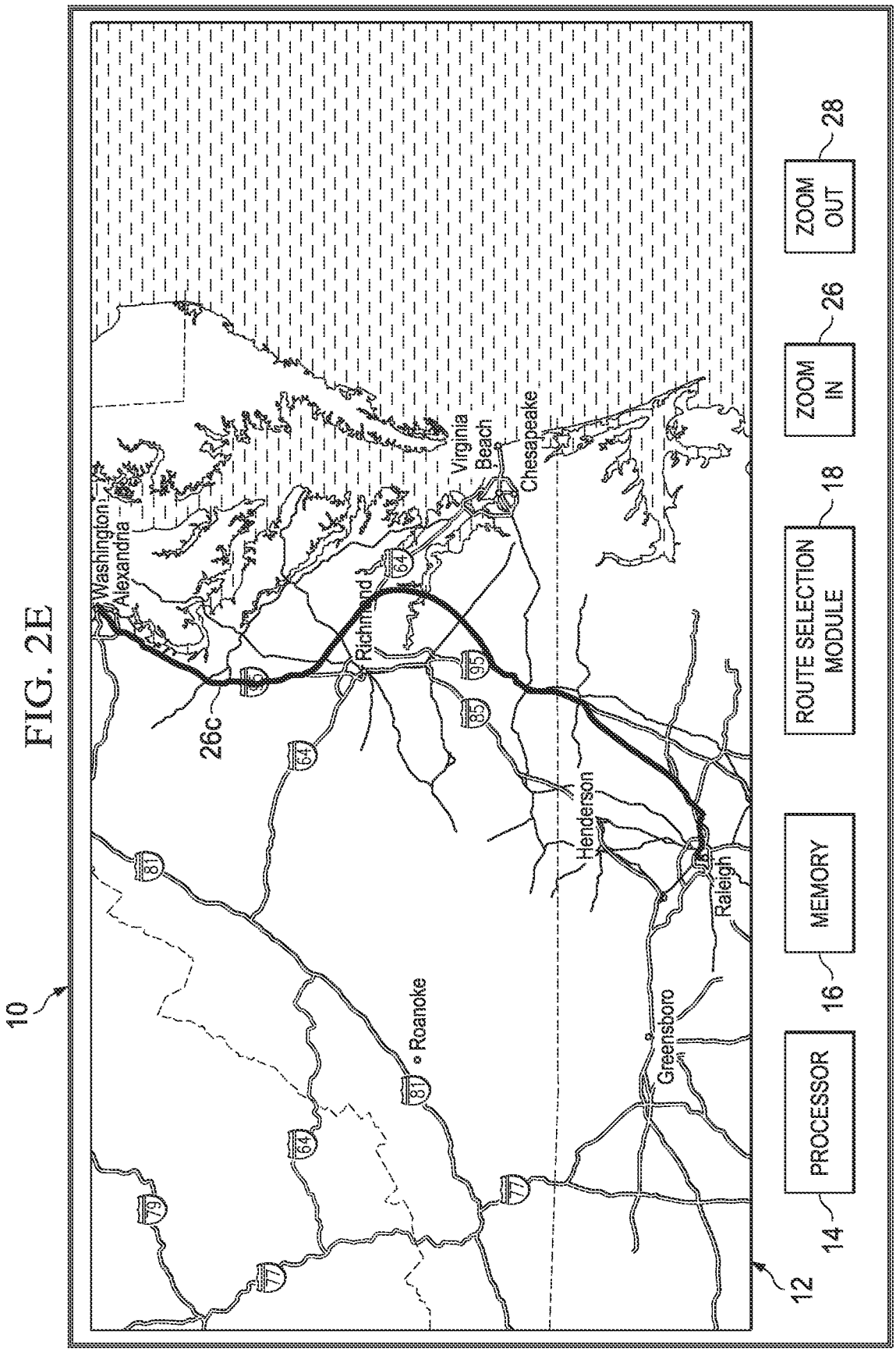

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
26
ZOOM IN
28
ZOOM OUT
26c
Washington
Alexandria
Richmond
Virginia Beach
Chesapeake
Roanoke
Greensboro
Henderson
Raleigh
95
85
64
81
77
79
87
7

FIG. 2F

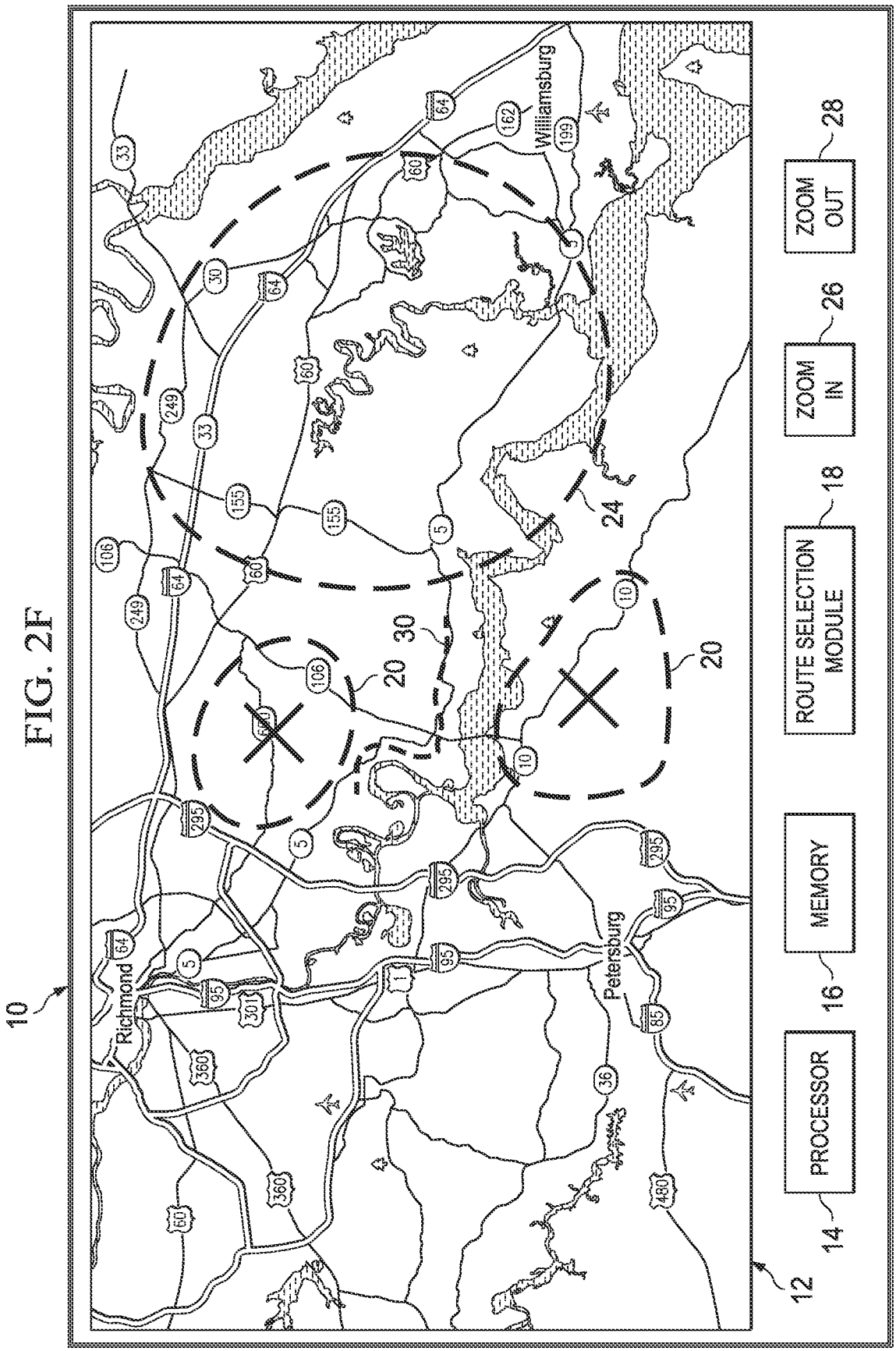

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
26
ZOOM IN
28
ZOOM OUT
Richmond
Petersburg
Williamsburg
20
30
24

FIG. 2G

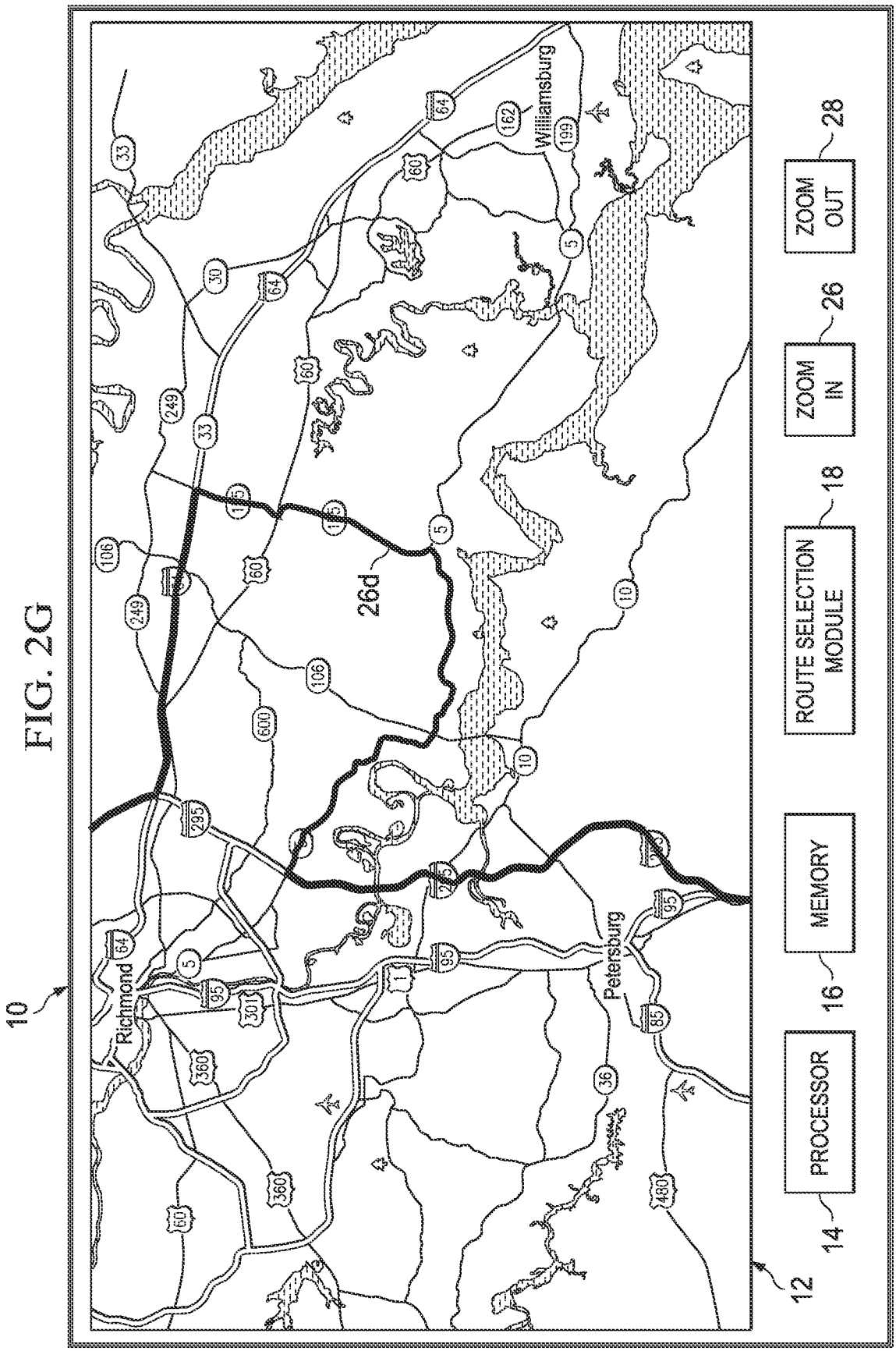

10
12
14
PROCESSOR
16
MEMORY
18
ROUTE SELECTION MODULE
26
ZOOM IN
28
ZOOM OUT
26d
Richmond
Petersburg
Williamsburg

FIG. 3

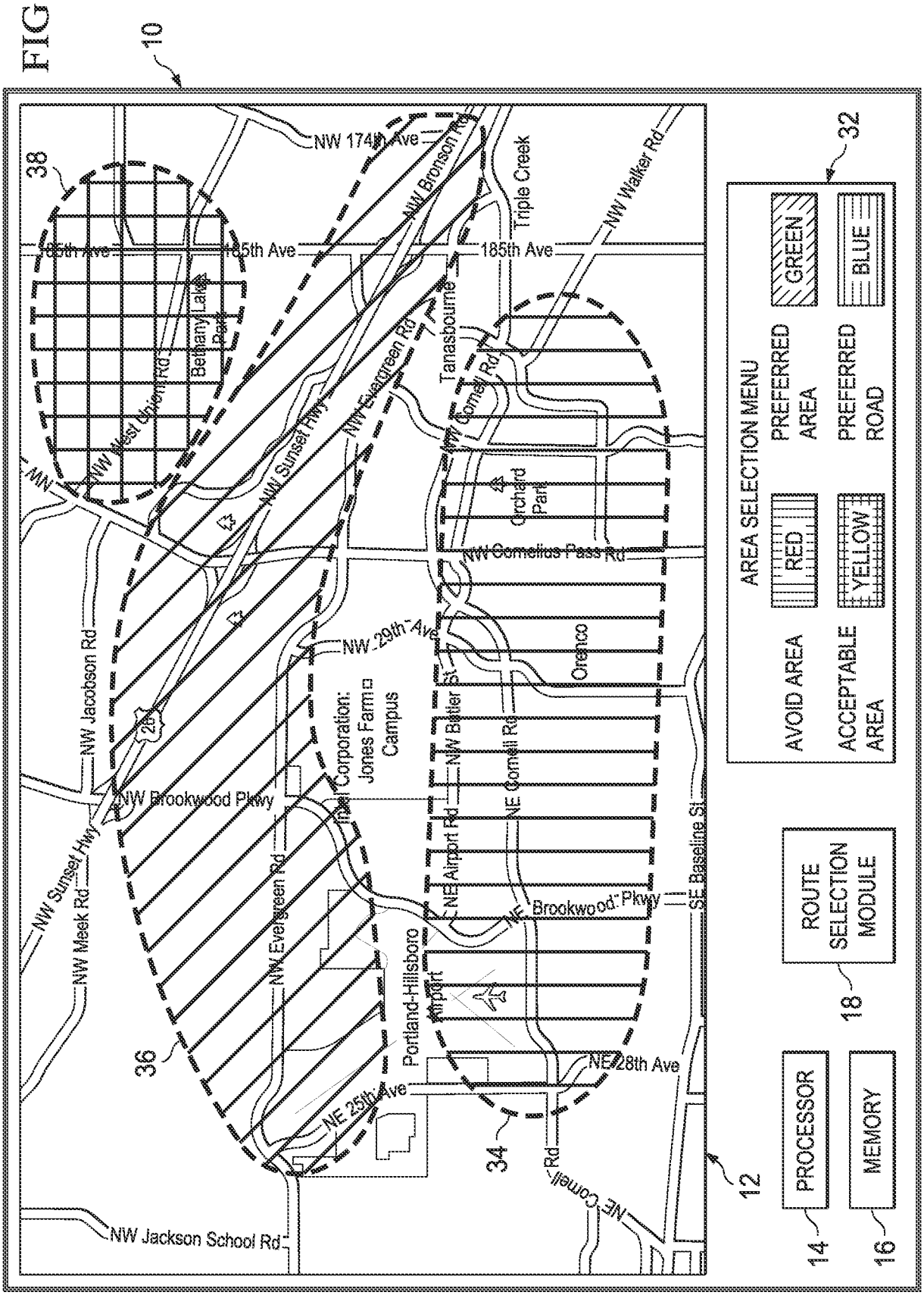
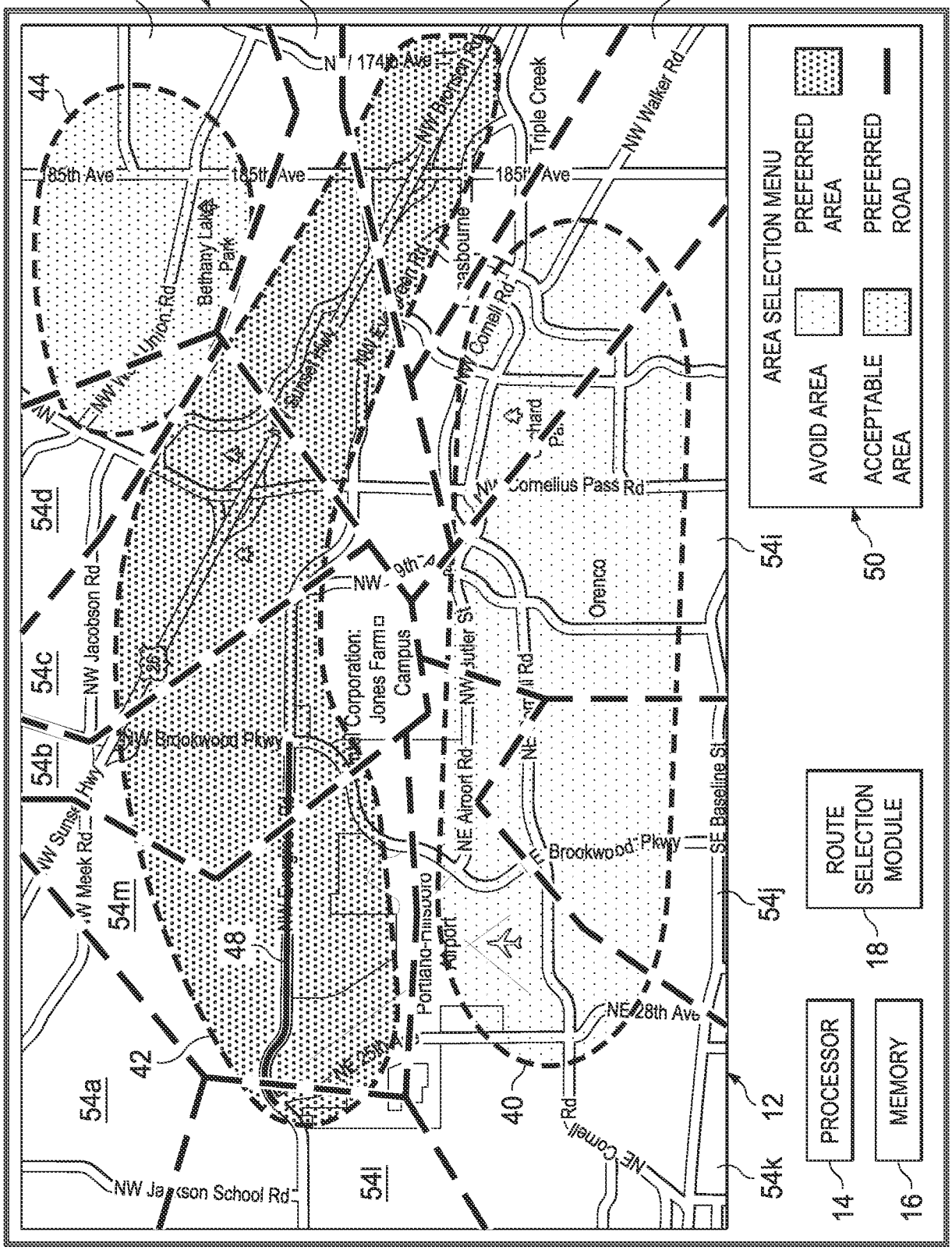

10
38
36
34
12
32
NW 174th Ave
NW Bronson Rd
Triple Creek
NW Walker Rd
185th Ave
Bethany Lake Park
NW West Union Rd
NW Sunset Hwy
NW Evergreen Rd
Tanasbourne
Cornell Rd
Orchard Park
NW Cornelius Pass Rd
NW 29th Ave
Oregon
NW Jacobson Rd
NW Brookwood Pkwy
Tribal Corporation: Jones Farm Campus
NW Meek Rd
NW Sunset Hwy
NW Evergreen Rd
NW Bailer St
NE Cornell Rd
NE Airport Rd
NE Brookwood Pkwy
SE Baseline St
Portland-Hillsboro Airport
NE 25th Ave
NE 28th Ave
NE Cornell Rd
NW Jackson School Rd
AREA SELECTION MENU
PREFERRED AREA
GREEN
BLUE
RED
YELLOW
AVOID AREA
ACCEPTABLE AREA
PREFERRED ROAD
ROUTE SELECTION MODULE
18
PROCESSOR
14
MEMORY
16

FIG. 4


54e
10
54f
54g
54h
44
54d
54c
54b
54m
54a
42
48
40
54l
54k
12
54j
54i
50
18
14
16
185th Ave
Bethany Lake Park
Union Rd
NW Jacobson Rd
NW Meek Rd
NW Sunset Hwy
Brookwood Pkwy
Intel Corporation: Jones Farm Campus
Portland-Hillsboro Airport
NE Airport Rd
NW Butler St
Cornelius Pass Rd
Orenco
NE Baseline St
NE 28th Ave
NW Jackson School Rd
NE Cornell Rd
Triple Creek
NW Walker Rd
AREA SELECTION MENU
AVOID AREA
PREFERRED AREA
ACCEPTABLE AREA
PREFERRED ROAD
ROUTE SELECTION MODULE
PROCESSOR
MEMORY

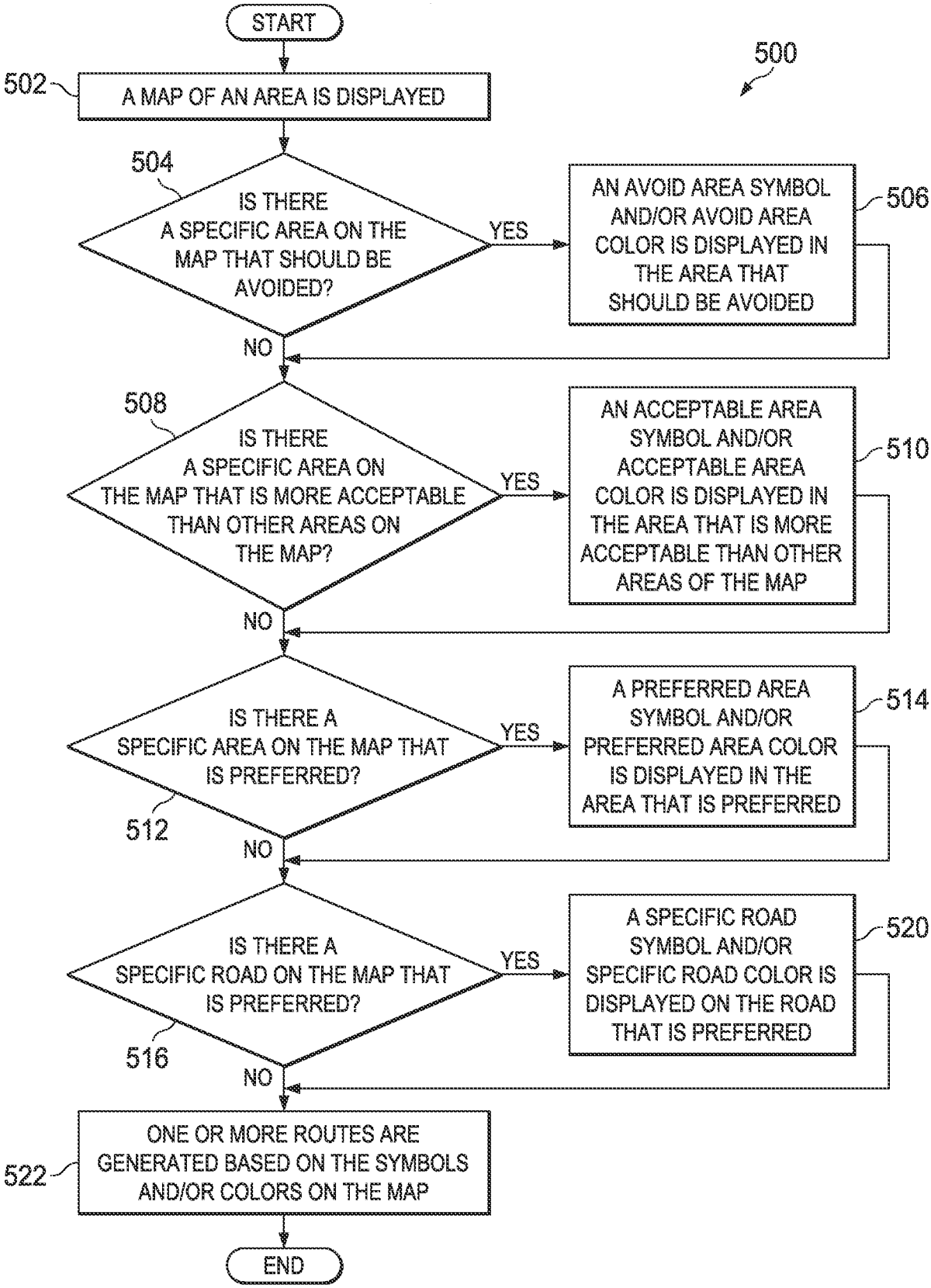

START
500
502
A MAP OF AN AREA IS DISPLAYED
504
IS THERE A SPECIFIC AREA ON THE MAP THAT SHOULD BE AVOIDED?
YES
AN AVOID AREA SYMBOL AND/OR AVOID AREA COLOR IS DISPLAYED IN THE AREA THAT SHOULD BE AVOIDED
506
NO
508
IS THERE A SPECIFIC AREA ON THE MAP THAT IS MORE ACCEPTABLE THAN OTHER AREAS ON THE MAP?
YES
AN ACCEPTABLE AREA SYMBOL AND/OR ACCEPTABLE AREA COLOR IS DISPLAYED IN THE AREA THAT IS MORE ACCEPTABLE THAN OTHER AREAS OF THE MAP
510
NO
IS THERE A SPECIFIC AREA ON THE MAP THAT IS PREFERRED?
YES
A PREFERRED AREA SYMBOL AND/OR PREFERRED AREA COLOR IS DISPLAYED IN THE AREA THAT IS PREFERRED
514
512
NO
IS THERE A SPECIFIC ROAD ON THE MAP THAT IS PREFERRED?
YES
A SPECIFIC ROAD SYMBOL AND/OR SPECIFIC ROAD COLOR IS DISPLAYED ON THE ROAD THAT IS PREFERRED
520
516
NO
ONE OR MORE ROUTES ARE GENERATED BASED ON THE SYMBOLS AND/OR COLORS ON THE MAP
522
END

FIG. 5

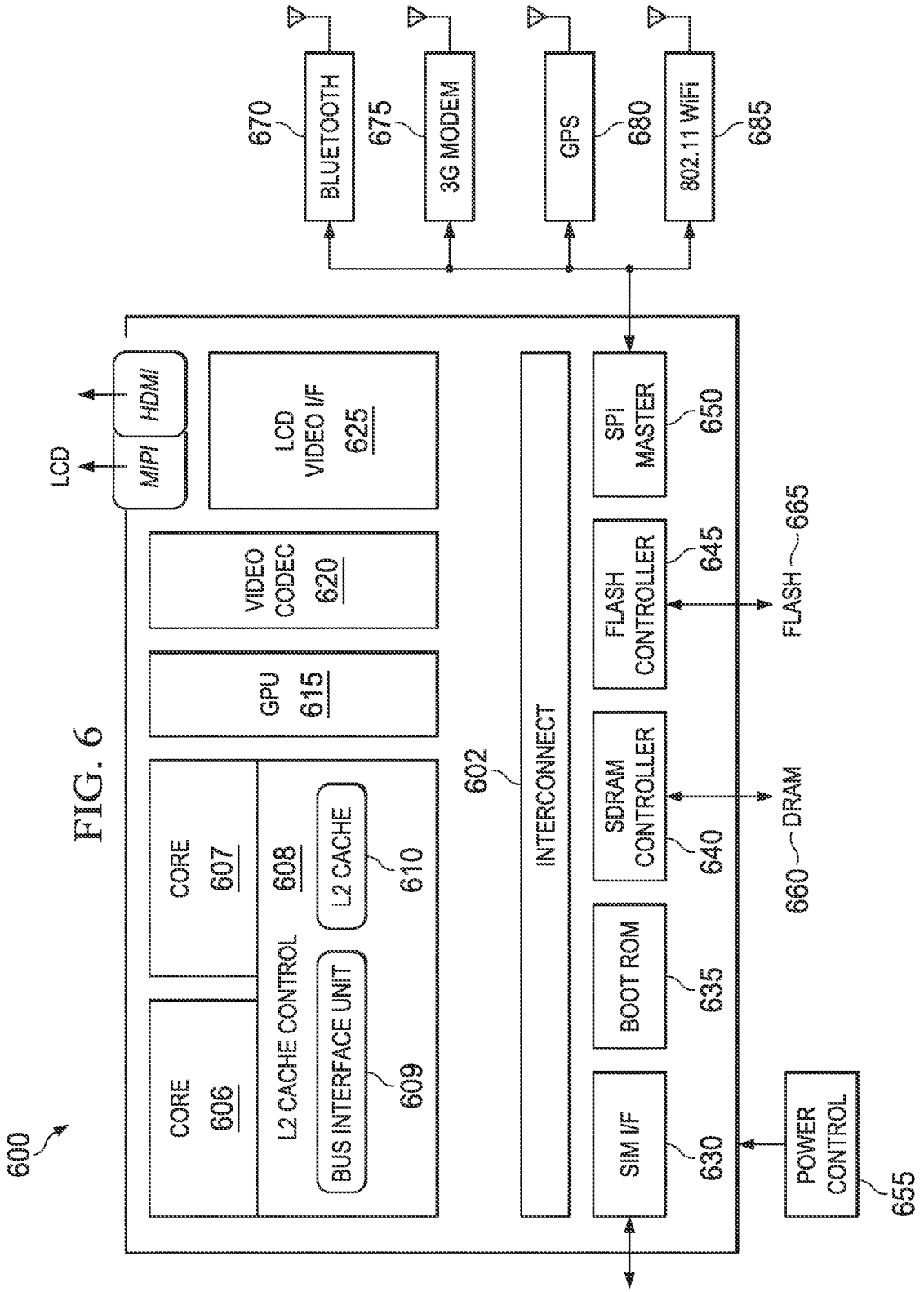

600
CORE 606
CORE 607
L2 CACHE CONTROL 608
BUS INTERFACE UNIT 609
L2 CACHE 610
GPU 615
VIDEO CODEC 620
LCD VIDEO I/F 625
MIPI
HDMI
LCD
602
INTERCONNECT
SIM I/F 630
BOOT ROM 635
SDRAM CONTROLLER 640
FLASH CONTROLLER 645
SPI MASTER 650
POWER CONTROL 655
DRAM 660
FLASH 665
BLUETOOTH 670
3G MODEM 675
GPS 680
802.11 WiFi 685

FIG. 6

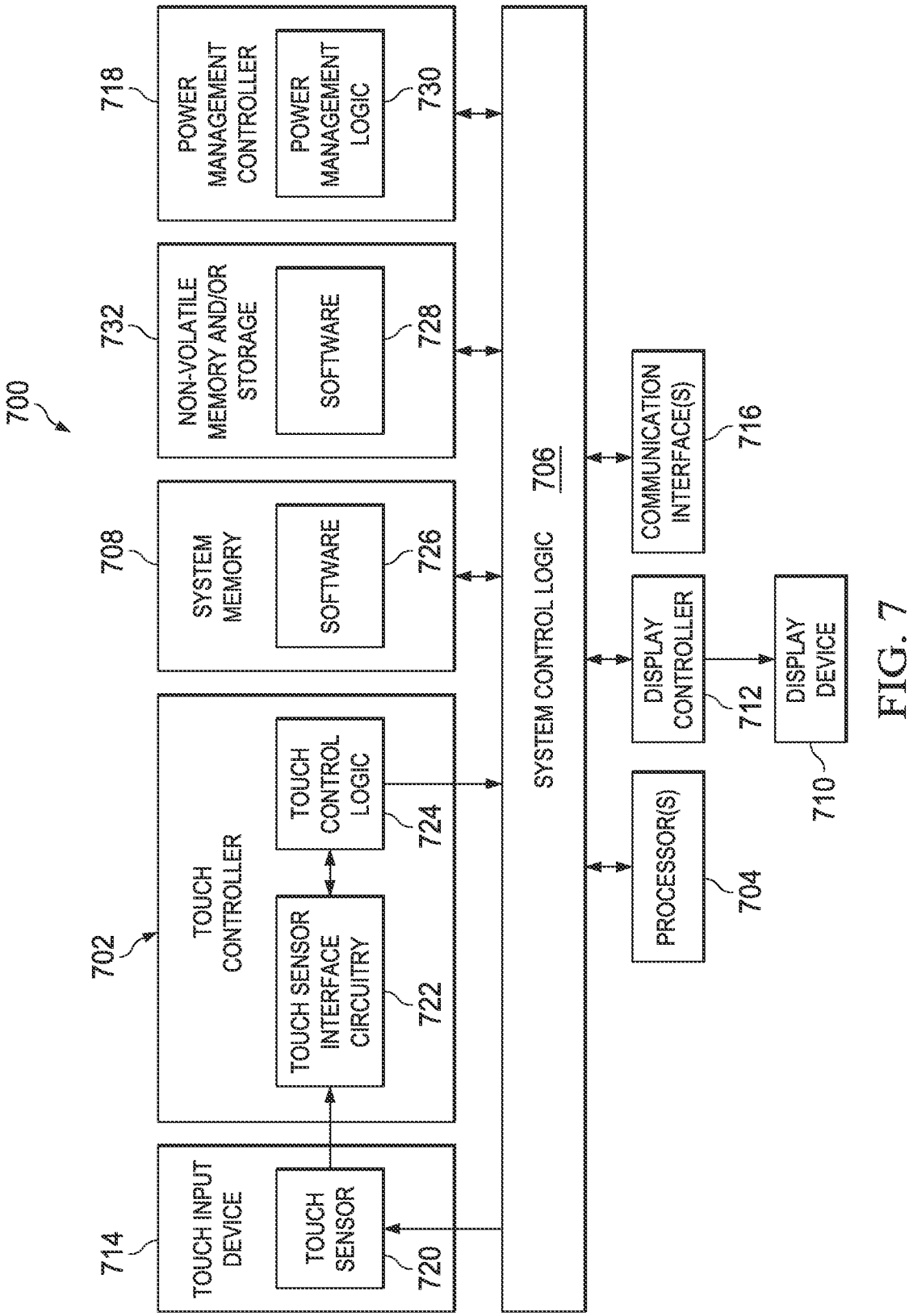

700
718
POWER MANAGEMENT CONTROLLER
POWER MANAGEMENT LOGIC
730
732
NON-VOLATILE MEMORY AND/OR STORAGE
SOFTWARE
728
708
SYSTEM MEMORY
SOFTWARE
726
702
TOUCH CONTROLLER
TOUCH CONTROL LOGIC
724
TOUCH SENSOR INTERFACE CIRCUITRY
722
714
TOUCH INPUT DEVICE
TOUCH SENSOR
720
SYSTEM CONTROL LOGIC 706
COMMUNICATION INTERFACE(S)
716
DISPLAY CONTROLLER
712
DISPLAY DEVICE
710
PROCESSOR(S)
704

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/024944

A. CLASSIFICATION OF SUBJECT MATTER

G01C 21/34(2006.01)i, G01C 21/36(2006.01)i, G08G 1/0969(2006.01)i, G09B 29/00(2006.01)i

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 21/34; G01C 21/26; G08G 1/0962; G08G 1/0969; G01C 21/36; G08G 1/0968; G01C 21/00; G09B 29/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: navigation, processor, memory, route, road, avoid area, preferred area and acceptable area

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2011-242228 A (CLARION CO., LTD.) 01 December 2011 See abstract; paragraphs 9-15, 17-40, 49-54; claim 1 and figures 1-12.	1-3,14,23-25
A	KR 10-2005-0102757 A (MANDO MAP & SOFT CO., LTD.) 27 October 2005 See abstract; pages 2,3 and figures 1-4.	1-3,14,23-25
A	KR 10-0777899 B1 (HYUNDAI AUTONET CO., LTD.) 21 November 2007 See abstract; pages 3-5 and figures 1-6.	1-3,14,23-25
A	US 2008-0162034 A1 (BREEN, THOMAS BERNARD) 03 July 2008 See abstract; paragraphs 17-21, 28-42 and figures 1-4.	1-3,14,23-25
A	JP 11-083519 A (DENSO CORP.) 26 March 1999 See abstract; paragraphs 15-55 and figures 1-8.	1-3,14,23-25

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

☒ 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 application or patent 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
04 July 2014 (04.07.2014)	**07 July 2014 (07.07.2014)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701,
Republic of Korea
Facsimile No. +82-42-472-7140

Authorized officer
AHN, Jae Yul
Telephone No. +82-42-481-8525

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/024944

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 4-13,15-22
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required addtional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2014/024944

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2011-242228 A	01/12/2011	None	
KR 10-2005-0102757 A	27/10/2005	KR 10-0680138 B1	07/02/2007
KR 10-0777899 B1	21/11/2007	None	
US 2008-0162034 A1	03/07/2008	WO 2008-082628 A2 WO 2008-082628 A3	10/07/2008 04/12/2008
JP 11-083519 A	26/03/1999	JP 3384293 B2	10/03/2003