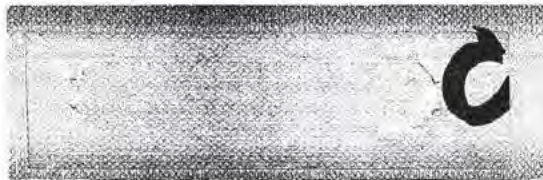


701	202
Class	Subclass
ISSUE CLASSIFICATION	



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6292743

U.S. UTILITY PATENT APPLICATION

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SECTOR	CLASS	SUBCLASS	ART UNIT	EXAMINER
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PREPARED AND APPROVED FOR ISSUE

ISSUING CLASSIFICATION											
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CLASS		SUBCLASS		CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)						
701		202		701	117	209					
INTERNATIONAL CLASSIFICATION				455	456						
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8/15/01 Formal Drawings (10 shts) set 01 06/15/01

☐ TERMINAL DISCLAIMER	DRAWINGS			CLAIMS ALLOWED	
	Sheets Drwg. <u>10</u>	Figs. Drwg. <u>15</u>	Print Fig. <u>1</u>	Total Claims <u>22</u>	Print Claim for O.G. <u>1</u>
☐ a) The term of this patent subsequent to _____ (date) has been disclaimed.	<u>Edward Pipala</u> <u>3/19/01</u> (Assistant Examiner) (Date)			NOTICE OF ALLOWANCE MAILED	
	 WILLIAM A. CUCHLINSKI, JR. SUPERVISORY PATENT EXAMINER TECHNOLOGY CENTER 3600 _____ (Primary Examiner) (Date)			<u>7/2/01</u> ISSUE FEE <u>44</u>	
				Amount Due <u>620</u> Date Paid <u>8/6/01</u>	
☐ b) The term of this patent shall not extend beyond the expiration date, of U.S. Patent. No. _____ _____ _____				ISSUE BATCH NUMBER	
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PATENT APPLICATION



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INITIALS

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CONTENTS

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1. Application <i>1/25</i> papers.		
2. <i>IDS</i> <i>6-5-00</i>		
3. <i>Rei 3</i> <i>10-3-00</i>		
4. <i>Interview Summary</i> <i>11/13/00</i>		
5. <i>Req. & Time x A</i> <i>3-5-01</i>		
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(12) **United States Patent**
Pu et al.

(10) **Patent No.:** **US 6,292,743 B1**
(45) **Date of Patent:** **Sep. 18, 2001**

(54) **MOBILE NAVIGATION SYSTEM**

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San Diego, CA (US)

(73) Assignee: **Infogation Corporation**, San Diego,
CA (US)

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(22) Filed: **Jan. 6, 1999**

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455/456

(58) Field of Search 701/200, 201,
701/202, 207, 208, 209, 211, 213, 117;
340/988, 990, 995; 455/456, 457

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Primary Examiner—William A. Cuchlinski, Jr.

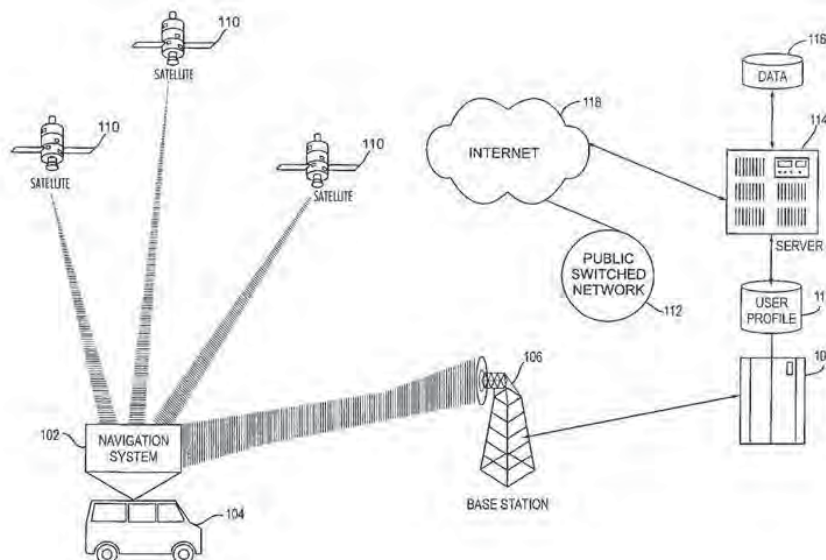
Assistant Examiner—Edward Pipala

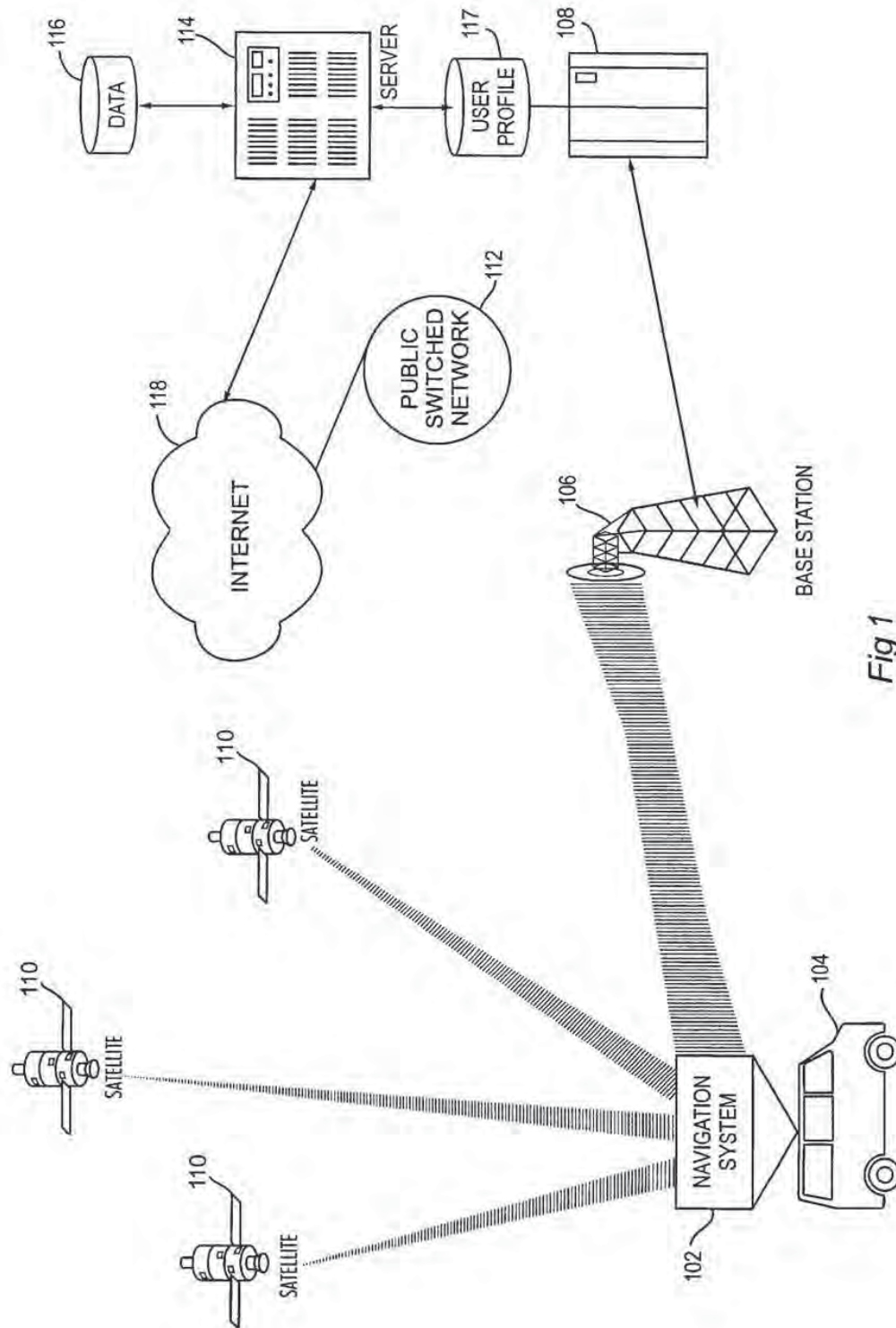
(74) *Attorney, Agent, or Firm*—Lyon & Lyon LLP

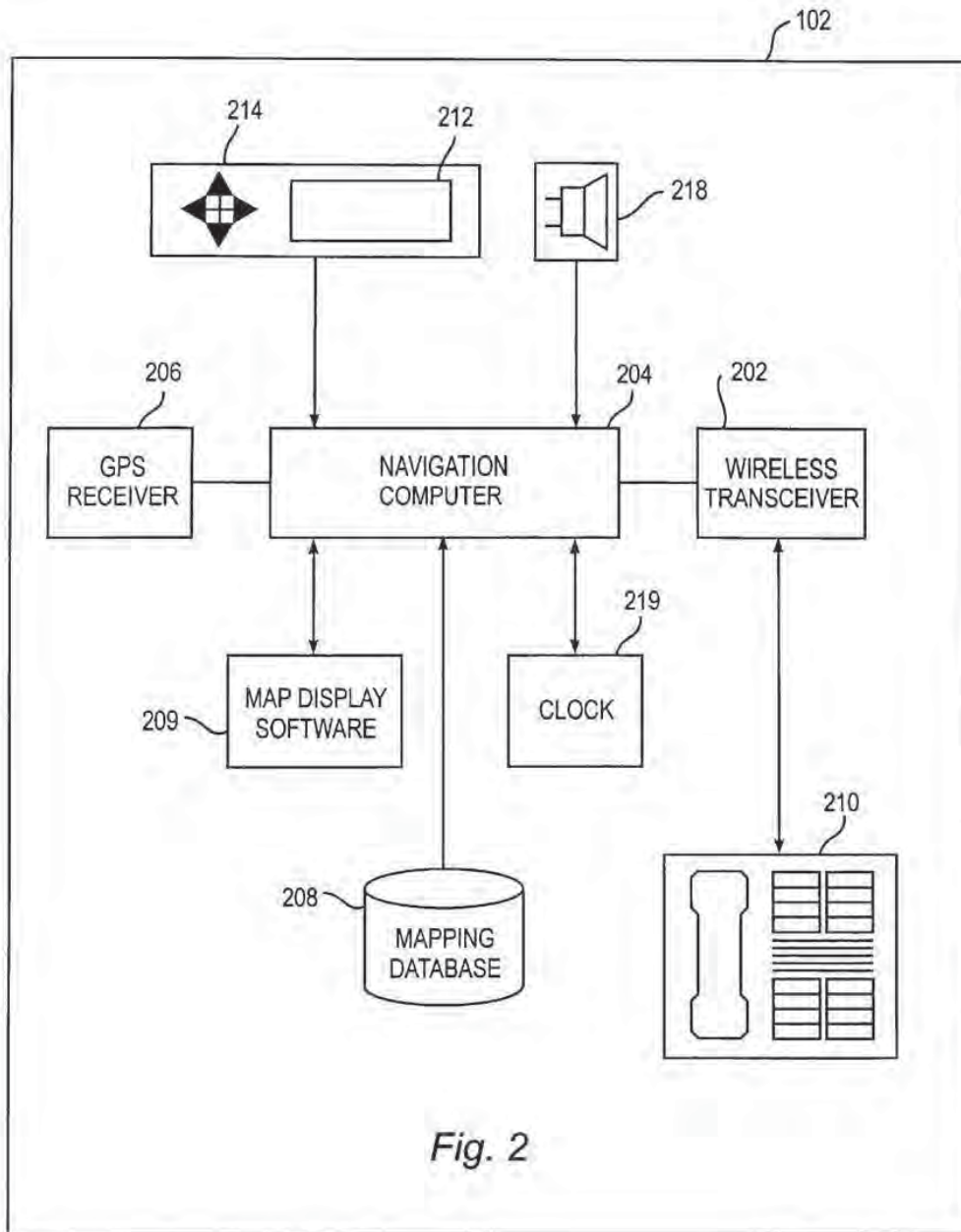
(57) **ABSTRACT**

A client navigation system establishes a wireless connection to a navigation server on a computer network. The client requests a route by uploading start and stop specifications. The server calculates an optimal route based on real-time data available on the network. A generic natural language description is used to specify the optimal route downloaded to the client. The natural language description is independent from the local mapping database software on the client and includes a plain text description for each link using pre-defined generic terms. The client interprets the route, interfaces with the local mapping database and reconstructs the optimal route using a mapping reconstruction algorithm. The route is displayed on the client navigation system using whatever mapping database is present. An enhanced user-interface data-entry feature is provided that anticipates data being entered by users to minimize the data-entry process. The current time zone is derived from the current GPS position and is used to set the clock on the navigation system in the client. Maps are automatically scrolled on a display screen so that a representation of the automobile is always pointing to the right or to the left to allow for additional look-ahead space on certain display systems. A telephone coupled with the navigation system automatically displays the current local time for a called party upon dialing out. The dialed number is used to query a local database for providing local time information.

22 Claims, 10 Drawing Sheets







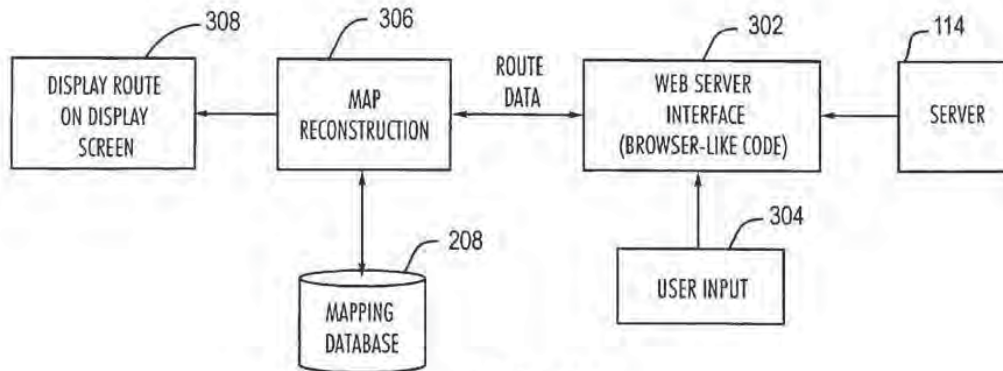


Fig. 3

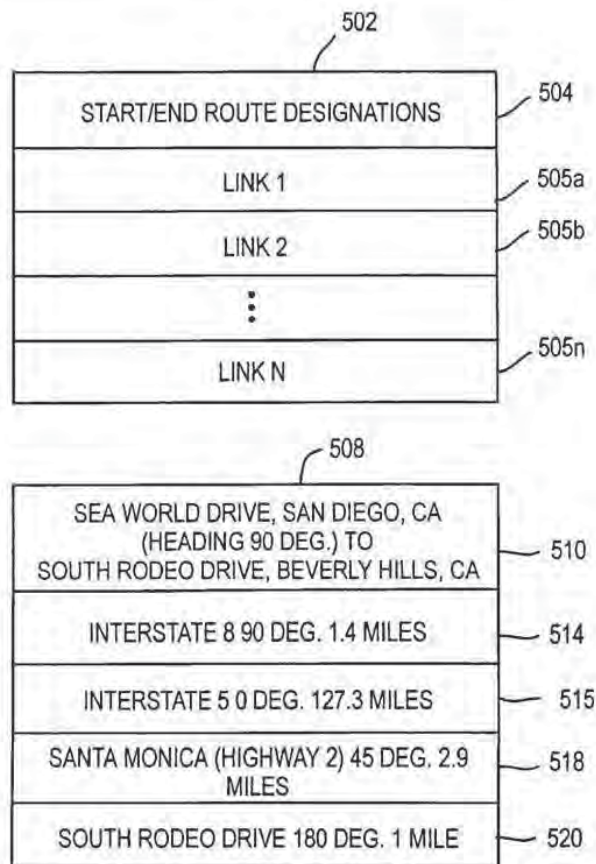


Fig. 5

Fig. 4

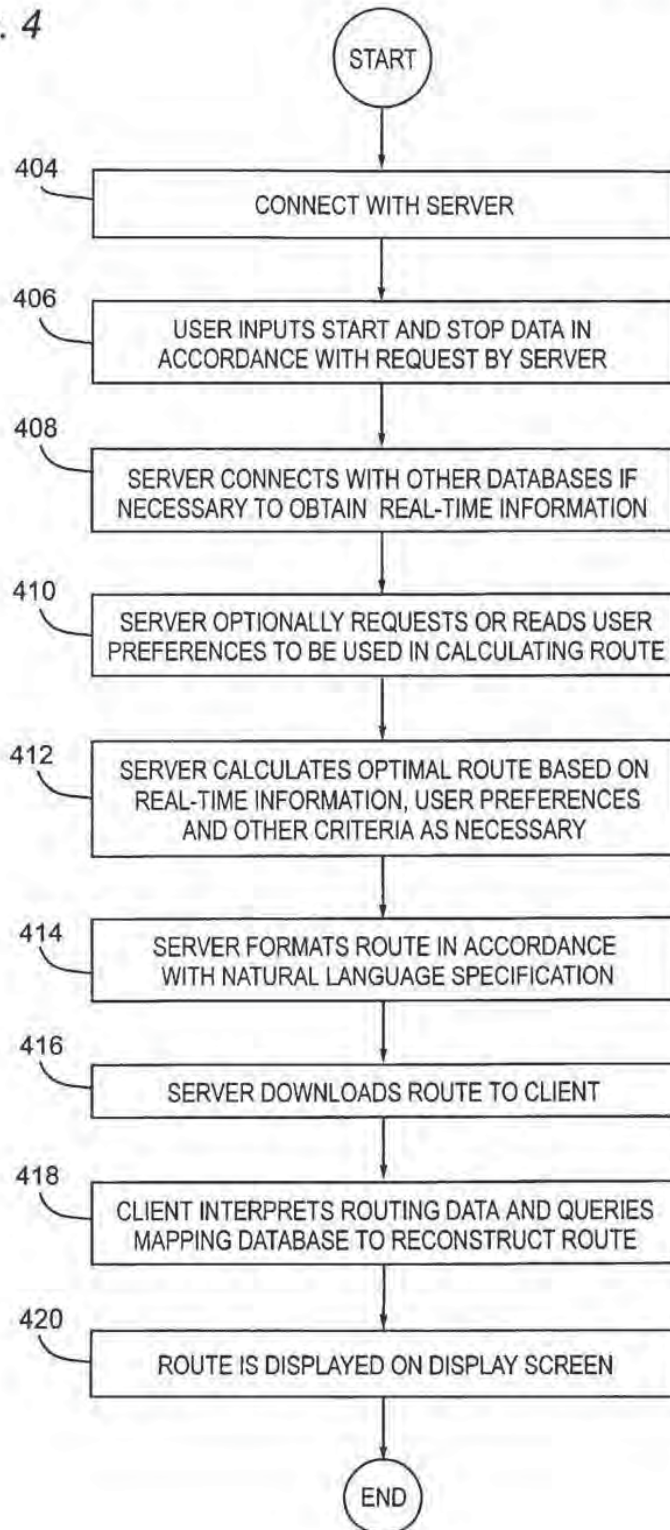
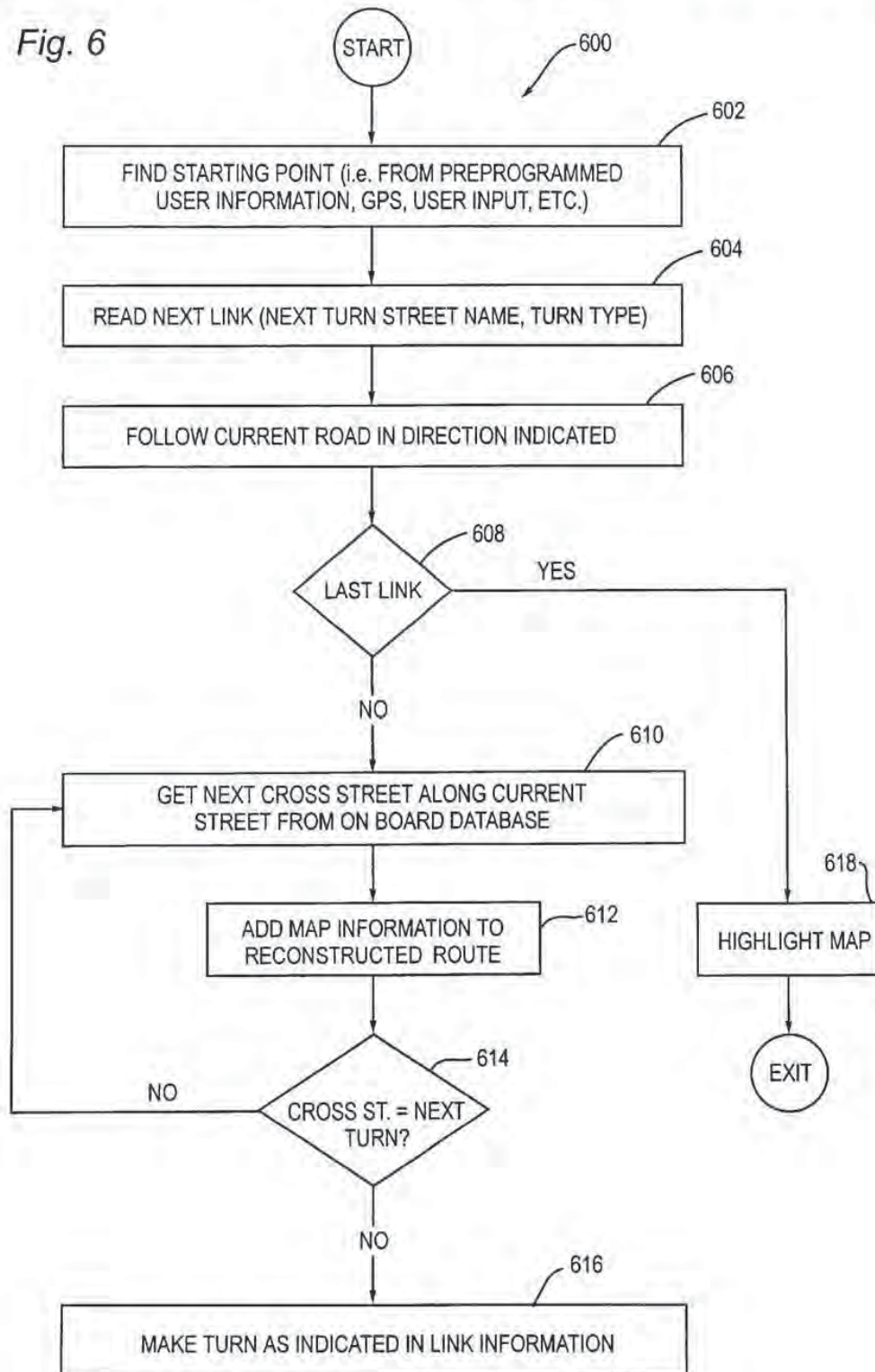


Fig. 6



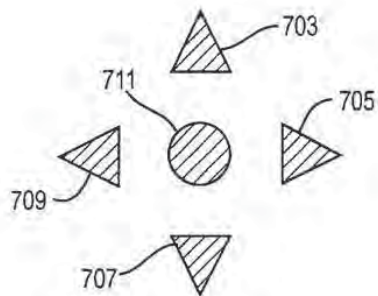


Fig. 7A

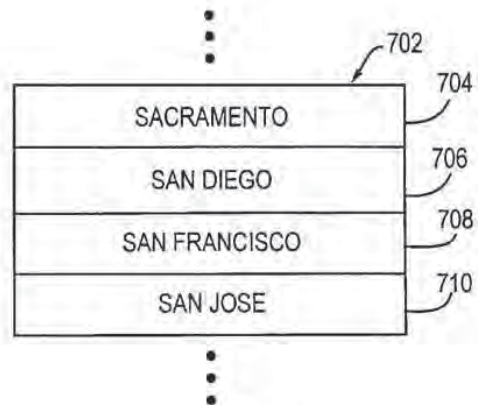


Fig. 7B

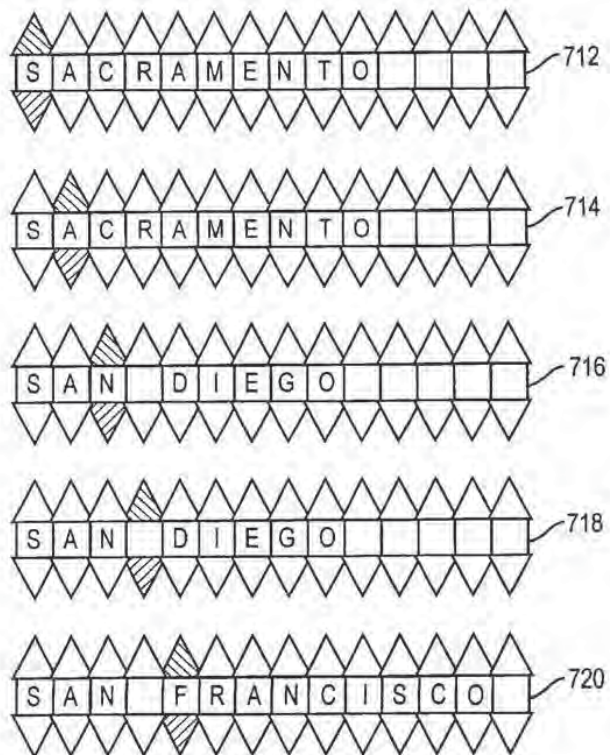
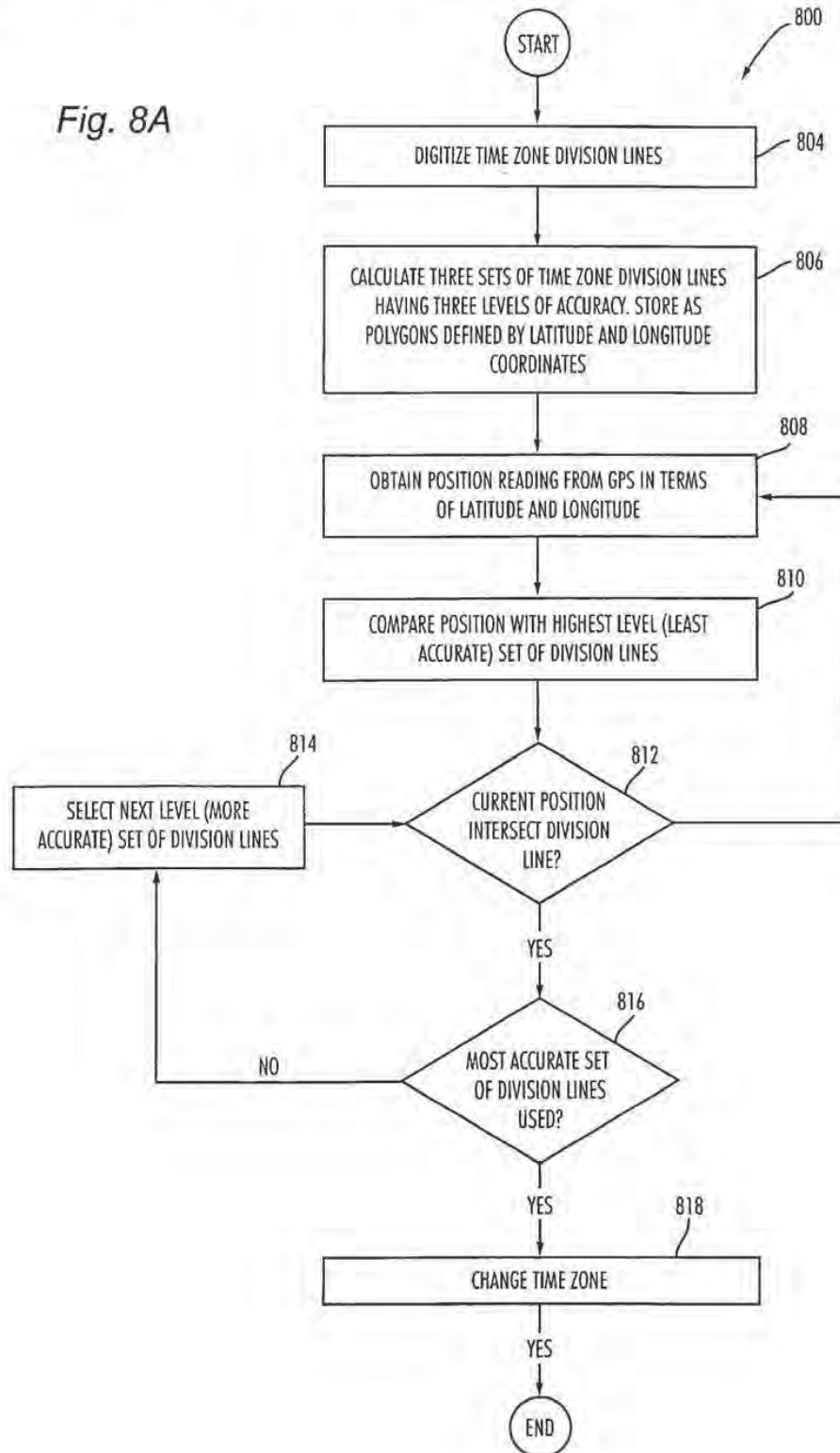


Fig. 7C

Fig. 8A



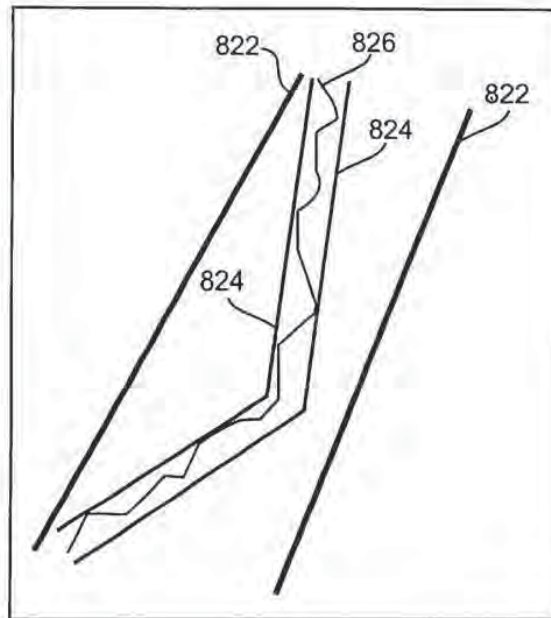


Fig. 8B

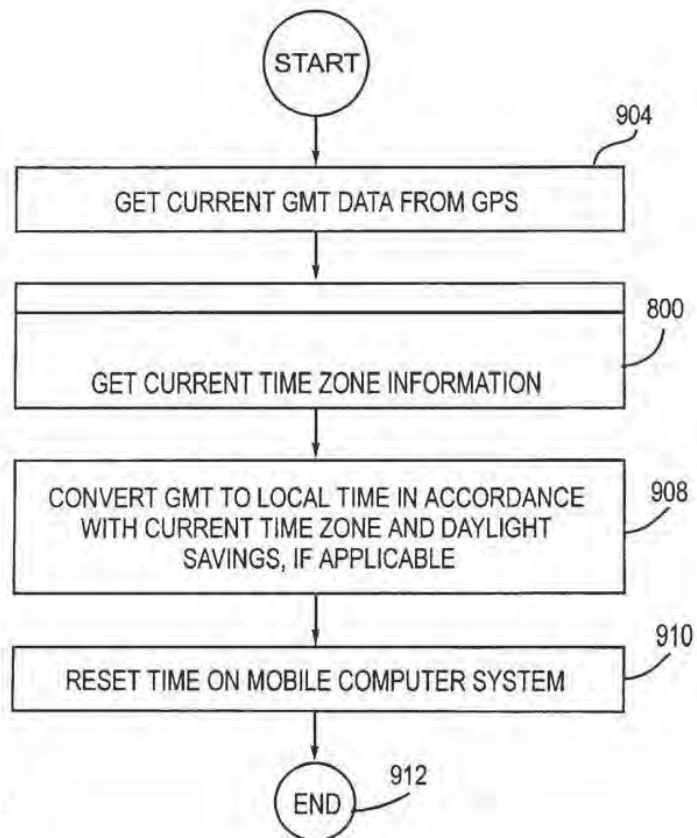


Fig. 9

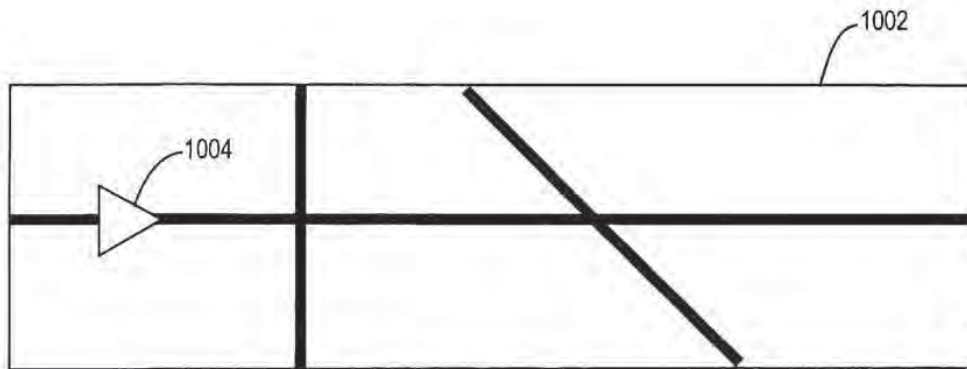


Fig. 10A

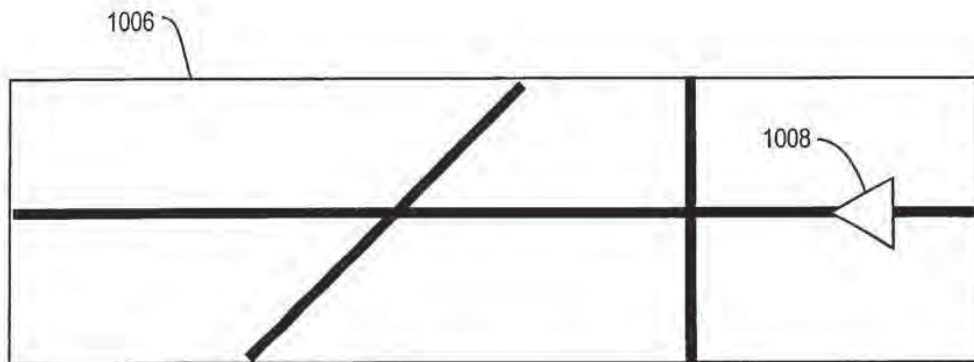
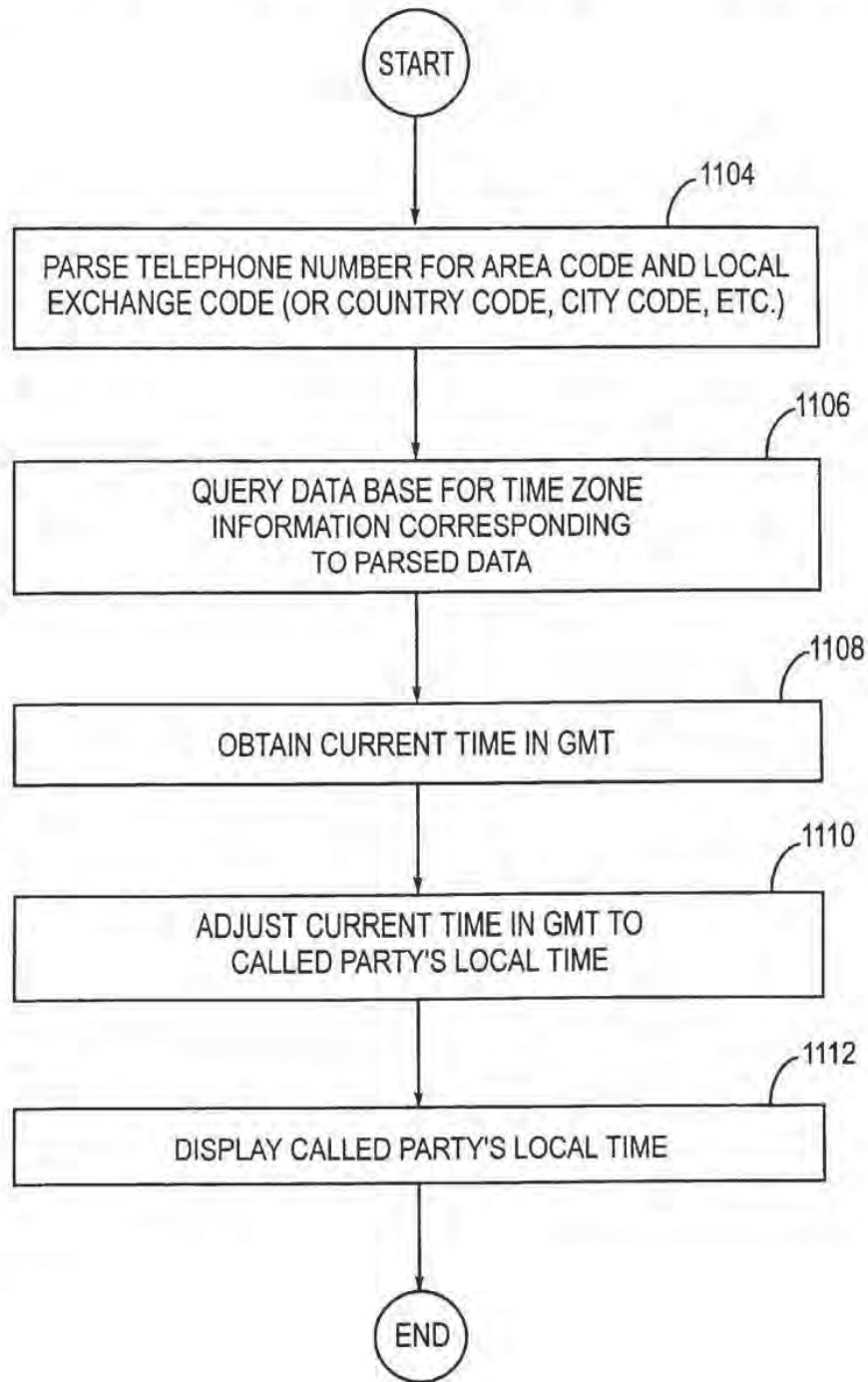


Fig. 10B

*Fig. 11*

MOBILE NAVIGATION SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to mobile navigation system and apparatus, and more particularly to a distributed navigation system having a wireless connection to a server for calculating optimal routes using real-time data.

2. Related Art

In recent years, navigation systems, in which automobiles are equipped with a navigational computer that includes a display screen, an input means such as a keypad or a remote control, and a storage means such as a CD, have become popular. Geographical map and routing data is typically stored on the CD. The map database on the CD can have various levels of detail. At the very least, the map database includes geographical information at the major road level. Additional details that can be included are minor roads, turn restrictions, one-way streets, highway ramp configurations, hotel, restaurant and other business information, traffic history, emergency facility locations and the like. The map databases with routing information are referred to as navigable map data or turn-by-turn data. The levels of detail stored on such databases depend on product and marketing factors, including cost and demand, as well as the physical storage capacity limitations.

Such navigation systems are stand-alone devices that rely completely on data stored on the local storage device for geographical and other information. Thus, the capacity of the storage device becomes a limiting factor as to how much information is available to users. In addition, users must update their mapping databases frequently to stay current. Typically, the cost of mapping databases increase with the amount of details provided thereon.

It would be desirable to have a navigation system that provides current information to users without the need to update their local databases whenever changes occur. In addition, it would be desirable to include real-time information such as traffic, weather and road conditions and the like for determining optimal routes. Further, it would be desirable to increase the level of details provided by current navigation systems without requiring expensive databases and/or databases that are beyond the capacity of the local storage device.

A current system, which connects to on-line servers in real-time, is Toyota's MONET navigation system implemented in Japan. The MONET system establishes a connection to the server that is responsive to requests for real-time information including current traffic conditions and the like. The server gathers the requested information and downloads the data to the client.

In this fashion, the MONET system, and other similar current systems, provide information and/or services to users in real-time. This information and/or services include real-time traffic data, road restrictions, email services, news, sports, and weather reports, points-of-interest data, and emergency information such as police, hospital and roadside assistance. These current systems also typically allow the user to download pictures of current traffic conditions, points of interest and the like.

In these current systems, all geographical data transmitted by the server is in a propriety format. That is, downloaded information used to describe geographical data, such as point-of-interest addresses and detailed map data, includes data points, indices and the like that are specific to the particular mapping database used on the client.

Accordingly, the client navigation system must have a particular pre-defined mapping database installed in order to work with the server. In some cases, the mapping database used by the client and server must be identical. If there is a mismatch between the expected mapping database and the actual mapping database used on the client, the client cannot properly interpret the geographical data downloaded from the server and the system will fail to operate.

Accordingly, customers using these current systems must obtain the latest version of the mapping database software available. This presents a major burden for customers and manufacturers alike due to the high frequency in which these databases must be updated.

In addition, the data downloaded by the client generally requires high bandwidth communication channels due to the sheer volume of data transmitted by these current systems. Such high bandwidth communication channels are expensive and may not be readily available in all areas. It would be desirable to develop a system that requires lower bandwidth communication channels than that required by these current systems.

Another problem with the current systems outlined above is that the client must include sophisticated algorithms for calculating optimal routes. In addition, these route-calculating algorithms in the client must be updated in accordance with current services and options available on the server. For example, if the server were updated to provide a new or modified feature to the client, the client must be specifically customized to support the new or modified feature. Thus, a very close coordination between the software installed on the server and the software installed on the clients must be maintained. This creates an additional economic burden for customers.

Another problem with the current systems is that the proprietary server cannot be used with navigation systems and mapping databases provided by other manufacturers. As stated, using current systems, client software must be frequently customized and very specific mapping software must be used. It would be desirable to have a navigation system that can be easily adapted to work with a variety of mapping software and navigational systems.

SUMMARY OF THE INVENTION

The present invention alleviates many of the failings of the prior art. One advantage of the present invention is that it alleviates the need to have specific pre-defined turn-by-turn mapping databases installed on the client. The present invention can be used with any mapping database installed on the client navigation system. In addition, the level of detail necessary for the client-installed mapping database is minimal.

Another advantage of the present invention is that the client navigation system can be made much less complex than those used in current systems. A feature of the present invention is that the server performs routing generation on behalf of the client. The routing generation takes all real-time variables into account, as well as user preferences and the like. Accordingly, the present invention alleviates the need to install sophisticated and expensive routing algorithms and/or complex hardware components on the client that are used to perform local routing calculations. In many cases, the role of the client system can be limited to displaying routes generated by the server.

Another advantage of the present invention is that it does not require software changes on the client navigation systems whenever the server provides new and/or modified

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features. All enhancements to the services provided by the server are independent from the software installed on the client.

Another advantage of the present invention is that it alleviates the need for users to update their mapping database whenever a new version is available. A feature of the present invention is that the server is hardware and software independent from the client. In this fashion, navigation systems from any vendor can be easily adapted to work with the server of the present invention.

Another feature of the present invention is that it uses a natural language to describe optimal routing information that can be interpreted by a variety of clients with minimal software additions. An advantage of the present invention is that low bandwidth communication channels can be used to download the information from the server to the clients. A further advantage of the present invention is that the natural language routing descriptions can be highly compressed to thereby reduce the already low bandwidth requirements of the wireless communication channels.

A generic natural language description is used to specify optimal routing information that is transmitted from the server to the client. The natural language description is completely independent from the local mapping database software used on the clients, and can therefore be used in conjunction with any type of mapping database software.

The client navigation system establishes a wireless connection to the server via cellular telephone technology or the like. Once connected, the client requests a specific route by uploading start and stop specifications to the server. The server independently calculates an optimal route for the user based on real-time and current data available to the server, as well as user preferences or the like.

The routing information is formatted using a natural language specification in accordance with each specific embodiment of the present invention. Generally this specification includes a plain text description for each link in the route using pre-defined generic terms such as road names and turning directions. The client interprets this routing data and interfaces with the local mapping database to reconstruct, in the format required by the client, the optimal route from the natural language description. This is accomplished by using a mapping reconstruction algorithm stored on the client.

Once the route is reconstructed, it is displayed on the display screen on the client navigation system, using whatever mapping database is present on the client. In this fashion, the database software used on the server is completely hardware and software independent from that used on the client.

In one embodiment of the present invention, an enhanced user-interface data-entry feature is provided. This "auto complete" feature anticipates data being entered by users to minimize the data-entry process. This feature is especially useful in an automobile navigation system due to the inherent difficulty in entering data while driving.

In another embodiment of the present invention, the current time zone is derived from the current GPS position. This information is used to set the clock on the navigation system to a highly accurate local time. In addition, this feature avoids the problem found in current systems that do not update local clocks.

In another embodiment of the present invention, maps are automatically scrolled on the display screen so that a representation of the automobile always points to the right or to the left. This enhanced user-interface feature provides a

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more efficient display allowing for more look-ahead space on displays that are wider than they are tall.

In another embodiment of the present invention, a telephone coupled with the navigation system automatically displays the current local time for a called party, even if the called party is in a foreign country. The dialed number is used to query a local database for providing local time information for the called party.

Further features and advantages of the invention, as well as the structure and operation of various embodiments of the invention, are described in detail below with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE FIGURES

The present invention is described with reference to the accompanying drawings, wherein:

FIG. 1 depicts an operational environment according to an embodiment of the present invention;

FIG. 2 is a block diagram depicting details of the navigation system according to an embodiment of the present invention;

FIG. 3 is a block diagram depicting some of the functional components of the navigation system in accordance with an embodiment of the present invention;

FIG. 4 is a flowchart that depicts a process that can be used in an embodiment of the present invention;

FIG. 5 is a block diagram describing a natural language format that can be used to specify route in accordance with an embodiment of the present invention;

FIG. 6 is a flowchart depicting a process that can be used to implement the map reconstruction feature in accordance with an embodiment of the present invention;

FIGS. 7A, 7B and 7C are block diagrams depicting an enhanced user-interface feature for data-entry in accordance with an embodiment of the present invention;

FIG. 8A is a flowchart depicting a process that can be used to implement an enhanced feature for determining current time zone information in accordance with an embodiment of the present invention;

FIG. 8B is a depicts three sets of time zone division lines ranging in accuracy from coarse to medium to fine in accordance with an embodiment of the present invention;

FIG. 9 is a flowchart depicting a process that can be used to calibrate a real-time clock in the navigation computer 204 in accordance with an embodiment of the present invention;

FIGS. 10A and 10B depict a navigational mapping system display in accordance with an embodiment of the present invention; and

FIG. 11 is a flowchart depicting a process that can be used to implement the current time reporting feature of the present invention.

In the figures, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The figure in which an element first appears is indicated by the leftmost digit(s) in the reference number.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 depicts an operational environment according to an embodiment of the present invention. A navigational system 102 is installed in a mobile unit such as an automobile 104. In one embodiment, the navigation system 102 receives data from Global Positioning System (GPS) satellites 110 for

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tracking purposes. A minimum number of three satellites is needed to obtain accurate readings. As described below, the connection to the GPS satellites 110 is an optional component of the navigation system 102 according to the present invention.

The navigation system 102 has the capability for wireless communications. In this example, one use of the wireless communication feature is to connect the navigation system 102 with a computer network, such as the Internet 118. The wireless communication feature of the present invention is also used for providing standard telephony functions.

In one example, cellular technology is used to implement the wireless communication feature of the present invention. In FIG. 1, the base station 106 and the mobile switching office 108 represent a portion of a typical cellular network. The base station 106 sends and receives radio signals to and from the navigation system 102. The mobile switching office 108 is coupled to the base station 106 via standard telecommunication transmission lines. Likewise, the mobile switching office 108 is coupled to the public switched telephone network 112 via standard telecommunication transmission lines. The public switched network 112 is coupled to the Internet 118 via a point-of-presence, which is typically implemented using high bandwidth T3 telecommunication channels or the like.

A navigation server 114 is coupled to the Internet 118. The navigation server 114 is used to generate and download optimal routing information to the navigation system 102 in accordance with real-time data gathered from various providers on the Internet 118, and current mapping data stored in the database 116, and user profile information stored in the database 117.

Note that the cellular network is just one example of a technology that can be used to implement the wireless communication feature of the present invention. In other embodiments, different types of wireless technology can be used, such as low orbit or geosynchronous orbit satellite communications. In fact, any type of wireless technology can be used to provide the wireless communication feature of the present invention.

Further, the Internet 118 is used in a preferred embodiment of the present invention due to its wide use and availability. However, any type of computer network can be used in alternate embodiments of the present invention. As such, the use of the examples of a cellular network and the Internet 118 should not be construed to limit the scope and breadth of the present invention.

Details of the navigational system 102 are depicted in FIG. 2. Specifically, the navigation system comprises a navigation computer 204, a mapping database 208, a display screen 212, a keypad input device 214, a speech interface 218, a GPS receiver 206, a wireless transceiver 202 and a telephony device 210.

Note that these components, such as the GPS receiver 206 and/or the wireless transceiver 202 may be imbedded within the navigation computer 102. Alternatively, such components may be implemented as discrete external devices coupled to the navigation computer 102 through external ports, such as RS-232, SCSI, USB ports or the like.

Any type of general or special purpose computer system can be used to implement the navigation computer 204. Typically the navigation computer 204 includes a CPU, local working memory, or RAM, non-volatile program memory, or ROM, and some form of non-volatile external memory such as a CD storage system or the like. An example of a general-purpose computer system that can be used in an

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embodiment of the present invention is a Clarion Auto PC manufactured by Clarion Corporation of America.

The display screen 212 is used to display output from the navigation computer 204. For example, geographical maps from the mapping database 208 are displayed on the display screen 212. In this example, the display screen 212 is a liquid crystal display that conforms to the Auto PC platform specification maintained by Microsoft Corporation. In this example, using the Auto PC platform specification, the navigation system 102 fits into a standard 1-DIN unit in the dash of an automobile 104. In accordance with this example standard, the display screen 212 is 256 pixels wide by 64 pixels tall. An improved method for displaying a navigational mapping system on such a display is described in detail below with reference to FIGS. 10A and 10B.

The keypad device 214 is coupled to the navigation computer 204 and is used for inputting data. For example, start and stop designations for a desired navigational route are input into the navigation computer 204 via the keypad 214. An improved method for efficiently inputting data into the navigation system via the keypad 214 is described in detail below with reference to FIGS. 7A, 7B and 7C.

A clock 219 coupled to the navigation computer 204 displays the local time. In one embodiment, the clock 219 has a mode in which it displays the local time of a called party via the telephonic device 210. Note that in one embodiment, the time is displayed on the display screen 212. Alternatively, in another embodiment, the time is displayed on a display on the telephonic device 210. Alternatively, in yet another embodiment, the time is displayed on another display device coupled to the navigation computer 204.

In this example, a speech interface 218 is also coupled to the navigation computer 204. The speech interface 218 uses voice recognition techniques to accept spoken commands from users for controlling the navigation computer 204. The speech interface 218 is used in a preferred embodiment to allow users to control the computer 204 via spoken voice commands for promoting safe driving conditions while operating the navigation system 102.

The mapping database 208 is used to store local mapping data. As described in detail below, the local mapping database can be any type of mapping database supported by a specific implementation of the present invention. The mapping database need not match the mapping database 116 used by the navigation server 114.

The map display software 209 comprises methods for displaying, on display 212, routes reconstructed from the optimal routing information provided by the server 114.

The wireless transceiver 202 is used to send and receive data between the navigation computer 204 and the navigation server 114. In addition, the wireless transceiver 202 is used to provide standard and enhanced telephony services via the telephonic device 210. In one embodiment of the present invention, an enhanced telephony service that is provided is one that automatically displays the current time of day relative to a called party's location upon dialing out. This aspect of the present invention is described in detail below with reference to FIG. 11.

The GPS receiver 206 is used to track the position, speed and bearing of the mobile unit 104. As is well known, the GPS is a collection of 24 satellites owned by the US Government. Other similar systems can also be used in alternate embodiments of the present invention. One example of a similar system is the Russian GLONASS system.

In general, the GPS and other similar systems provide highly accurate positioning and navigational information.

Currently, the US GPS comprises 24 twenty-four NAVSTAR GPS satellites which orbit 12,000 miles above the earth and constantly transmit their individual positions as well as the current precise time-of-day. The current precise time-of-day is provided by one of four highly accurate on-board atomic clocks.

GPS receivers, such as the receiver 206, listen to the information received from at least three satellites to determine the precise location of the receiver, as well as velocity and bearing information (if in motion). The GPS receiver 206 determines its distance from the satellite by using the travel time of the radio message from the satellite 110 to the receiver 206. After calculating its relative position from at least three satellites 110, the current position is calculated using well known triangulation techniques.

Accordingly, when the GPS receiver 206 is present, the navigation computer 102 uses data from the GPS to track the current location of the mobile unit 104. The current location is overlaid on a map from the mapping database 208 and is displayed on the display screen 212.

In one embodiment of the present invention, the precise location that is calculated by the GPS receiver 206 is used to determine current time zone information. This information can be used for example to set a highly accurate compensated local time in the navigation computer 204. Details of this aspect of the present invention are subsequently described below with reference to FIGS. 8 and 9.

FIG. 3 is a block diagram depicting some of the functional components of the navigation system in accordance with an embodiment of the present invention. The navigation computer 204 is provided with a web server interface component 302. The web server interface component 302 is used to perform web browser-like functions for the navigation computer 204. As shown, the web server interface is coupled with the navigation server 114. This is generally accomplished through the use of the wireless transceiver 202.

Accordingly, the web server interface module 302 interprets data streams from the server for displaying display text and/or graphics on the display screen 214. Preferably, the data streams transmitted by the server 114 are in a standard format, such as HTML, a modified version of HTML or the like. In this fashion, generic web-browsing tools can be used to interface with the web navigation server 114 of the present invention.

The web server interface module 302 is also used to accept input 304 from the user and transmit such user input 304 to the server 114. For example, users may request a route to be calculated by the server 114 by inputting route start and stop designations.

Route data that is calculated by the server 114 is downloaded to the navigation computer 204 via the web server interface 302. The map reconstruction module 306 then processes the route data. In particular, the map reconstruction module interprets the route data and reconstructs, in the format required by the map display software 209, the optimal route calculated by the server 114, using the local mapping database 208. As indicated by block 308, the reconstructed mapping data is displayed, by the map display software 209, on the display screen 214.

FIG. 4 is a flowchart that depicts a process that can be used in an embodiment of the present invention. The process begins with step 404, where the navigation computer 204 establishes a connection with the server 114. Once a connection is established, the user inputs start and destination parameters for a requested route.

In step 408, the server connects with other databases, as necessary to obtain real-time information that is to be used

in calculating an optimal route for the user. For example, the server may connect with another server on the Internet 118 that provides current traffic or road conditions relevant to the proposed route. Alternatively, such information may reside in one or more resources directly controlled by the navigation server 114, such as the database 116, or the user profile 117.

In any case, the Internet 118 is a preferred computer network used in an embodiment of the present invention because of the wide availability of information offered by governmental, educational and commercial sources. Thus, depending on the specific implementation of the present invention, real-time data provided by the present invention can originate from the navigation server 114, or from other sources on the Internet 118.

Accordingly, the knowledge base used by the navigation server 114 can be local or widely distributed, depending on each specific implementation of the present invention. On one end of the spectrum, the navigation server 114 provides all of the real-time information for the mobile navigation system 102. On the other end of the spectrum, none of the real-time data is provided directly from navigation server 114, but from other resources available on the Internet 118. In a typical embodiment, the distribution of the knowledge base falls somewhere in-between these two extremes.

In step 408, the server 114 optionally reads or requests user preference data for calculating the route. For example, the user may want to avoid toll roads, dirt roads or major highways. The server 114 can request this information from the user in real-time. Alternatively, such information may be pre-stored from previous sessions and is accessible by the server 114, from the database 117. Many known methods can be used to obtain user specific information, such as the use of cookies and the like. Such methods would be apparent to persons skilled in the relevant art(s).

In step 412, the server calculates an optimal route based on the start and destination data from step 406, the real-time data from step 408, and the user information, if any, from step 410. Next, in step 414, the server 114 formats the routing data in accordance with a natural language specification. An example of a natural language specification that can be used to implement an embodiment of the present invention is described below with reference to FIG. 5.

Next, in step 416, the server downloads the calculated optimal route to the navigation computer 204. Typically, this data is compressed prior to downloading in step 416. Upon receipt of the compressed data, the client uses a decompression algorithm to expand the data to its original text format. The textual nature of the natural language specification of the present invention provides for highly compressible routing data to thereby reduce bandwidth requirements for the wireless connection.

In step 418, the client interprets the routing data, queries the mapping database 208, and reconstructs the optimal route in terms that are native to the mapping database 208 and/or the map display software 209. In step 420 the route is displayed, by the map display software 209, on the display screen 212, as indicated by block 308.

FIG. 5 is a block diagram describing a natural language format that can be used to specify routes in accordance with an embodiment of the present invention. A generic designation for the natural language description is depicted in block 502. This is followed by a specific example of a formatted calculated route as shown in block 508.

The natural language description 502 preferably consists of start and end route designations 504. These designations

are described using a natural language specification and generally include such information as street names and city names, etc. In addition, in a typical embodiment, the start/end route designation includes a start direction.

The start and end route designations are followed by a number of links **505a**, **505b**, . . . **505n** (generally **505**). Each link **505** is described using a natural language description. This can include many variables such as a street name, a distance, a turning orientation, a landmark designation, a turning distance from the landmark, etc. Many variations can be used in different embodiments of the present invention in accordance with desired features.

In a preferred embodiment, a minimal amount of information is used to describe each link to minimize bandwidth requirements. The route table **508** depicts a specific example of a calculated route that begins on Sea World Drive in San Diego Calif. and ends on South Rodeo Drive in Beverly Hills Calif.

As stated above, the natural language routing description **502** begins with the start/end route designations **504**. An example of a start/end route designation is shown in block **510**. These designations can be as simple as the name of the start and end streets as well as the city and state of such streets. In this example, the start/end route designation is defined as "Sea World Drive, San Diego Calif. to South Rodeo Drive, Beverly Hills Calif. The meaning of these terms is self-explanatory.

The first link **514** describes information about the next turn. In particular, the link **514** lists the name of the next road ("Interstate 8"), the orientation of the turn at Interstate 8 ("90 Deg.") and the distance to the turn at Interstate 8 ("1.4 miles"). Similarly, Link **515** lists the name of the next road ("Interstate 5"), the orientation of the turn ("0 Deg.") and the distance ("127.3 miles"). The next link **518** lists the name of the next road ("Santa Monica Highway 2"), the orientation of the turn ("45 Deg.") and the distance to the turn ("2.9 miles"). Finally, the last link **520** lists the next turn ("South Rodeo Drive"), the turning orientation ("180 Deg.") and the distance to the turn ("1 mile").

As described below, this information is processed by the navigation computer **204** to reconstruct and display the route **508** using the local mapping database **208**. As stated, the local mapping database **208** can be different from the mapping database **116** used by the server **114** to calculate the route. Specifically, the map reconstruction module **306** reads the natural language routing description **508** and reconstructs the route in step **418**.

A method that can be used by the map reconstruction module **306** to reconstruct the route (as shown in step **418** from FIG. 4) will now be described with reference to FIG. 6. The map reconstruction process **600** begins with step **602**. In step **602**, the process finds the starting point of the route. Typically, this starting point is listed in the first entry **504** in the natural language description **502**. It should be noted that there are many ways in which to specify a start location. For example, in one embodiment, the start location is specified in accordance with the current GPS location. In another embodiment, the start location is specified by specific user input. In yet another embodiment, preprogrammed user information, such as a home or work address is stored in either the navigation computer **204** or the user profile database **117**. In any case, various methods for specifying a start location that can be used in specific embodiments of the present invention would be apparent to persons skilled in the relevant art(s).

Accordingly, in step **602**, the start location is found within the local mapping database **208**. Specific methods for

searching the local mapping database **208** depend on the actual mapping database being used in each specific implementation of the present invention. Typically, standard map data accessing function calls are used in accordance with requirements of a predefined application-programming interface (API). Specific method steps for searching various types of mapping databases **208** would be apparent to persons skilled in the relevant art(s).

Once the starting point is found on the mapping database **208**, the process continues with step **604**. In step **604**, the next link is extracted from the natural language description **505**. As stated, this includes at least the street name of the next turn ("next turn street") and the type of the next turn ("turn type"). It should be noted the turn type could be specified in various ways. For example, the turn type could be specified in terms of absolute degrees, as shown in FIG. 5 or as directional indicators, such as N, NE, E, SE, S, SW, W and NW. Alternatively, the turn type could be specified as a left turn or a right turn, a left bear or a right bear, etc. Any method for describing turns can be used in alternative embodiments of the present invention.

Next, in step **606**, the current road in the mapping database **208** is followed in the indicated direction. The indicated direction is determined by the start/end route designations **504**, or from the last turn. Next, in step **608** the process determines if the last link **505n** has been processed. If so, the map is highlighted in accordance with the reconstructed routing information determined from the previous steps. Typically, the highlighted map is displayed on the display screen **212**.

If the last link **505n** has not been reached in step **608**, control passes to step **610**. In step **610** the current road in the mapping database **208** is searched for the next occurrence of a cross street. The goal is to determine the exact location (i.e. the latitude and longitude) of each maneuver. This is accomplished by finding the intersection of the two streets before and after a maneuver under consideration. In one embodiment, it is assumed that the street names and the city name of the streets have been extracted from the turn-by-turn text instructions provided by the server.

This task can be achieved by using standard map data accessing function calls. A node ID of the maneuver point (intersection) can thus be obtained. Once the maneuver point is identified, the road segment corresponding to the next cross street can be determined.

Next, in step **612**, the process adds the map information to the reconstructed route. Control next passes to step **614**. The objective is to construct a route data structure or "link list" which consists of all the shape points along the route. Given two nodes (i.e. maneuver points) and the name of the road between them, the process traces through the segments that connect the two nodes. From each segment, a series of shape points can be obtained. The result of step **612** is link list of shape points, which define part of the route.

Next, in step **614**, the process double checks if the found cross street matches the turn street. In a preferred embodiment, fuzzy logic is used to implement the street name comparison in step **614** to account for differences in spelling and for differences in street names such as "road" verses "drive", "street", or "circle" and abbreviations and the like. If an exact match is not found, heuristic techniques can be used to determine the best match. Typically, this involves additional searching in the current direction to determine if other candidates exist.

If in step **614**, a match between the cross street and the turn street is found, control passes to step **616**. In step **616**,

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the process makes the turn as indicated in the link information. Control next passes back to step 604, where the next link is read. The process represented by steps 604-616 continues until step 608 determines that the last link has been processed, as described above.

The outcome of this algorithm depicted by flowchart 600 is a link list of shape points, which define the optimal route downloaded from the server 114. A subset of the link list of shape points is the actual maneuver points. This reconstructed route data can then be used to display and route track a vehicle progression along the route. The navigational computer 204 can then issue guidance instructions to the user at appropriate times (e.g. when the automobile 104 approaches a turn).

An enhanced user-interface data-entry feature will now be described with reference to FIGS. 7A, 7B and 7C. This feature is preferably used in embodiments of the present invention that include the use of data entry fields similar to the type shown in FIG. 7C. This type of data entry field is hereinafter referred to as a "keypad data entry field." A keypad data entry field provides the capability for inputting alphanumeric characters with the use of a keypad device, rather than a keyboard device. Keypad data entry fields can be found, for example, in Microsoft's CE Auto PC operating system.

The keypad input device 214 used in one embodiment of the present invention consists of five keys that are arranged as shown in FIG. 7A. In this example, the central key 711 is used to perform an "Enter" function and is hereinafter referred to as the "enter-key 711." The four directional keys 705, 707, 709, and 703 are generally used to alter the position of a screen object, such as a cursor or the like. In addition, the directional keys are used to scroll data as described below.

FIG. 7C represents a single keypad data entry field shown at different points in time. In particular, in this example, the elapsed time increases as the reference numerals 712-720 increase. In this example, different character positions are highlighted (as indicated by darkened triangles) at each point in time 712-720. That is, the first character is highlighted at time 712, the second at time 714, the third at time 716, the fourth at time 718 and the fifth at time 720.

The highlighted character position indicates the active character position. When a particular character position is active, users can manipulate the data within that position by using the up and down arrow keys 703 and 707, respectively. Typically, pressing the up arrow key 703 scrolls data in the data in the active character position in a descending alphabetical order. Similarly, pressing the down arrow key 707 scrolls the data in the active character position in an ascending alphabetical order.

Further, users select which character position in the data entry field is active by manipulating the left 709 and right 705 arrow keys. The enter-key 711 is generally depressed to indicate that data should be entered and accepted by the program.

The enhanced user interface feature of the present invention anticipates the contents of data being entered by the user and fills-in the data entry field with the anticipated characters to the right of the active character position. In this fashion, if the anticipated data is correct, the user need not enter data into the remaining character positions, but instead, immediately presses the enter-key 711.

In addition, the method constantly determines a valid character set for each character position. Therefore, when user presses up arrow key or down arrow key for scrolling

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characters, only valid characters appear in the keypad data entry field in accordance with the set of allowable entries. This feature of the present invention is especially useful in a mobile environment such as an automobile, where data entry is not only cumbersome, but can also be dangerous.

The enhanced user-interface feature of the present invention functions as follows. FIG. 7B represents a portion of a database comprising allowable cities that can be specified by a user, for example, when specifying the start and/or stop route designations in step 406. In this example, the cities are listed in alphabetical order, but any order can be used in alternate embodiments.

As shown by the data entry field at time 712, the user enters an "S" in the first character position by manipulating the up and down arrow keys (703 and 707, respectively). In response to this user input, all of the character positions to the right of the active character position are completed with anticipated data. In this example, the city "Sacramento" 704 is selected as the anticipated data entry item.

In this example, "Sacramento" 704 is selected from the table 702, because it is the first entry found in the table 704 that conforms to the entered data at the time 712. That is, "Sacramento" is the first city in the table 702 that begins with the letter "S".

It is important to note that in other embodiments, different criteria can be used to select a particular item from the set of conforming data items. In this example, the set of conforming data items is all items in the table that begin with the letter "S". Further, in this example, the criterion used for selecting a particular conforming data item is that it appears first in the list, alphabetically.

In another embodiments, different criteria can be used, such as frequency of use and most recent use. For example in one embodiment, a frequency of use counter is maintained for each data item in the list 702. Accordingly, a data item having the highest frequency of use is selected from the set of conforming data items. In another embodiment, a date counter is maintained for each item in the list 702. In this example, the most recently used data item is selected from the set of conforming data items. Any method can be used to select the anticipated data item from the set of conforming data items at each point in time during the data entry process. Such methods would be apparent to persons skilled in the relevant art(s).

Next, as indicated by the time 714, the user selects the letter "A" in the second character position. At this point, the set of conforming data items is all items in the list 702 beginning with the letters "SA". This includes the data items 704-710. Using the alphabetical criterion as described above, the data item "Sacramento" is selected as the anticipated data entry.

Next, as indicated by the time 716, the user selects the letter "N" in the third character position. This letter can be quickly selected by the user because the scrollable character set at each position is limited in accordance with the allowable entry list 702. In this example, if the allowable data entry list 702 represents the entire list, then the allowable characters in the third character position is limited by to the letters "C" and "N".

When the "N" is selected, the set of conforming data items is all items in the list 702 beginning with the letters "SAN", namely 706-710. Again, using the alphabetical criterion as described above the data item "San Diego" is selected as the anticipated data entry.

Next, as indicated by the time 718, the user selects a space in the fourth character position. At this point, the set of

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conforming data items remains the same. Therefore, the data item "San Diego" is selected as the anticipated data entry.

Next, as indicated by the time 720, the user selects the letter "F" in the fifth character position. At this point, the set of conforming data items is all items in the list 702 beginning with the letters "SAN F." The set of conforming data items that meets this criterion is "San Francisco" 78. Accordingly, "San Francisco" 708 is selected as the anticipated data entry.

As stated above, in one embodiment of the present invention, the precise location that is calculated by the GPS receiver 206 is used to determine the current time zone. This information can be used for example to set the clock 219 coupled to the navigation computer 204 to a highly accurate compensated local time, based on current position. This feature avoids the problem found in current systems where a local clock is not updated with a time zone is crossed.

FIG. 8A is a flowchart depicting a process that can be used to implement an enhanced feature for determining current time zone information in accordance with an embodiment of the present invention. In step 804 time zone division lines are input into the navigation computer system 204. One way to accomplish this is to digitize time zone division lines. In step 806 three sets of time zone division lines are stored in the computer system 204. Preferably, these lines are stored as three sets of polygons having an increasing level of accuracy, as indicated by step 806.

Accordingly, three sets of time zone division lines are stored, ranging in accuracy from course to medium to fine. The course time zone division lines are wider and not as accurate as the medium division lines, which in turn are wider and not as accurate as the fine division lines. As the level of accuracy increases, so does the number and complexity of the polygons that comprise the different sets of time zone lines. In other words, the course and medium time zone division lines are approximations that are used to quickly determine whether a current position is close to an actual time zone. If so, a more precise set of lines is used. The fine time zone division lines very accurately depict the shape and position of the actual time zone division lines. The fine set of lines is much more complex and requires more polygons than the less accurate course and medium sets of lines. This concept is illustrated in FIG. 8B.

In FIG. 8B, a portion of a course, medium and fine set of time zone lines are depicted. The actual time zone is coincident with the fine set of time zone lines that are represented by the line 826. In this example the fine set of division lines 826 exactly matches the width and shape of the actual time zone. The medium set of time zone division lines 824 represent a close approximation that encompasses the time zone line 826.

Note that the medium set of lines 824 can be represented with much fewer polygons than the fine set of lines 826. In this fashion, searches using the medium set of lines 824 for determining whether a current position is coincident with the time zone lines 824 can occur much faster than using the fine set of lines 826.

The course set of time zone division lines 822 represent a gross approximation of the time zone line 826. Note that the course set of lines 822 can be represented with fewer polygons than the medium set of lines 824. In this fashion, searches using the course set of lines 822 for determining whether a current position is coincident with the time zone lines 822 can occur much faster than using the medium set of lines 824. Accordingly, as shown below, searches are made first with the course set of lines 822, followed by the medium set of lines 824, followed by the fine set of lines 826.

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Referring back now to FIG. 8A, in step 808, the process determines the current position from the GPS receiver 206 in terms of latitude and longitude. Next, in step 810, the process determines if the current position intersects with the course set of time zone division lines. It should be noted that comparing the position using the course set of time zone division lines is faster than using the medium set of time zone division lines. Similarly, the comparison using the medium set of time zone division lines is faster than using the fine set of time zone division lines. In this fashion, the medium and fine sets are used only when required (i.e. when the navigation system 102 gets closer to an actual time zone division line.)

When the navigation system 102 gets close to a time zone, the compare using the course approximation location information will indicate that an intersection between the current location and the course set of lines exist. This indicates that a higher resolution compare is required using a finer set of time zone division lines.

Accordingly, in step 810, a comparison is made between the current position and the course set of time zone division lines. In step 812, the process determines if the current position intersects with the time zone division lines in accordance with the comparison. If it does, the process determines if the most accurate set of division lines have been used in step 812. If so, control passes to step 818, where the new time zone is set. If not, the next finer set of division lines are used for another comparison, as indicated by steps 814 and 812.

If it is determined in step 812 that an intersection between the current position and the time zone lines do not exist, control passes back to step 808 and the process repeats. Note that an embodiment of the present invention may include a delay between steps 812 and 808. For example, it may be desirable to save CPU cycles by checking for a new time zone at specified intervals, rather than continuously.

FIG. 9 is a flowchart depicting a process that can be used to calibrate a real-time clock in the navigation computer 204. The process begins with step 904. In step 904 the process determines the current time in Greenwich Mean Time (GMT) from the GPS receiver 206. Next, in step 906, the process determines the current time zone information. This can be accomplished using the process 800 as described above.

Next, in step 908, the process converts the GMT to local time in accordance with the current time zone and daylight savings time and like. A database that is accessible to the navigation computer 204 is used for this purpose. In step 910 the process sets the local time of the navigation computer 204 in accordance with the time calculated in step 908. The process ends as indicated by step 912.

As stated above, the display screen 212 is used to display geographical maps from the mapping database 208. In addition, the current position of the automobile 102 is superimposed on the geographical map to indicate the current position and bearing. In this example, the display screen 212 is a liquid crystal display that conforms to the Auto PC platform specification maintained by Microsoft Corporation. In this example embodiment, the navigation system conforms to the Auto PC platform and thus 102 fits into a standard 1-DIN unit in the dash of the automobile 104. It is assumed that in accordance with this standard, the display screen 212 is on the order of 256 pixels wide by 64 pixels tall. A method for displaying a navigational mapping system on such a display will now be described with reference to FIG. 10.

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A "head-right" map display **1002** is shown in FIG. **10A**. In this example, the automobile **104** is represented by the triangle **1004**. In this example the automobile is heading from left to right. In the head-right display **1002**, the map is continuously rotated such that the direction of the vehicle **1004** always points to the right. This method is much preferred over the current method of displaying maps such that the vehicle always points up. Using a head-right display is preferred due to the fact that the display screen **212** is significantly wider than it is tall. In this fashion, by using a head right display, more look-ahead space of the route is provided.

Alternatively, a "head-left" map display **1006** as shown in FIG. **10B** can be used. This may be the preferred method for automobiles equipped with a steering wheel on the right side. In this example, the automobile **104** is represented by the triangle **1008** and is heading from right to left. In the head-left display **1006**, the map is continuously rotated such that the direction of the vehicle **1004** always points to the left. This method is much preferred over the current method of displaying maps such that the vehicle always points up.

In one embodiment of the present invention, a database is maintained that maps time zone information to telephone numbers. This database is used to provide an enhanced user-interface feature of the present invention. In particular, the database is used to display the current local time of a called party, when dialing out on the telephonic device **210**. The database used to implement this feature matches country codes, city codes, area codes, and local exchange information that comprise telephone numbers to time zone information.

FIG. **11** is a flowchart depicting a process that can be used to implement this feature of the present invention. In step **1104**, the telephone number input by the user is parsed to extract a country and city code, or an area code and three-digit exchange. Once this information is extracted, it is used in step **1106** to query a database that matches such information with time zone information. The time zone information is generally relative to universal time or GMT, and typically ranges from GMT -12 hours to GMT +12 hours. Once this information is retrieved from the database, the current time in GMT is obtained as indicated in step **1108**.

After the current GMT is obtained, it is adjusted in accordance with the time zone information as indicated in step **1110**. Finally, in step **1112**, the adjusted time is displayed to the user.

While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only, and not limitation. Thus, the breadth and scope of the present invention should not be limited by any of the above-described exemplary embodiments, but should be defined only in accordance with the following claims and their equivalents.

What is claimed is:

1. A method for providing an optimal route using real-time information for a navigation system comprising a client and a server, said server coupled to a computer network, said method comprising the steps of:

- establishing a wireless connection between the client and the server;
- transmitting start and end route designations from the client to the server;
- accessing real-time information by the server;
- calculating the optimal route by the server, based on the real-time information and said start and end route designations;

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formatting the optimal route into a non-proprietary, natural language description;

downloading said non-proprietary, natural language description to the client;

reconstructing the optimal route by the client using a local mapping database; and

displaying said optimal route on a display system coupled to the client.

2. The method of claim 1, wherein said step of formatting includes the step of dividing the optimal route into one or more links, wherein each link includes at least a street name and a turning orientation.

3. The method of claim 2, wherein said step of reconstructing includes the steps of:

searching said local mapping database for a closest match of said street name and said turning orientation for each of said links; and

building the optimal route by combining each of said closest matches from said searching step.

4. The method of claim 1, wherein said accessing step comprises the step of accessing a traffic database comprising current traffic conditions; and

querying said traffic database for determining current traffic conditions between locations defined by said start and end route designations.

5. The method of claim 1, wherein said real-time information includes one or more from the set of:

- current traffic conditions;
- highway ramp configurations;
- current weather conditions;
- constriction information;
- road restrictions;
- detour information; and
- event traffic information.

6. The method of claim 1, wherein said wireless connection is accomplished using a cellular network.

7. The method of claim 1, wherein said transmitting step includes the step of entering into a keypad data entry field, said start and stop route designations including a name for one or more of:

- a city;
- a state;
- a country; and
- a street.

8. The method of claim 7, wherein said step of entering comprises the steps of:

- comparing data entered into the keypad data entry field with a database of allowable entries;
- determining a set of conforming data items associated with said entered data;
- applying a criterion to said set of conforming data items to determine an anticipated data item; and
- displaying said anticipated data item in the data entry field.

9. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that appears first alphabetically.

10. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most frequently.

11. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most recently.

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12. The method of claim 1, wherein said downloading step comprises the step of compressing said natural language description.

13. The method of claim 1, wherein said calculating step further comprises the step of reading user-specific data in calculating the optimal route.

14. The method of claim 1, wherein said computer network is the Internet.

15. A mobile navigation system comprising:

a navigation computer;

a wireless transceiver coupled to said navigation computer for connecting with a navigation server, said navigation server for calculating optimal routes based on real-time information, said optimal routes being formatted using a non-proprietary, natural language description;

a mapping database coupled to said navigation computer for reconstructing said optimal route from said non-proprietary, natural language description; and

a display screen coupled to said navigation computer for displaying said optimal route using said mapping database.

16. The mobile navigation system of claim 15, further comprising:

a GPS receiver coupled to said navigation computer for monitoring position;

a telephonic device coupled to said wireless transceiver and said navigation computer for making and receiving telephone calls; and

a keypad coupled to said navigation computer for entering start and end route designations.

17. The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head right configuration.

18. The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head left configuration.

19. The mobile navigation system of claim 16, further including a clock coupled to said navigation computer, wherein said navigation computer is programmed to set said clock to an accurate local time in accordance with a time from said GPS receiver and a current time zone.

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20. The mobile navigation system of claim 15, further including a clock coupled to said navigation computer, and said telephonic device, wherein said navigation computer is programmed to indicate from said clock a local time of a called party based on a dialed number.

21. A method for providing an optimal route using real-time information from a server of a navigation system, the navigation system also comprising a client and said server coupled to a computer network, said method comprising the steps of:

establishing a wireless connection with the client;

receiving at the server start and end route designations from the client;

calculating at the server the optimal route based on real-time information at the server and said start and end route designations;

formatting at the server the optimal route into a non-proprietary, natural language description;

downloading from the server said non-proprietary, natural language description to the client so that the client can reconstruct the optimal route using a local mapping database and display said optimal route on a display system coupled to the client.

22. A method for providing an optimal route using real-time information at client of a navigation system, the navigation system also comprising a client and said server coupled to a computer network, said method comprising the steps of:

establishing a wireless connection with the server;

transmitting start and end route designations from the client to the server;

receiving from the server an optimal route formatted in a non-proprietary, natural language description and calculated based on real-time information and said start and end route designations;

reconstructing the optimal route using a local mapping database; and

displaying said optimal route on a display system coupled to the client.

* * * * *



Patent
239/054

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To: Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

NEW APPLICATION TRANSMITTAL
UTILITY

Sir:

Transmitted herewith for filing is a **utility** patent application:

Inventor(s): Qing Kent Pu and Hui Henry Li

Title: MOBILE NAVIGATION SYSTEM



I. PAPERS ENCLOSED HEREWITH FOR FILING:

30 Page(s) of Specification (which includes 6 Page(s) Claims)

1 Page Abstract

12 Sheets of Drawings Informal X Formal

II. ADDITIONAL PAPERS ENCLOSED IN CONNECTION WITH THIS FILING:

☒ Executed Declaration and Power of Attorney.

☒ Assignment to InfoGation Corporation and assignment cover sheet.

☒ Verified Statement establishing "Small Entity" under 37 CFR §§ 1.9 and 1.27.

☐ Priority Document No(s):

☐ Information Disclosure Statement w/PTO 1449 ☐ References

SD-99473.1

CERTIFICATE OF MAILING
(37 C.F.R. §1.10)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as 'Express Mail Post Office To Addressee' in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

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☐ Preliminary Amendment.

III. THE FILING FEE HAS BEEN CALCULATED AS SHOWN BELOW:

BASIC FILING FEE:						\$760.00
Total Claims	28	-	20	=	8	x \$18.00 \$144.00
Independent Claims	7	-	3	=	4	x \$78.00 \$312.00
Multiple Dependent Claims	\$260	(if applicable)			☐	\$0.00
TOTAL OF ABOVE CALCULATIONS						\$1,216.00
Reduction by 1/2 for Filing by Small Entity. Note 37 CFR §§ 1.9, 1.27, 1.28. If applicable, Verified Statement must be attached.						☒ \$608.00
Misc. Filing Fees (Recordation of Assignment)						\$40.00
TOTAL FEES SUBMITTED HERewith						\$648.00

IV. METHOD OF PAYMENT OF FEES

- ☒ A check in the amount of \$648.00.
- ☐ Charge Deposit Account No. 12-2475 in the amount of _____.
- ☐ This application is being filed without fee or Declaration under 37 CFR § 1.53.

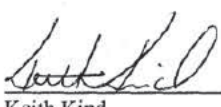
V. AUTHORIZATION TO CHARGE FEES

The Commissioner is authorized to charge any underpayment of fees or credit any overpayment of fees to deposit account No. 12-2475.

Respectfully submitted,

LYON & LYON LLP

Dated: January 6, 1999

By: 
Keith Kind
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MOBILE NAVIGATION SYSTEM*Background of the Invention**Field of the Invention*

The present invention relates generally to mobile navigation system and apparatus, and more particularly to a distributed navigation system having a wireless connection to a server for calculating optimal routes using real-time data.

Related Art

In recent years, navigation systems, in which automobiles are equipped with a navigational computer that includes a display screen, an input means such as a keypad or a remote control, and a storage means such as a CD, have become popular. Geographical map and routing data is typically stored on the CD. The map database on the CD can have various levels of detail. At the very least, the map database includes geographical information at the major road level. Additional details that can be included are minor roads, turn restrictions, one-way streets, highway ramp configurations, hotel, restaurant and other business information, traffic history, emergency facility locations and the like. The map databases with routing information are referred to as navigable map data or turn-by-turn data. The levels of detail stored on such databases depend on product and marketing factors, including cost and demand, as well as the physical storage capacity limitations.

Such navigation systems are stand-alone devices that rely completely on data stored on the local storage device for geographical and other information. Thus, the capacity of the storage device becomes a limiting factor as to how much information is available to users. In addition, users must update their mapping databases frequently to stay current. Typically, the cost of mapping databases increase with the amount of details provided thereon.

It would be desirable to have a navigation system that provides current information to users without the need to update their local databases whenever changes occur. In addition, it would be desirable to include real-time information such as traffic, weather and road conditions

and the like for determining optimal routes. Further, it would be desirable to increase the level of details provided by current navigation systems without requiring expensive databases and/or databases that are beyond the capacity of the local storage device.

5 A current system, which connects to on-line servers in real-time, is Toyota's MONET navigation system implemented in Japan. The MONET system establishes a connection to the server that is responsive to requests for real-time information including current traffic conditions and the like. The server gathers the requested information and downloads the data to the client.

10 In this fashion, the MONET system, and other similar current systems, provide information and/or services to users in real-time. This information and/or services include real-time traffic data, road restrictions, email services, news, sports, and weather reports, points-of-interest data, and emergency information such as police, hospital and roadside assistance. These current systems also typically allow the user to download pictures of current traffic conditions, points of interest and the like.

15 In these current systems, all geographical data transmitted by the server is in a propriety format. That is, downloaded information used to describe geographical data, such as point-of-interest addresses and detailed map data, includes data points, indices and the like that are specific to the particular mapping database used on the client.

20 Accordingly, the client navigation system must have a particular pre-defined mapping database installed in order to work with the server. In some cases, the mapping database used by the client and server must be identical. If there is a mismatch between the expected mapping database and the actual mapping database used on the client, the client cannot properly interpret the geographical data downloaded from the server and the system will fail to operate.

25 Accordingly, customers using these current systems must obtain the latest version of the mapping database software available. This presents a major burden for customers and manufacturers alike due to the high frequency in which these databases must be updated.

In addition, the data downloaded by the client generally requires high bandwidth communication channels due the sheer volume of data transmitted by these current systems. Such high bandwidth communication channels are expensive and may not be readily available

in all areas. It would be desirable to develop a system that requires lower bandwidth communication channels than that required by these current systems.

Another problem with the current systems outlined above is that the client must include sophisticated algorithms for calculating optimal routes. In addition, these route-calculating algorithms in the client must be updated in accordance with current services and options available on the server. For example, if the server were updated to provide a new or modified feature to the client, the client must be specifically customized to support the new or modified feature. Thus, a very close coordination between the software installed on the server and the software installed on the clients must be maintained. This creates an additional economic burden for customers.

Another problem with the current systems is that the proprietary server cannot be used with navigation systems and mapping databases provided by other manufacturers. As stated, using current systems, client software must be frequently customized and very specific mapping software must be used. It would be desirable to have a navigation system that can be easily adapted to work with a variety of mapping software and navigational systems.

Summary of the Invention

The present invention alleviates many of the failings of the prior art. One advantage of the present invention is that it alleviates the need to have specific pre-defined turn-by-turn mapping databases installed on the client. The present invention can be used with any mapping database installed on the client navigation system. In addition, the level of detail necessary for the client-installed mapping database is minimal.

Another advantage of the present invention is that the client navigation system can be made much less complex than those used in current systems. A feature of the present invention is that the server performs routing generation on behalf of the client. The routing generation takes all real-time variables into account, as well as user preferences and the like. Accordingly, the present invention alleviates the need to install sophisticated and expensive routing algorithms

and/or complex hardware components on the client that are used to perform local routing calculations. In many cases, the role of the client system can be limited to displaying routes generated by the server.

Another advantage of the present invention is that it does not require software changes
5 on the client navigation systems whenever the server provides new and/or modified features. All enhancements to the services provided by the server are independent from the software installed on the client.

Another advantage of the present invention is that it alleviates the need for users to update their mapping database whenever a new version is available. A feature of the present
10 invention is that the server is hardware and software independent from the client. In this fashion, navigation systems from any vendor can be easily adapted to work with the server of the present invention.

Another feature of the present invention is that it uses a natural language to describe optimal routing information that can be interpreted by a variety of clients with minimal software
15 additions. An advantage of the present invention is that low bandwidth communication channels can be used to download the information from the server to the clients. A further advantage of the present invention is that the natural language routing descriptions can be highly compressed to thereby reduce the already low bandwidth requirements of the wireless communication channels.

20 A generic natural language description is used to specify optimal routing information that is transmitted from the server to the client. The natural language description is completely independent from the local mapping database software used on the clients, and can therefore be used in conjunction with any type of mapping database software.

The client navigation system establishes a wireless connection to the server via cellular
25 telephone technology or the like. Once connected, the client requests a specific route by uploading start and stop specifications to the server. The server independently calculates an optimal route for the user based on real-time and current data available to the server, as well as user preferences or the like.

The routing information is formatted using a natural language specification in accordance with each specific embodiment of the present invention. Generally this specification includes a plain text description for each link in the route using pre-defined generic terms such as road names and turning directions. The client interprets this routing data and interfaces with the local mapping database to reconstruct, in the format required by the client, the optimal route from the natural language description. This is accomplished by using a mapping reconstruction algorithm stored on the client.

Once the route is reconstructed, it is displayed on the display screen on the client navigation system, using whatever mapping database is present on the client. In this fashion, the database software used on the server is completely hardware and software independent from that used on the client.

In one embodiment of the present invention, an enhanced user-interface data-entry feature is provided. This "auto complete" feature anticipates data being entered by users to minimize the data-entry process. This feature is especially useful in an automobile navigation system due to the inherent difficulty in entering data while driving.

In another embodiment of the present invention, the current time zone is derived from the current GPS position. This information is used to set the clock on the navigation system to a highly accurate local time. In addition, this feature avoids the problem found in current systems that do not update local clocks.

In another embodiment of the present invention, maps are automatically scrolled on the display screen so that a representation of the automobile always points to the right or to the left. This enhanced user-interface feature provides a more efficient display allowing for more look-ahead space on displays that are wider than they are tall.

In another embodiment of the present invention, a telephone coupled with the navigation system automatically displays the current local time for a called party, even if the called party is in a foreign country. The dialed number is used to query a local database for providing local time information for the called party.

Further features and advantages of the invention, as well as the structure and operation of various embodiments of the invention, are described in detail below with reference to the accompanying drawings.

Brief Description of the Figures

5 The present invention is described with reference to the accompanying drawings, wherein:

FIG. 1 depicts an operational environment according to an embodiment of the present invention;

10 FIG. 2 is a block diagram depicting details of the navigation system according to an embodiment of the present invention;

15 FIG. 3 is a block diagram depicting some of the functional components of the navigation system in accordance with an embodiment of the present invention;

20 FIG. 4 is a flowchart that depicts a process that can be used in an embodiment of the present invention;

25 FIG. 5 is a block diagram describing a natural language format that can be used to specify route in accordance with an embodiment of the present invention;

FIG. 6 is a flowchart depicting a process that can be used to implement the map reconstruction feature in accordance with an embodiment of the present invention;

30 FIGS. 7A, 7B and 7C are block diagrams depicting an enhanced user-interface feature for data-entry in accordance with an embodiment of the present invention;

FIG. 8A is a flowchart depicting a process that can be used to implement an enhanced feature for determining current time zone information in accordance with an embodiment of the present invention;

35 FIG. 8B is a depicts three sets of time zone division lines ranging in accuracy from course to medium to fine in accordance with an embodiment of the present invention;

FIG. 9 is a flowchart depicting a process that can be used to calibrate a real-time clock in the navigation computer 204 in accordance with an embodiment of the present invention;

FIGS. 10A and 10B depict a navigational mapping system display in accordance with an embodiment of the present invention; and

5 FIG. 11 is a flowchart depicting a process that can be used to implement the current time reporting feature of the present invention.

In the figures, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The figure in which an element first appears is indicated by the leftmost digit(s) in the reference number.

Detailed Description of the Preferred Embodiments

FIG. 1 depicts an operational environment according to an embodiment of the present invention. A navigational system 102 is installed in a mobile unit such as an automobile 104. In one embodiment, the navigation system 102 receives data from Global Positioning System (GPS) satellites 110 for tracking purposes. A minimum number of three satellites is needed to obtain accurate readings. As described below, the connection to the GPS satellites 110 is an optional component of the navigation system 102 according to the present invention.

20 The navigation system 102 has the capability for wireless communications. In this example, one use of the wireless communication feature is to connect the navigation system 102 with a computer network, such as the Internet 118. The wireless communication feature of the present invention is also used for providing standard telephony functions.

25 In one example, cellular technology is used to implement the wireless communication feature of the present invention. In FIG. 1, the base station 106 and the mobile switching office 108 represent a portion of a typical cellular network. The base station 106 sends and receives radio signals to and from the navigation system 102. The mobile switching office 108 is coupled

to the base station 106 via standard telecommunication transmission lines. Likewise, the mobile switching office 108 is coupled to the public switched telephone network 112 via standard telecommunication transmission lines. The public switched network 112 is coupled to the Internet 118 via a point-of-presence, which is typically implemented using high bandwidth T3
5 telecommunication channels or the like.

A navigation server 114 is coupled to the Internet 118. The navigation server 114 is used to generate and download optimal routing information to the navigation system 102 in accordance with real-time data gathered from various providers on the Internet 118, and current mapping data stored in the database 116, and user profile information stored in the database 117.

10 Note that the cellular network is just one example of a technology that can be used to implement the wireless communication feature of the present invention. In other embodiments, different types of wireless technology can be used, such as low orbit or geosynchronous orbit satellite communications. In fact, any type of wireless technology can be used to provide the wireless communication feature of the present invention.

15 Further, the Internet 118 is used in a preferred embodiment of the present invention due to its wide use and availability. However, any type of computer network can be used in alternate embodiments of the present invention. As such, the use of the examples of a cellular network and the Internet 118 should not be construed to limit the scope and breadth of the present invention.

20 Details of the navigational system 102 are depicted in FIG. 2. Specifically, the navigation system comprises a navigation computer 204, a mapping database 208, a display screen 212, a keypad input device 214, a speech interface 218, a GPS receiver 206, a wireless transceiver 202 and a telephony device 210.

Note that these components, such as the GPS receiver 206 and/or the wireless transceiver
25 202 may be imbedded within the navigation computer 102. Alternatively, such components may be implemented as discrete external devices coupled to the navigation computer 102 through external ports, such as RS-232, SCSI, USB ports or the like.

Any type of general or special purpose computer system can be used to implement the navigation computer 204. Typically the navigation computer 204 includes a CPU, local working memory, or RAM, non-volatile program memory, or ROM, and some form of non-volatile external memory such as a CD storage system or the like. An example of a general-purpose computer system that can be used in an embodiment of the present invention is a Clarion Auto PC manufactured by Clarion Corporation of America.

The display screen 212 is used to display output from the navigation computer 204. For example, geographical maps from the mapping database 208 are displayed on the display screen 212. In this example, the display screen 212 is a liquid crystal display that conforms to the Auto PC platform specification maintained by Microsoft Corporation. In this example, using the Auto PC platform specification, the navigation system 102 fits into a standard 1-DIN unit in the dash of an automobile 104. In accordance with this example standard, the display screen 212 is 256 pixels wide by 64 pixels tall. An improved method for displaying a navigational mapping system on such a display is described in detail below with reference to FIGS. 10A and 10B.

The keypad device 214 is coupled to the navigation computer 204 and is used for inputting data. For example, start and stop designations for a desired navigational route are input into the navigation computer 204 via the keypad 214. An improved method for efficiently inputting data into the navigation system via the keypad 214 is described in detail below with reference to FIGS. 7A, 7B and 7C.

A clock 219 coupled to the navigation computer 204 displays the local time. In one embodiment, the clock 219 has a mode in which it displays the local time of a called party via the telephonic device 210. Note that in one embodiment, the time is displayed on the display screen 212. Alternatively, in another embodiment, the time is displayed on a display on the telephonic device 210. Alternatively, in yet another embodiment, the time is displayed on another display device coupled to the navigation computer 204.

In this example, a speech interface 218 is also coupled to the navigation computer 204. The speech interface 218 uses voice recognition techniques to accept spoken commands from users for controlling the navigation computer 204. The speech interface 218 is used in a

preferred embodiment to allow users to control the computer 204 via spoken voice commands for promoting safe driving conditions while operating the navigation system 102.

The mapping database 208 is used to store local mapping data. As described in detail below, the local mapping database can be any type of mapping database supported by a specific implementation of the present invention. The mapping database need not match the mapping database 116 used by the navigation server 114.

The map display software 209 comprises methods for displaying, on display 212, routes reconstructed from the optimal routing information provided by the server 114.

The wireless transceiver 202 is used to send and receive data between the navigation computer 204 and the navigation server 114. In addition, the wireless transceiver 202 is used to provide standard and enhanced telephony services via the telephonic device 210. In one embodiment of the present invention, an enhanced telephony service that is provided is one that automatically displays the current time of day relative to a called party's location upon dialing out. This aspect of the present invention is described in detail below with reference to FIG. 11.

The GPS receiver 206 is used to track the position, speed and bearing of the mobile unit 104. As is well known, the GPS is a collection of 24 satellites owned by the US Government. Other similar systems can also be used in alternate embodiments of the present invention. One example of a similar system is the Russian GLONASS system.

In general, the GPS and other similar systems provide highly accurate positioning and navigational information. Currently, the US GPS comprises 24 twenty-four NAVSTAR GPS satellites which orbit 12,000 miles above the earth and constantly transmit their individual positions as well as the current precise time-of-day. The current precise time-of-day is provided by one of four highly accurate on-board atomic clocks.

GPS receivers, such as the receiver 206, listen to the information received from at least three satellites to determine the precise location of the receiver, as well as velocity and bearing information (if in motion). The GPS receiver 206 determines its distance from the satellite by using the travel time of the radio message from the satellite 110 to the receiver 206. After

calculating its relative position from at least three satellites 110, the current position is calculated using well known triangulation techniques.

Accordingly, when the GPS receiver 206 is present, the navigation computer 102 uses data from the GPS to track the current location of the mobile unit 104. The current location is overlaid on a map from the mapping database 208 and is displayed on the display screen 212.

In one embodiment of the present invention, the precise location that is calculated by the GPS receiver 206 is used to determine current time zone information. This information can be used for example to set a highly accurate compensated local time in the navigation computer 204. Details of this aspect of the present invention are subsequently described below with reference to FIGS. 8 and 9.

FIG. 3 is a block diagram depicting some of the functional components of the navigation system in accordance with an embodiment of the present invention. The navigation computer 204 is provided with a web server interface component 302. The web server interface component 302 is used to perform web browser-like functions for the navigation computer 204. As shown, the web server interface is coupled with the navigation server 114. This is generally accomplished through the use of the wireless transceiver 202.

Accordingly, the web server interface module 302 interprets data streams from the server for displaying display text and/or graphics on the display screen 214. Preferably, the data streams transmitted by the server 114 are in a standard format, such as HTML, a modified version of HTML or the like. In this fashion, generic web-browsing tools can be used to interface with the web navigation server 114 of the present invention.

The web server interface module 302 is also used to accept input 304 from the user and transmit such user input 304 to the server 114. For example, users may request a route to be calculated by the server 114 by inputting route start and stop designations.

Route data that is calculated by the server 114 is downloaded to the navigation computer 204 via the web server interface 302. The map reconstruction module 306 then processes the route data. In particular, the map reconstruction module interprets the route data and reconstructs, in the format required by the map display software 209, the optimal route calculated

by the server 114, using the local mapping database 208. As indicated by block 308, the reconstructed mapping data is displayed, by the map display software 209, on the display screen 214.

FIG. 4 is a flowchart that depicts a process that can be used in an embodiment of the present invention. The process begins with step 404, where the navigation computer 204 establishes a connection with the server 114. Once a connection is established, the user inputs start and destination parameters for a requested route.

In step 408, the server connects with other databases, as necessary to obtain real-time information that is to be used in calculating an optimal route for the user. For example, the server may connect with another server on the Internet 118 that provides current traffic or road conditions relevant to the proposed route. Alternatively, such information may reside in one or more resources directly controlled by the navigation server 114, such as the database 116, or the user profile 117.

In any case, the Internet 118 is a preferred computer network used in an embodiment of the present invention because of the wide availability of information offered by governmental, educational and commercial sources. Thus, depending on the specific implementation of the present invention, real-time data provided by the present invention can originate from the navigation server 114, or from other sources on the Internet 118.

Accordingly, the knowledge base used by the navigation server 114 can be local or widely distributed, depending on each specific implementation of the present invention. On one end of the spectrum, the navigation server 114 provides all of the real-time information for the mobile navigation system 102. On the other end of the spectrum, none of the real-time data is provided directly from navigation server 114, but from other resources available on the Internet 118. In a typical embodiment, the distribution of the knowledge base falls somewhere in between these two extremes.

In step 408, the server 114 optionally reads or requests user preference data for calculating the route. For example, the user may want to avoid toll roads, dirt roads or major highways. The server 114 can request this information from the user in real-time. Alternatively,

such information may be pre-stored from previous sessions and is accessible by the server 114, from the database 117. Many known methods can be used to obtain user specific information, such as the use of cookies and the like. Such methods would be apparent to persons skilled in the relevant art(s).

5 In step 412, the server calculates an optimal route based on the start and destination data from step 406, the real-time data from step 408, and the user information, if any, from step 410. Next, in step 414, the server 114 formats the routing data in accordance with a natural language specification. An example of a natural language specification that can be used to implement an embodiment of the present invention is described below with reference to FIG. 5.

10 Next, in step 416, the server downloads the calculated optimal route to the navigation computer 204. Typically, this data is compressed prior to downloading in step 416. Upon receipt of the compressed data, the client uses a decompression algorithm to expand the data to its original text format. The textual nature of the natural language specification of the present invention provides for highly compressible routing data to thereby reduce bandwidth requirements for the wireless connection.

15 In step 418, the client interprets the routing data, queries the mapping database 208, and reconstructs the optimal route in terms that are native to the mapping database 208 and/or the map display software 209. In step 420 the route is displayed, by the map display software 209, on the display screen 212, as indicated by block 308.

20 FIG. 5 is a block diagram describing a natural language format that can be used to specify routes in accordance with an embodiment of the present invention. A generic designation for the natural language description is depicted in block 502. This is followed by a specific example of a formatted calculated route as shown in block 508.

25 The natural language description 502 preferably consists of start and end route designations 504. These designations are described using a natural language specification and generally include such information as street names and city names, etc. In addition, in a typical embodiment, the start/end route designation includes a start direction.

The start and end route designations are followed by a number of links 505a, 505b ... 505n (generally 505). Each link 505 is described using a natural language description. This can include many variables such as a street name, a distance, a turning orientation, a landmark designation, a turning distance from the landmark, etc. Many variations can be used in different
5 embodiments of the present invention in accordance with desired features.

In a preferred embodiment, a minimal amount of information is used to describe each link to minimize bandwidth requirements. The route table 508 depicts a specific example of a calculated route that begins on Sea World Drive in San Diego California and ends on South Rodeo Drive in Beverly Hills California.

10 As stated above, the natural language routing description 502 begins with the start/end route designations 504. An example of a start/end route designation is shown in block 510. These designations can be as simple as the name of the start and end streets as well as the city and state of such streets. In this example, the start/end route designation is defined as "Sea World Drive, San Diego CA to South Rodeo Drive, Beverly Hills CA. The meaning of these
15 terms is self-explanatory.

The first link 514 describes information about the next turn. In particular, the link 514 lists the name of the next road ("Interstate 8"), the orientation of the turn at Interstate 8 ("90 Deg.") and the distance to the turn at Interstate 8 ("1.4 miles"). Similarly, Link 515 lists the name of the next road ("Interstate 5"), the orientation of the turn ("0 Deg.") and the distance
20 ("127.3 miles"). The next link 518 lists the name of the next road ("Santa Monica Highway 2"), the orientation of the turn ("45 Deg.") and the distance to the turn ("2.9 miles"). Finally, the last link 520 lists the next turn ("South Rodeo Drive"), the turning orientation ("180 Deg.") and the distance to the turn ("1 mile").

As described below, this information is processed by the navigation computer 204 to
25 reconstruct and display the route 508 using the local mapping database 208. As stated, the local mapping database 208 can be different from the mapping database 116 used by the server 114 to calculate the route. Specifically, the map reconstruction module 306 reads the natural language routing description 508 and reconstructs the route in step 418.

A method that can be used by the map reconstruction module 306 to reconstruct the route (as shown in step 418 from FIG. 4) will now be described with reference to FIG. 6. The map reconstruction process 600 begins with step 602. In step 602, the process finds the starting point of the route. Typically, this starting point is listed in the first entry 504 in the natural language description 502. It should be noted that there are many ways in which to specify a start location. For example, in one embodiment, the start location is specified in accordance with the current GPS location. In another embodiment, the start location is specified by specific user input. In yet another embodiment, preprogrammed user information, such as a home or work address is stored in either the navigation computer 204 or the user profile database 117. In any case, various methods for specifying a start location that can be used in specific embodiments of the present invention would be apparent to persons skilled in the relevant art(s).

Accordingly, in step 602, the start location is found in within the local mapping database 208. Specific methods for searching the local mapping database 208 depend on the actual mapping database being used in each specific implementation of the present invention. Typically, standard map data accessing function calls are used in accordance with requirements of a predefined application-programming interface (API). Specific method steps for searching various types of mapping databases 208 would be apparent to persons skilled in the relevant art(s).

Once the starting point is found on the mapping database 208, the process continues with step 604. In step 604, the next link is extracted from the natural language description 505. As stated, this includes at least the street name of the next turn ("next turn street") and the type of the next turn ("turn type"). It should be noted the turn type could be specified in various ways. For example, the turn type could be specified in terms of absolute degrees, as shown in FIG. 5 or as directional indicators, such as N, NE, E, SE, S, SW, W and NW. Alternatively, the turn type could be specified as a left turn or a right turn, a left bear or a right bear, etc. Any method for describing turns can be used in alternative embodiments of the present invention.

Next, in step 606, the current road in the mapping database 208 is followed in the indicated direction. The indicated direction is determined by the start/end route designations 504, or from the last turn. Next, in step 608 the process determines if the last link 505n has been

processed. If so, the map is highlighted in accordance with the reconstructed routing information determined from the previous steps. Typically, the highlighted map is displayed on the display screen 212.

If the last link 505n has not been reached in step 608, control passes to step 610. In step 610 the current road in the mapping database 208 is searched for the next occurrence of a cross street. The goal is to determine the exact location (i.e. the latitude and longitude) of each maneuver. This is accomplished by finding the intersection of the two streets before and after a maneuver under consideration. In one embodiment, it is assumed that the street names and the city name of the streets have been extracted from the turn-by-turn text instructions provided by the server.

This task can be achieved by using standard map data accessing function calls. A node ID of the maneuver point (intersection) can thus be obtained. Once the maneuver point is identified, the road segment corresponding to the next cross street can be determined.

Next, in step 612, the process adds the map information to the reconstructed route. Control next passes to step 614. The objective is to construct a route data structure or "link list" which consists of all the shape points along the route. Given two nodes (i.e. maneuver points) and the name of the road between them, the process traces through the segments that connect the two nodes. From each segment, a series of shape points can be obtained. The result of step 612 is link list of shape points, which define part of the route.

Next, in step 614, the process double checks if the found cross street matches the turn street. In a preferred embodiment, fuzzy logic is used to implement the street name comparison in step 614 to account for differences in spelling and for differences in street names such as "road" verses "drive", "street", or "circle" and abbreviations and the like. If an exact match is not found, heuristic techniques can be used to determine the best match. Typically, this involves additional searching in the current direction to determine if other candidates exist.

If in step 614, a match between the cross street and the turn street is found, control passes to step 616. In step 616, the process makes the turn as indicated in the link information. Control

next passes back to step 614, where the next link is read. The process represented by steps 604-616 continues until step 608 determines that the last link has been processed, as described above.

The outcome of this algorithm depicted by flowchart 600 is a link list of shape points, which define the optimal route downloaded from the server 114. A subset of the link list of shape points is the actual maneuver points. This reconstructed route data can then be used to display and route track a vehicle progression along the route. The navigational computer 204 can then issue guidance instructions to the user at appropriate times (e.g. when the automobile 104 approaches a turn).

An enhanced user-interface data-entry feature will now be described with reference to FIGS. 7A, 7B and 7C. This feature is preferably used in embodiments of the present invention that include the use of data entry fields similar to the type shown in FIG. 7C. This type of data entry field is hereinafter referred to as a "keypad data entry field." A keypad data entry field provides the capability for inputting alphanumeric characters with the use of a keypad device, rather than a keyboard device. Keypad data entry fields can be found, for example, in Microsoft's CE Auto PC operating system.

The keypad input device 214 used in one embodiment of the present invention consists of five keys that are arranged as shown in FIG. 7A. In this example, the central key 711 is used to perform an "Enter" function and is hereinafter referred to as the "enter-key 711." The four directional keys 705, 707, 709, and 703 are generally used to alter the position of a screen object, such as a cursor or the like. In addition, the directional keys are used to scroll data as described below.

FIG. 7C represents a single keypad data entry field shown at different points in time. In particular, in this example, the elapsed time increases as the reference numerals 712-720 increase. In this example, different character positions are highlighted (as indicated by darkened triangles) at each point in time 712-720. That is, the first character is highlighted at time 712, the second at time 714, the third at time 716, the fourth at time 718 and the fifth at time 720.

The highlighted character position indicates the active character position. When a particular character position is active, users can manipulate the data within that position by using

the up and down arrow keys 703 and 707, respectively. Typically, pressing the up arrow key 703 scrolls data in the data in the active character position in a descending alphabetical order. Similarly, pressing the down arrow key 707 scrolls the data in the active character position in an ascending alphabetical order.

5 Further, users select which character position in the data entry field is active by manipulating the left 709 and right 705 arrow keys. The enter-key 711 is generally depressed to indicate that data should be entered and accepted by the program.

10 The enhanced user interface feature of the present invention anticipates the contents of data being entered by the user and fills-in the data entry field with the anticipated characters to the right of the active character position. In this fashion, if the anticipated data is correct, the user need not enter data into the remaining character positions, but instead, immediately presses the enter-key 711.

15 In addition, the method constantly determines a valid character set for each character position. Therefore, when user presses up arrow key or down arrow key for scrolling characters, only valid characters appear in the keypad data entry field in accordance with the set of allowable entries. This feature of the present invention is especially useful in a mobile environment such as an automobile, where data entry is not only cumbersome, but can also be dangerous.

20 The enhanced user-interface feature of the present invention functions as follows. FIG. 7B represents a portion of a database comprising allowable cities that can be specified by a user, for example, when specifying the start and/or stop route designations in step 406. In this example, the cities are listed in alphabetical order, but any order can be used in alternate embodiments.

25 As shown by the data entry field at time 712, the user enters an "S" in the first character position by manipulating the up and down arrow keys (703 and 707, respectively). In response to this user input, all of the character positions to the right of the active character position are completed with anticipated data. In this example, the city "Sacramento" 704 is selected as the anticipated data entry item.

In this example, "Sacramento" 704 is selected from the table 702, because it is the first entry found in the table 704 that conforms to the entered data at the time 712. That is, "Sacramento" is the first city in the table 702 that begins with the letter "S".

It is important to note that in other embodiments, different criteria can be used to select a particular item from the set of conforming data items. In this example, the set of conforming data items is all items in the table that begin with the letter "S". Further, in this example, the criterion used for selecting a particular conforming data item is that it appears first in the list, alphabetically.

In another embodiments, different criteria can be used, such as frequency of use and most recent use. For example in one embodiment, a frequency of use counter is maintained for each data item in the list 702. Accordingly, a data item having the highest frequency of use is selected from the set of conforming data items. In another embodiment, a date counter is maintained for each item in the list 702. In this example, the most recently used data item is selected from the set of conforming data items. Any method can be used to select the anticipated data item from the set of conforming data items at each point in time during the data entry process. Such methods would be apparent to persons skilled in the relevant art(s).

Next, as indicated by the time 714, the user selects the letter "A" in the second character position. At this point, the set of conforming data items is all items in the list 702 beginning with the letters "SA". This includes the data items 704-710. Using the alphabetical criterion as described above, the data item "Sacramento" is selected as the anticipated data entry.

Next, as indicated by the time 716, the user selects the letter "N" in the third character position. This letter can be quickly selected by the user because the scrollable character set at each position is limited in accordance with the allowable entry list 702. In this example, if the allowable data entry list 702 represents the entire list, then the allowable characters in the third character position is limited by to the letters "C" and "N".

When the "N" is selected, the set of conforming data items is all items in the list 702 beginning with the letters "SAN", namely 706-710. Again, using the alphabetical criterion as described above, the data item "San Diego" is selected as the anticipated data entry.

Next, as indicated by the time 718, the user selects a space in the forth character position. At this point, the set of conforming data items remains the same. Therefore, the data item "San Diego" is selected as the anticipated data entry.

Next, as indicated by the time 720, the user selects the letter "F" in the fifth character position. At this point, the set of conforming data items is all items in the list 702 beginning with the letters "SAN F." The set of conforming data items that meets this criterion is "San Francisco" 78. Accordingly, "San Francisco" 708 is selected as the anticipated data entry.

As stated above, in one embodiment of the present invention, the precise location that is calculated by the GPS receiver 206 is used to determine the current time zone. This information can be used for example to set the clock 219 coupled to the navigation computer 204 to a highly accurate compensated local time, based on current position. This feature avoids the problem found in current systems where a local clock is not updated with a time zone is crossed.

FIG. 8A is a flowchart depicting a process that can be used to implement an enhanced feature for determining current time zone information in accordance with an embodiment of the present invention. In step 804 time zone division lines are input into the navigation computer system 204. One way to accomplish this is to digitize time zone division lines. In step 806 three sets of time zone division lines are stored in the computer system 204. Preferably, these lines are stored as three sets of polygons having an increasing level of accuracy, as indicated by step 806.

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Accordingly, three sets of time zone division lines are stored, ranging in accuracy from course to medium to fine. The course time zone division lines are wider not as accurate as the medium division lines, which in turn are wider and not as accurate as the fine division lines. As the level of accuracy increases, so does the number and complexity of the polygons that comprise the different sets of time zone lines. In other words, the course and medium time division lines are approximations that are used to quickly determine whether a current position is close to an actual time zone. If so, a more precise set of lines is used. The fine time zone division lines very accurately depict the shape and position of the actual time zone division lines. The fine set of lines is much more complex and requires more polygons than the less accurate course and medium sets of lines. This concept is illustrated in FIG. 8B.

In FIG. 8B, a portion of a course, medium and fine set of time zone lines are depicted. The actual time zone is coincident with the fine set of time zone lines that are represented by the line 826. In this example the fine set of division lines 826 exactly matches the width and shape of the actual time zone. The medium set of time zone division lines 824 represent a close
5 approximation that encompasses the time zone line 826.

Note that the medium set of lines 824 can be represented with much fewer polygons than the fine set of lines 826. In this fashion, searches using the medium set of lines 824 for determining whether a current position is coincident with the time zone lines 824 can occur much faster than using the fine set of lines 826.

10 The course set of time zone division lines 822 represent a gross approximation of the time zone line 826. Note that the course set of lines 822 can be represented with fewer polygons than the medium set of lines 824. In this fashion, searches using the course set of lines 822 for determining whether a current position is coincident with the time zone lines 822 can occur much faster than using the medium set of lines 824. Accordingly, as shown below, searches are made
15 first with the course set of lines 822, followed by the medium set of lines 824, followed by the fine set of lines 826.

Referring back now to FIG. 8A, in step 808, the process determines the current position from the GPS receiver 206 in terms of latitude and longitude. Next, in step 810, the process determines if the current position intersects with the course set of time division lines. It should
20 be noted that comparing the position using the course set of time zone division lines is faster than using the medium set of time zone division lines. Similarly, the comparison using the medium set of time zone division lines is faster than using the fine set of time zone division lines. In this fashion, the medium and fine sets are used only when required (i.e. when the navigation system 102 gets closer to an actual time zone division line.)

25 When the navigation system 102 gets close to a time zone, the compare using the course approximation location information will indicate that an intersection between the current location and the course set of lines exist. This indicates that a higher resolution compare is required using a finer set of time zone division lines.

Accordingly, in step 810, a comparison is made between the current position and the course set of time zone division lines. In step 812, the process determines if the current position intersects with the time zone division lines in accordance with the comparison. If it does, the process determines if the most accurate set of division lines have been used in step 812. If so, control passes to step 818, where the new time zone is set. If not, the next finer set of division lines are used for another comparison, as indicated by steps 814 and 812.

If it is determined in step 812 that an intersection between the current position and the time zone lines do not exist, control passes back to step 808 and the process repeats. Note that an embodiment of the present invention may include a delay between steps 812 and 808. For example, it may be desirable to save CPU cycles by checking for a new time zone at specified intervals, rather than continuously.

FIG. 9 is a flowchart depicting a process that can be used to calibrate a real-time clock in the navigation computer 204. The process begins with step 904. In step 904 the process determines the current time in Greenwich Mean Time (GMT) from the GPS receiver 206. Next, in step 906, the process determines the current time zone information. This can be accomplished using the process 800 as described above.

Next, in step 908, the process converts the GMT to local time in accordance with the current time zone and daylight savings time and like. A database that is accessible to the navigation computer 204 is used for this purpose. In step 910 the process sets the local time of the navigation computer 204 in accordance with the time calculated in step 908. The process ends as indicated by step 912.

As stated above, the display screen 212 is used to display geographical maps from the mapping database 208. In addition, the current position of the automobile 102 is superimposed on the geographical map to indicate the current position and bearing. In this example, the display screen 212 is a liquid crystal display that conforms to the Auto PC platform specification maintained by Microsoft Corporation. In this example embodiment, the navigation system conforms to the Auto PC platform and thus 102 fits into a standard 1-DIN unit in the dash of the automobile 104. It is assumed that in accordance with this standard, the display screen 212 is

on the order of 256 pixels wide by 64 pixels tall. An method for displaying a navigational mapping system on such a display will now be described with reference to FIG. 10.

A "head-right" map display 1002 is shown in FIG. 10A. In this example, the automobile 104 is represented by the triangle 1004. In this example the automobile is heading from left to right. In the head-right display 1002, the map is continuously rotated such that the direction of the vehicle 1004 always points to the right. This method is much preferred over the current method of displaying maps such that the vehicle always points up. Using a head-right display is preferred due to the fact that the display screen 212 is significantly wider than it is tall. In this fashion, by using a head right display, more look-ahead space of the route is provided.

10 Alternatively, a "head-left" map display 1006 as shown in FIG. 10B can be used. This may be the preferred method for automobiles equipped with a steering wheel on the right side. In this example, the automobile 104 is represented by the triangle 1008 and is heading from right to left. In the head-left display 1006, the map is continuously rotated such that the direction of the vehicle 1004 always points to the left. This method is much preferred over the current method of displaying maps such that the vehicle always points up.

15 In one embodiment of the present invention, a database is maintained that maps time zone information to telephone numbers. This database is used to provide an enhanced user-interface feature of the present invention. In particular, the database is used to display the current local time of a called party, when dialing out on the telephonic device 210. The database used to implement this feature matches country codes, city codes, area codes, and local exchange information that comprise telephone numbers to time zone information.

FIG. 11 is a flowchart depicting a process that can be used to implement this feature of the present invention. In step 1104, the telephone number input by the user is parsed to extract a country and city code, or an area code and three-digit exchange. Once this information is extracted, it is used in step 1106 to query a database that matches such information with time zone information. The time zone information is generally relative to universal time or GMT, and typically ranges from GMT -12 hours to GMT + 12 hours. Once this information is retrieved from the database, the current time in GMT is obtained as indicated in step 1108.

While various embodiments of the present invention have been described above, it should
5 be understood that they have been presented by way of example only, and not limitation. Thus,
the breadth and scope of the present invention should not be limited by any of the above-
described exemplary embodiments, but should be defined only in accordance with the following
claims and their equivalents.

[illegible]

What is Claimed is:

1. A method for providing an optimal route using real-time information for a navigation system comprising a client and a server, said server coupled to a computer network, said method comprising the steps of:

5 establishing a wireless connection between the client and the server;
transmitting start and end route designations from the client to the server;
accessing real-time information by the server;
calculating the optimal route by the server, based on the real-time information and said start and end route designations;
10 formatting the optimal route into a natural language description;
downloading said natural language description to the client;
reconstructing the optimal route by the client using a local mapping database; and
displaying said optimal route on a display system coupled to the client.

15 2. The method of claim 1, wherein said step of formatting includes the step of dividing the optimal route into one or more links, wherein each link includes at least a street name and a turning orientation.

20 3. The method of claim 2, wherein said step of reconstructing includes the steps of:
searching said local mapping database for a closest match of said street name and said turning orientation for each of said links; and
building the optimal route using by combining each of said closest matches from said searching step.

25 4. The method of claim 1, wherein said accessing step comprises the step of accessing a traffic database comprising current traffic conditions; and
querying said traffic database for determining current traffic conditions between locations defined by said start and end route designations.

30 5. The method of claim 1, wherein said real-time information includes one or more from the set of:
current traffic conditions;

highway ramp configurations;
current weather conditions;
construction information;
road restrictions;
5 detour information; and
event traffic information.

6. The method of claim 1, wherein said wireless connection is accomplished using a cellular network.

7. The method of claim 1, wherein said transmitting step includes the step of entering into a keypad data entry field, said start and stop route designations including a name for one or more of:

a city;
a state;
a country; and
a street

8. The method of claim 7, wherein said step of entering comprises the steps of:
comparing data entered into the keypad data entry field with a database of allowable entries;
determining a set of conforming data items associated with said entered data;
applying a criterion to said set of conforming data items to determine an anticipated data item; and
25 displaying said anticipated data item in the data entry field.

9. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that appears first alphabetically.

10. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most frequently.

11. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most recently.

5 12. The method of claim 1, wherein said downloading step comprises the step of compressing said natural language description.

13. The method of claim 1, wherein said calculating step further comprises the step of reading user-specific data in calculating the optimal route.

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14. The method of claim 1, wherein said computer network is the Internet.

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15. A mobile navigation system comprising:

a navigation computer;

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a wireless transceiver coupled to said navigation computer for connecting with a navigation server, said navigation server for calculating optimal routes based on real-time information, said optimal routes being formatted using a natural language description;

a mapping database coupled to said navigation computer for reconstructing said optimal route from said natural language description; and

a display screen coupled to said navigation computer for displaying said optimal route using said mapping database.

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16. The mobile navigation system of claim 15, further comprising:

a GPS receiver coupled to said navigation computer for monitoring position;

a telephonic device coupled to said wireless transceiver and said navigation computer for making and receiving telephone calls; and

a keypad coupled to said navigation computer for entering start and end route designations;

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17. The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head right configuration.

18. The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head left configuration.

5 19. The mobile navigation system of claim 16, further including a clock coupled to said navigation computer, wherein said navigation computer is programmed to set said clock to an accurate local time in accordance with a time from said GPS receiver and a current time zone.

10 20. The mobile navigation system of claim 15, further including a clock coupled to said navigation computer, and said telephonic device, wherein said navigation computer is programmed to display on said clock a local time of a called party based on a dialed number.

15 21. A method for displaying a local time with respect to a called party, comprising the steps of:
 parsing a dialed-out telephone number to extract location data comprising at least one of:
 a country code;
 a city code;
 an area code; and
 an exchange code;
 20 querying a database to determine a time zone corresponding with said location data;
 obtaining the current GMT time;
 converting said current GMT time to a local time in accordance with said associated time zone; and
 displaying said local time.

25 22. A method for determining a current time zone for a navigation system having a GPS receiver comprising the steps of:
 storing a digital representation of time zone division lines;
 obtaining a position from the GPS; and
 30 comparing said position with said digital representation to determine the current time zone.

23. The method of claim 22, further comprising the steps of:
obtaining current GMT from the GPS;
converting said GMT to local time in accordance with said current time zone; and
setting clock on said navigation system in accordance with said local time.

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24. The method of claim 22, wherein:
said storing step further includes the step of storing three sets of time zone division
lines, having different resolutions ranging from course to medium to fine; and
said comparing step further includes the step of comparing said position with said
course set of time zone division lines, and if a match is found, comparing said
position with said medium set of time zone division lines, and if a match is
found comparing said position with said fine set of time zone division lines.

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25. A method for displaying a representation of an automobile's bearing and position
superimposed on a map for a navigation system, said method comprising the steps of:
displaying the representation of the automobile to always point to the right; and
continuously scrolling the map relative to said representation.

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26. A method for displaying a representation of an automobile's bearing and position
superimposed on a map for a navigation system, said method comprising the steps of:
displaying the representation of the automobile to always point to the left; and
continuously scrolling the map relative to said representation.

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27. A method for entering data into a mobile navigation system using a keypad data
entry field comprising the steps of:

comparing data entered into the keypad data entry field with a database of allowable
entries;

determining a set of conforming data items associated with said entered data;

applying a criterion to said set of conforming data items to determine an anticipated
data item; and

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displaying said anticipated data item in the keypad data entry field.

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MOBILE NAVIGATION SYSTEM

Abstract

A client navigation system establishes a wireless connection to a navigation server on a computer network. The client requests a route by uploading start and stop specifications. The server calculates an optimal route based on real-time data available on the network. A generic natural language description is used to specify the optimal route downloaded to the client. The natural language description is independent from the local mapping database software on the client and includes a plain text description for each link using pre-defined generic terms. The client interprets the route, interfaces with the local mapping database and reconstructs the optimal route using a mapping reconstruction algorithm. The route is displayed on the client navigation system using whatever mapping database is present. An enhanced user-interface data-entry feature is provided that anticipates data being entered by users to minimize the data-entry process. The current time zone is derived from the current GPS position and is used to set the clock on the navigation system in the client. Maps are automatically scrolled on a display screen so that a representation of the automobile is always pointing to the right or to the left to allow for additional look-ahead space on certain display systems. A telephone coupled with the navigation system automatically displays the current local time for a called party upon dialing out. The dialed number is used to query a local database for providing local time information.

**DECLARATION
AND POWER OF ATTORNEY**
Utility Application

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **MOBILE NAVIGATION SYSTEM** the specification of which

(Check One) ☒ is attached hereto OR
☐ was filed on _____ as United States Application Serial No. Serial Number or PCT International Application No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Date of Filing	Priority Claimed	
			Yes	No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date	Status-Patented, Pending or Abandoned

POWER OF ATTORNEY: As named inventor, I hereby appoint as my attorneys and/or agents, with full power of substitution and revocation, to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Roland N. Smoot, Reg. No. 18,718; Conrad R. Solum, Jr., Reg. No. 20,467; James W. Geriak, Reg. No. 20,233; Robert M. Taylor, Jr., Reg. No. 19,848; Samuel B. Stone, Reg. No. 19,297; Douglas E. Olson, Reg. No. 22,798; Robert E. Lyon, Reg. No. 24,171; Robert C. Weiss, Reg. No. 24,939; Richard E. Lyon, Jr., Reg. No. 26,300; John D. McConaghy, Reg. No. 26,773; William C. Steffin, Reg. No. 26,811; Coe A. Bloomberg, Reg. No. 26,605; J. Donald McCarthy, Reg. No. 25,119; John M. Benassi, Reg. No. 27,483; James H. Shalek, Reg. No. 29,749; Allan W. Jansen, Reg. No. 29,395; Robert W. Dickerson, Reg. No. 29,914; Roy L. Anderson, Reg. No. 30,240; David B. Murphy, Reg. No. 31,125; James C. Brooks, Reg. No. 29,898; Jeffrey M. Olson, Reg. No. 30,790; Steven D. Hemminger, Reg. No. 30,755; Jerrold B. Reilly, Reg. No. 32,293; Paul H. Meier, Reg. No. 32,274; John A. Rafter, Jr., Reg. No. 31,653; Kenneth H. Ohriner, Reg. No. 31,646; Mary S. Consalvi, Reg. No. 32,212; Lois M. Kwasigroch, Reg. No. 35,579; Lawrence R. LaPorte, Reg. No. 38,948; Robert C. Laurenson, Reg. No. 34,206; Carol A. Schneider, Reg. No. 34,923; Hope E. Melville, Reg. No. 34,874; Michael J. Wise, Reg. No. 34,047; Richard J. Warburg, Reg. No. 32,327; Kurt T. Mulville, Reg. No. 37,194; Theodore S. Maceiko, Reg. No. 35,593; Bruce G. Chapman, Reg. No. 33,846; and F. T. Alexandra Mahaney, Reg. No. 37,668; and Keith Kind, Reg. No. 42,735.

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Residence, post office address, citizenship and signature of inventor(s) set forth beginning on next page.

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	POST OFFICE ADDRESS		City	State or Country	Zip Code
	FULL NAME OF INVENTOR	FIRST Name	MIDDLE Initial	LAST Name	
206	RESIDENCE & CITIZENSHIP	City	State or Foreign Country	Country of Citizenship	
	POST OFFICE ADDRESS		City	State or Country	Zip Code

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code §1001, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Signature of Inventor	<i>[Signature]</i>	201
Date	Jan. 5th 1999	
Signature of Inventor	<i>[Signature]</i>	202
Date	1/5/99	
Signature of Inventor		203
Date		

Signature of Inventor		204
Date		
Signature of Inventor		205
Date		
Signature of Inventor		206
Date		

(Signatures should conform to names as presented at 201 et seq. above.)

PATENT
239/054

Applicant or Patentee: Qing Kent Pu and Hui Henry Li
Serial or Patent No.: To be assigned
Filed or Issued: Filed herewith
For: MOBILE NAVIGATION SYSTEM

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(d) and 1.27(c)) - SMALL BUSINESS CONCERN

I hereby declare that I am:

_____ the owner of the small business concern identified below;
☒ an official of the small business concern empowered to act on behalf of the concern identified below:

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ADDRESS OF CONCERN: 6125 Cornerstone Court East
San Diego, CA 92121

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled MOBILE NAVIGATION SYSTEM, by inventors Qing Kent Pu and Hui Henry Li described in

☒ the specification filed herewith.
_____ application serial number _____, filed _____,
_____ Patent No. _____, issued _____.

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME: _____
ADDRESS: _____

[] INDIVIDUAL [] SMALL BUSINESS CONCERN [] NONPROFIT ORGANIZATION

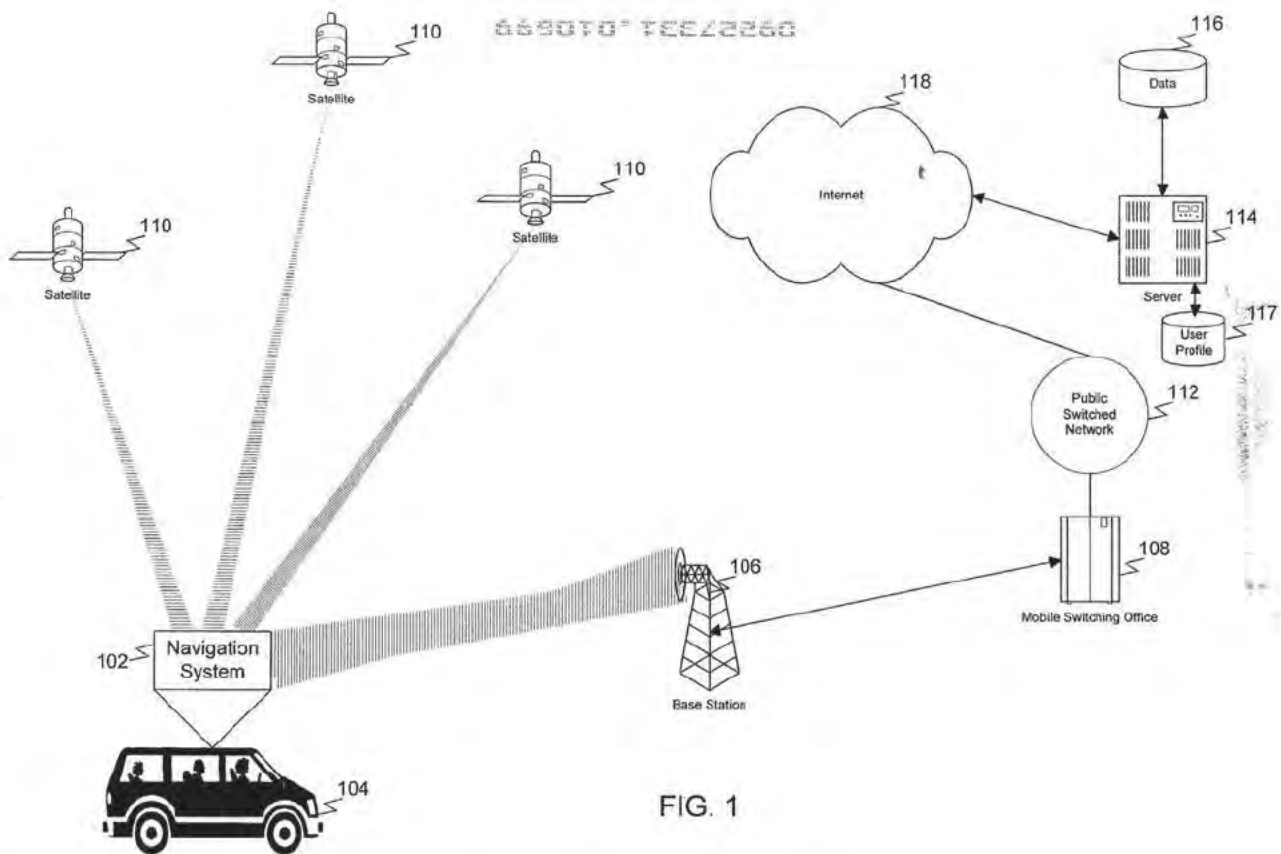
I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b)).

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: Qing Kent Pu
TITLE OF PERSON IN ORGANIZATION: President
ADDRESS OF PERSON SIGNING: 6125 Cornerstone Court East
San Diego, CA 92121

Signature
93106

Date Jan. 5th, 1999



5000000 = 42212260

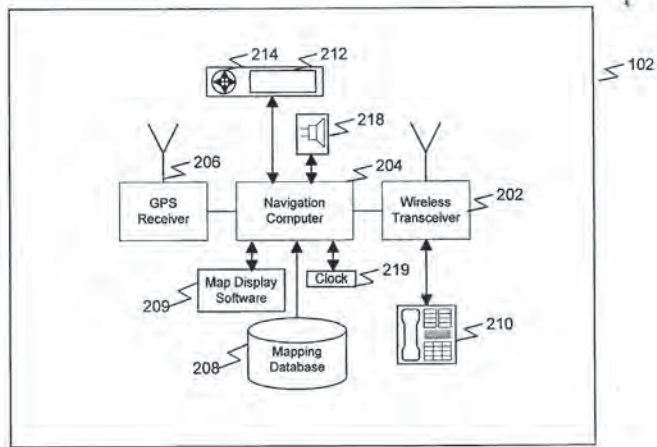


FIG. 2

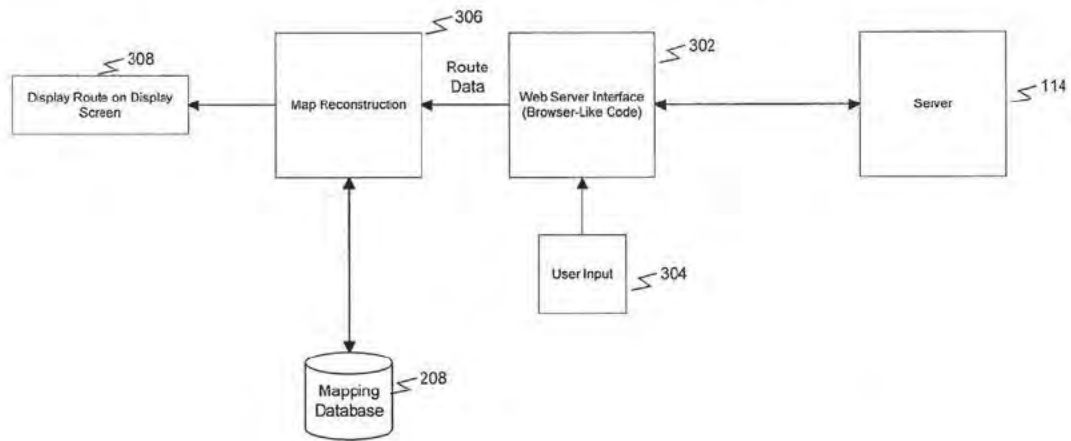


FIG. 3

FIG. 4

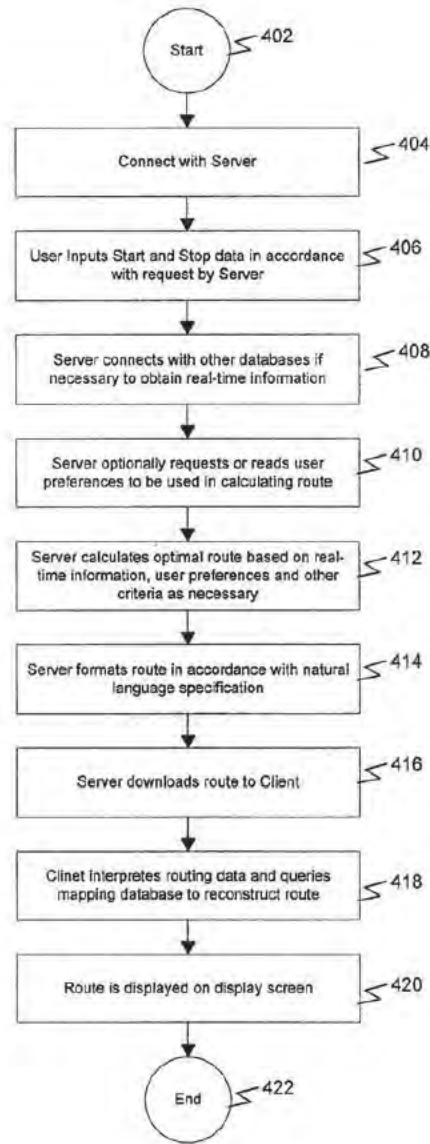


FIG. 4

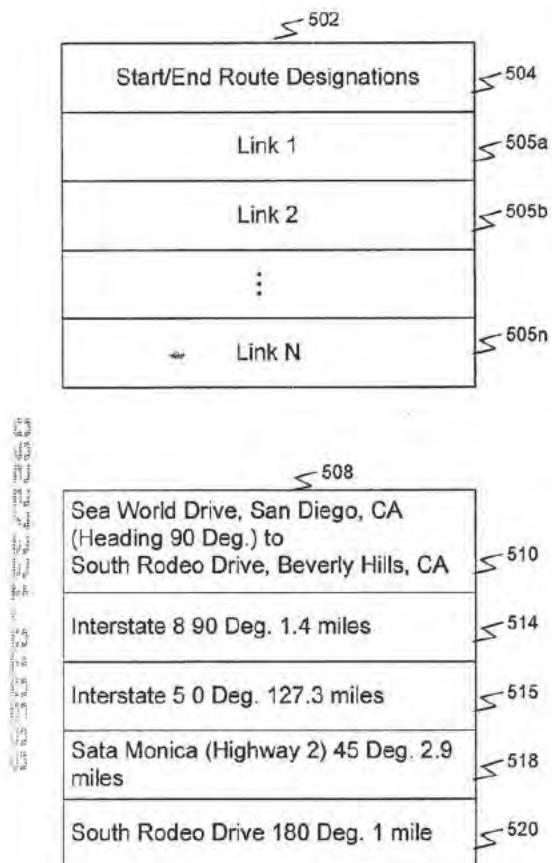
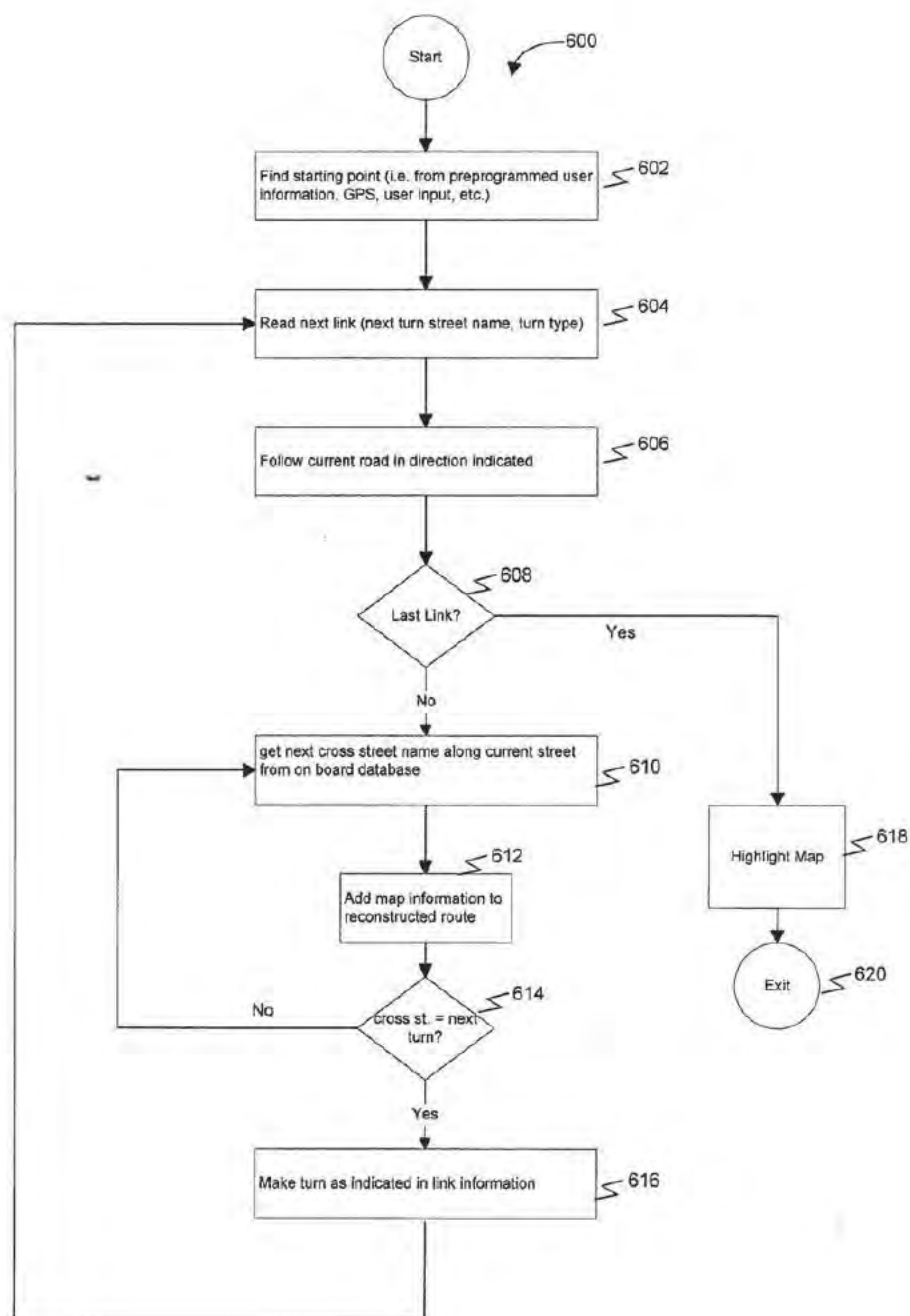


FIG. 5



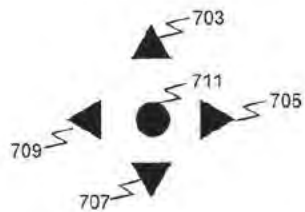


FIG. 7A

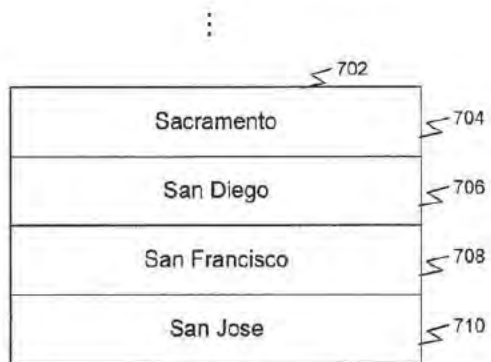


FIG. 7B

FIG. 7C

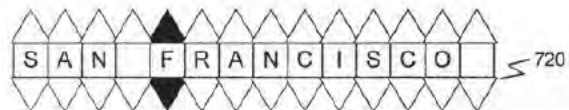
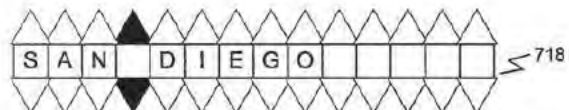
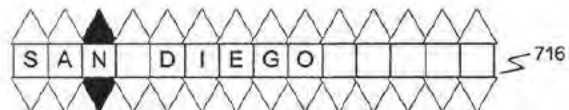
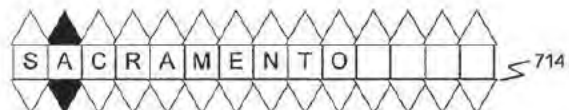
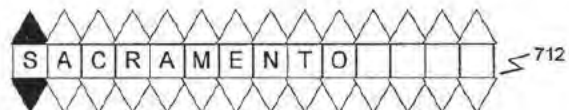
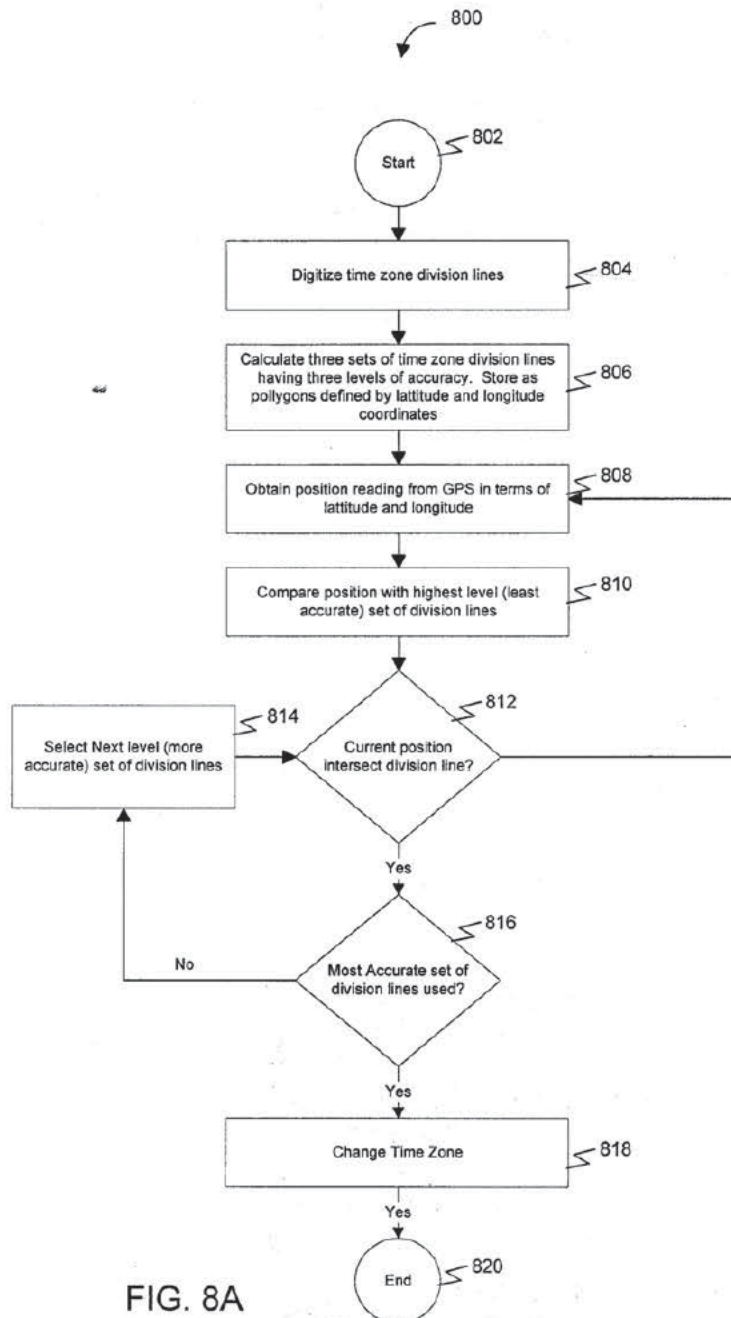


FIG. 7C



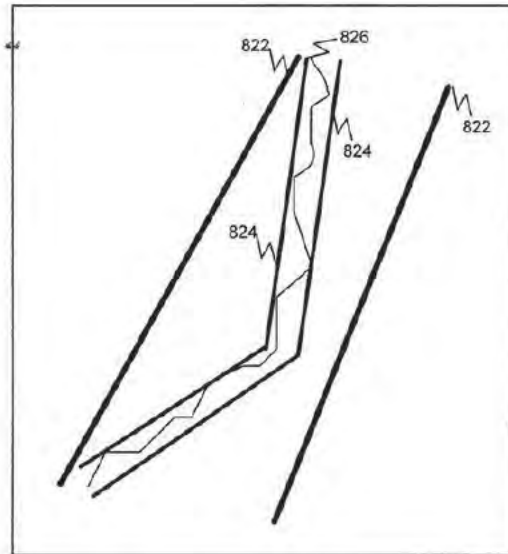


FIG. 8B

FIG. 9

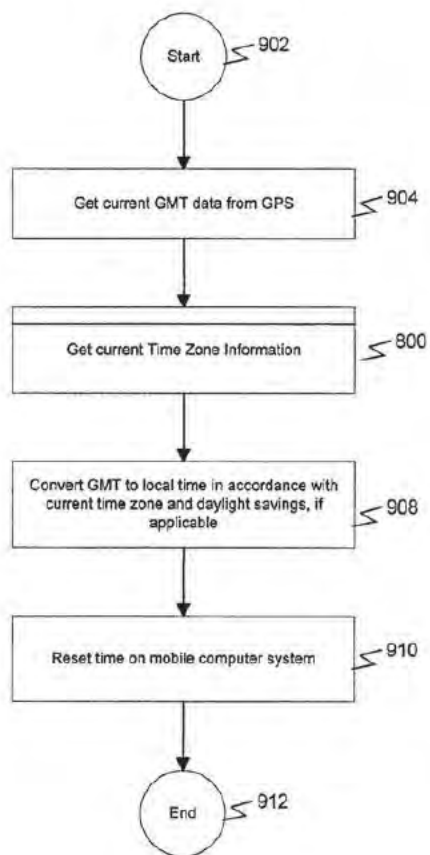


FIG. 9

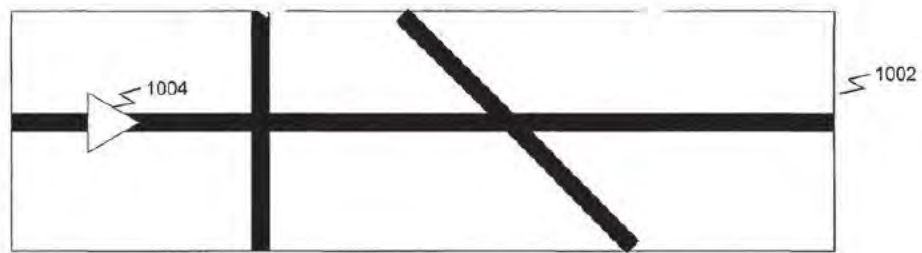


FIG. 10A



FIG. 10B

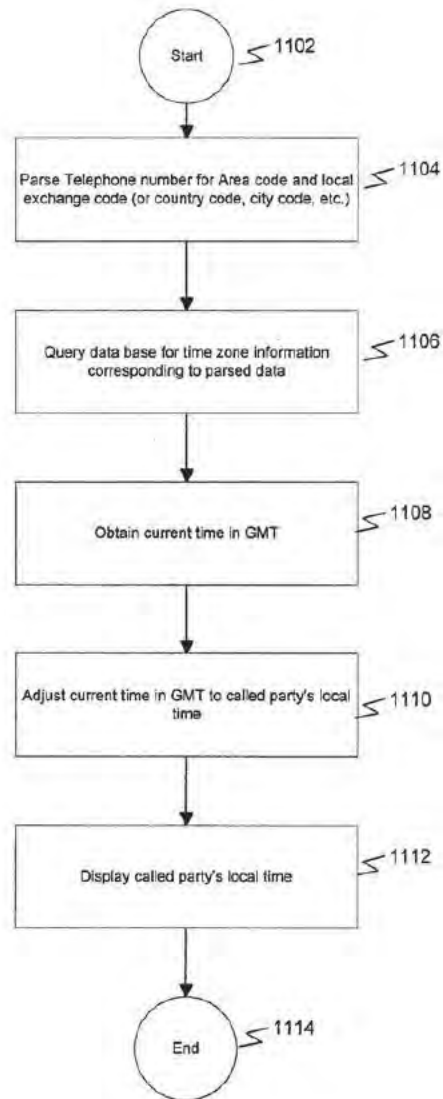
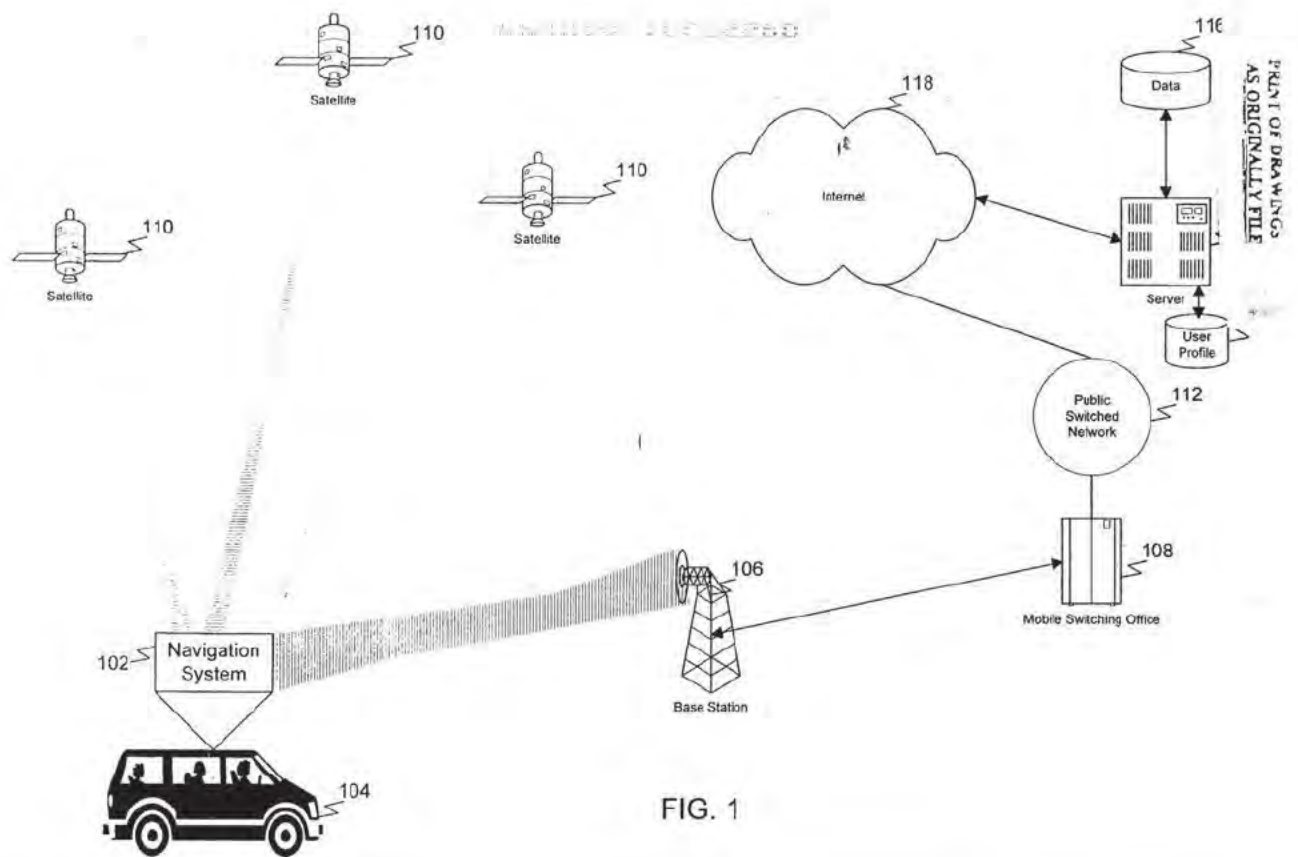


FIG. 11



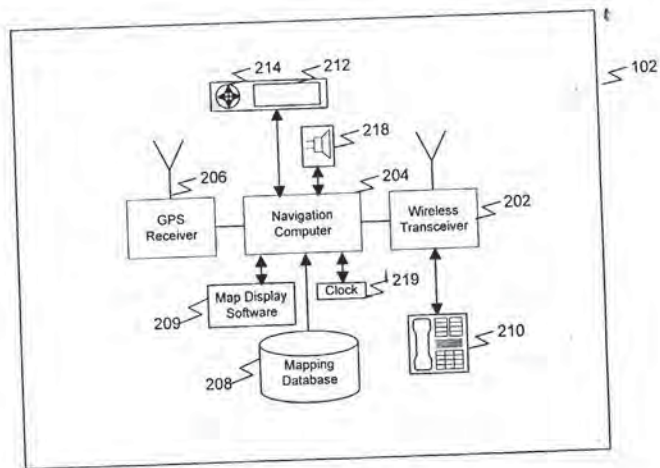


FIG. 2

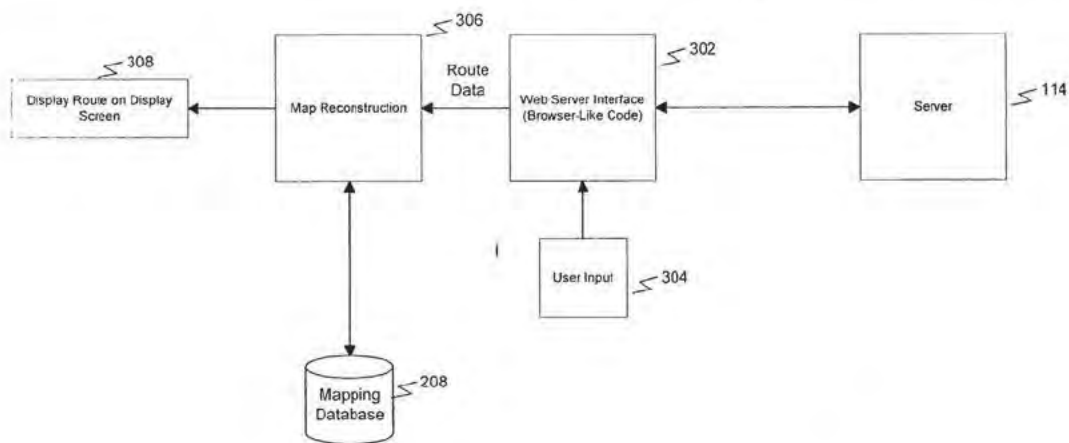


FIG. 3

PRINT OF DRAWINGS
AS ORIGINALLY FILED

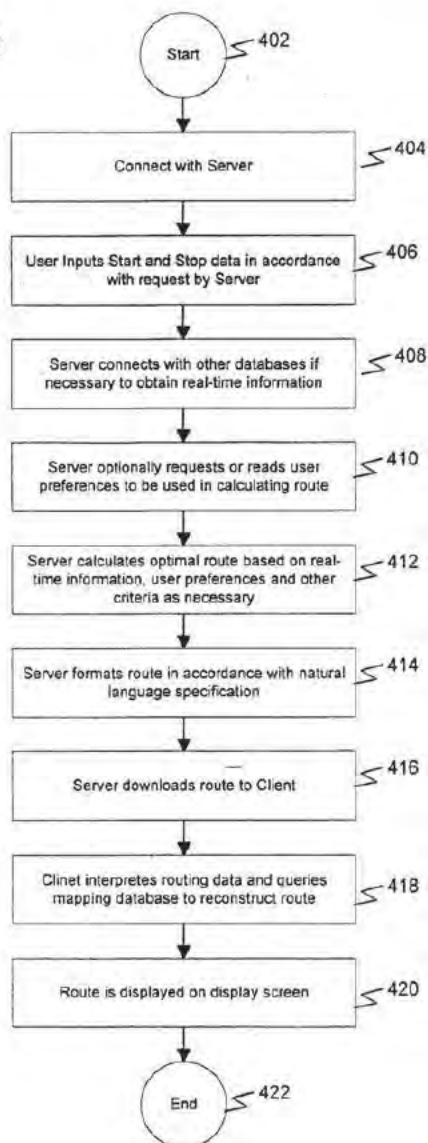


FIG. 4

PRINT OF DRAWINGS
AS ORIGINALLY FILED

502	
Start/End Route Designations	504
Link 1	505a
Link 2	505b
⋮	
Link N	505n

508	
Sea World Drive, San Diego, CA (Heading 90 Deg.) to South Rodeo Drive, Beverly Hills, CA	510
Interstate 8 90 Deg. 1.4 miles	514
Interstate 5 0 Deg. 127.3 miles	515
Santa Monica (Highway 2) 45 Deg. 2.9 miles	518
South Rodeo Drive 180 Deg. 1 mile	520

FIG. 5

PRINT OF DRAWINGS
AS ORIGINALLY FILED

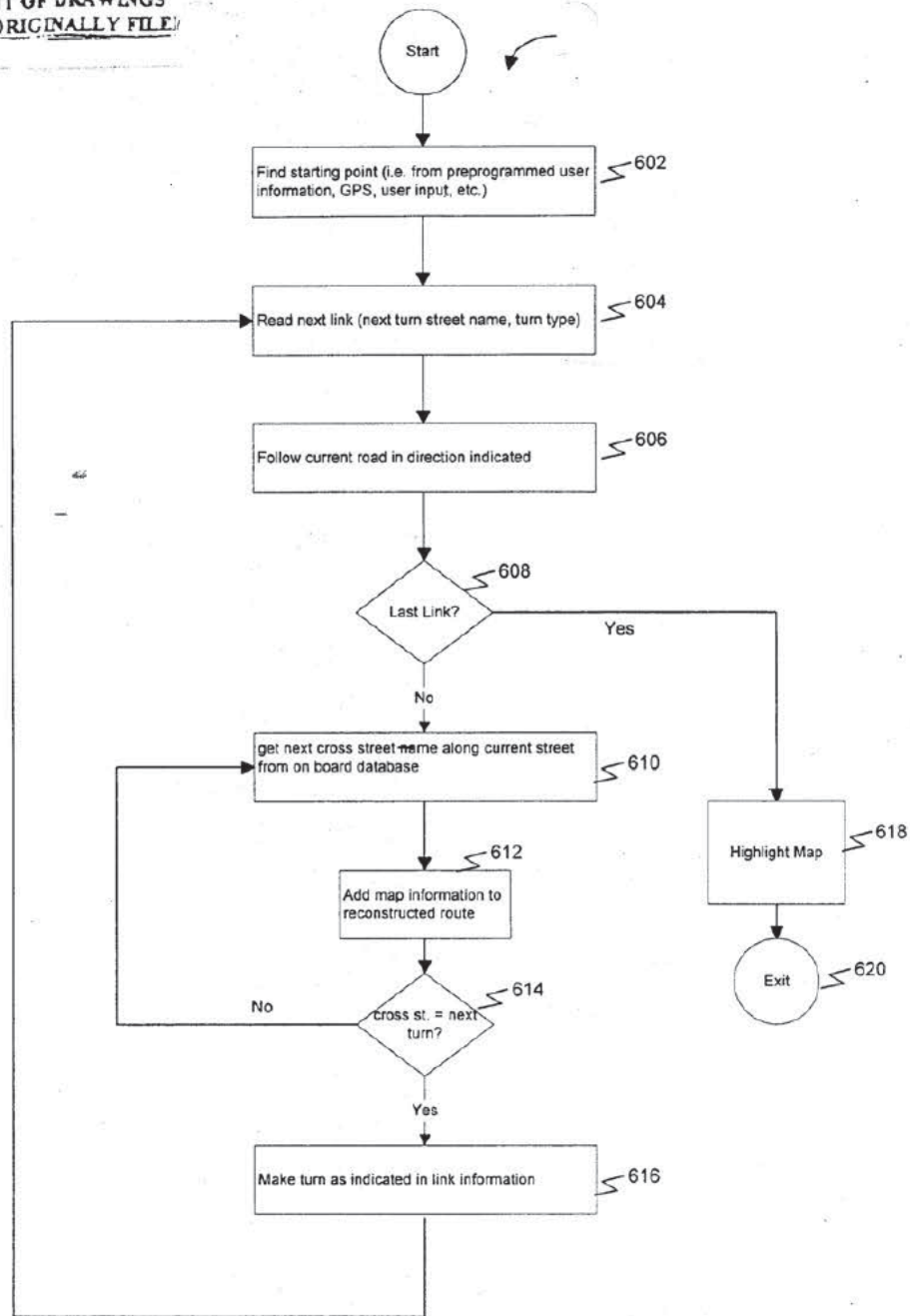


FIG. 6

⋮

702

Sacramento

704

San Diego

706

San Francisco

708

San Jose

710

712

S A C R A M E N T O

714

S A C R A M E N T O

716

S A N D I E G O

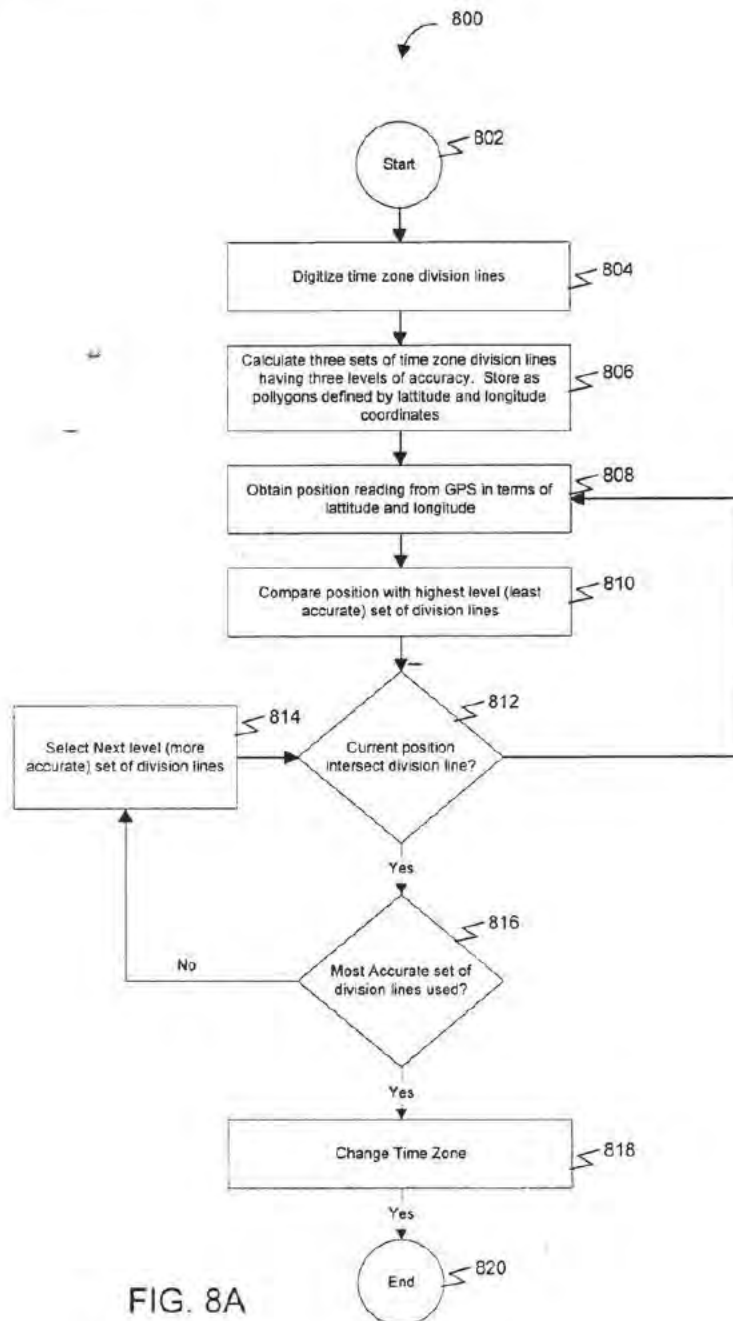
718

S A N D I E G O

720

S A N F R A N C I S C O

Petitioner Honda Ex-1004, 0079



PRINT OF DRAWINGS
AS ORIGINALLY FILED

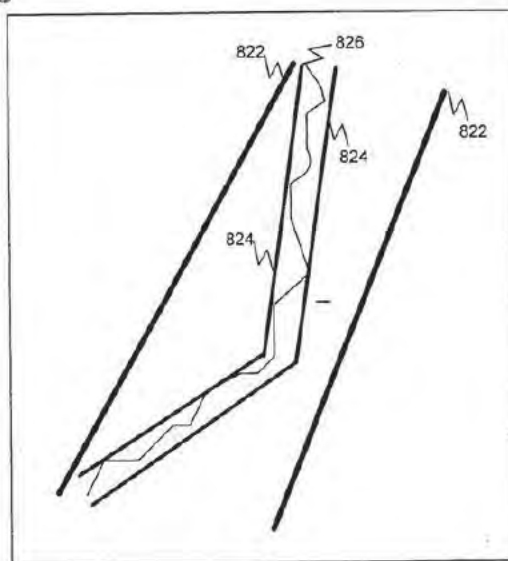


FIG. 8B

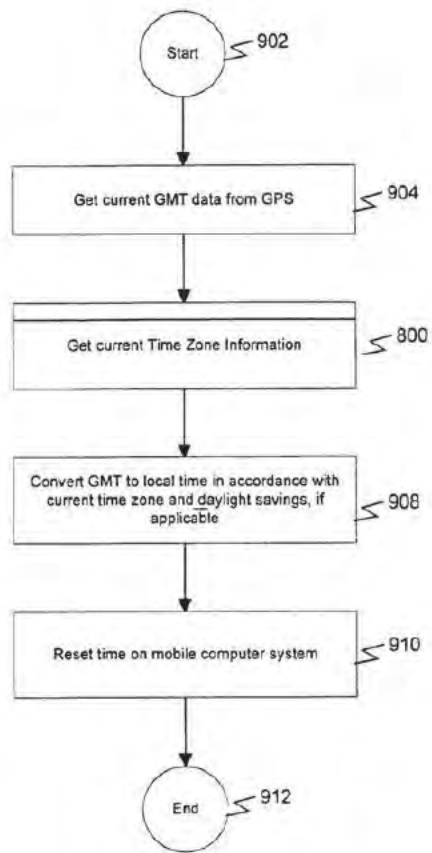


FIG. 9

PRINT OF DRAWINGS
AS ORIGINALLY FILED

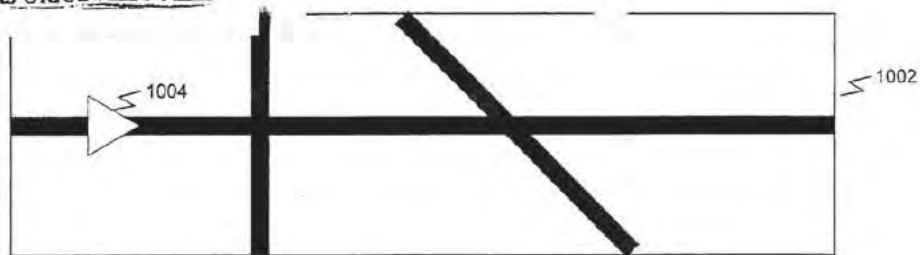


FIG. 10A

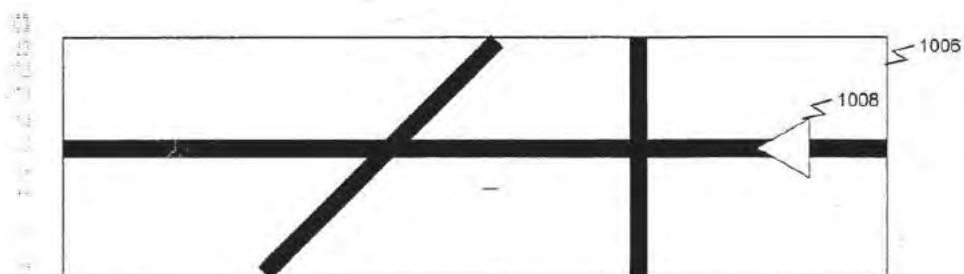


FIG. 10B

PRINT OF DRAWINGS
AS ORIGINALLY FILED

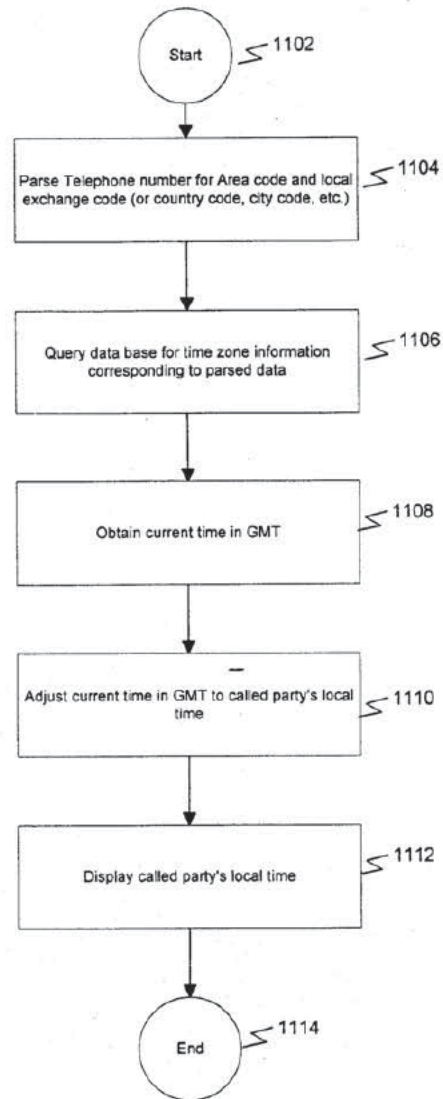


FIG. 11

GP 3661

Patent
239/054

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Qing Kent Pu et al

Serial No.: 09/227,331

Filed: January 6, 1999

For: MOBILE NAVIGATION SYSTEM



Group Art Unit: 3661

Examiner: Not Yet Assigned

#2 IDS watts
S. Ross
6-14-00

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§ 1.97(B)(3) & 1.9 (E)(1)

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In compliance with the Applicant's duty under 37 CFR § 1.56, the following information is brought to the attention of the Examiner. The items are listed on the attached form PTO-1449 and copies are enclosed for the convenience of the Examiner.

The items identified in this Information Disclosure Statement (IDS) may or may not be "material" pursuant to 37 CFR § 1.56 and the submission thereof by Applicant shall not be construed as an admission that any such patent, publication or other information referred to therein is material

CERTIFICATE OF MAILING
(37 C.F.R. §1.8a)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as First Class Mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

May 31 2000
Date of Deposit
SD-119853

Melanie Carmosino

Name of Person Mailing Paper

Signature of Person Mailing Paper



Patent
239/054

or considered to be material (37 CFR § 1.97(h)), or even qualifies as "prior art" under 35 USC § 102 with respect to this invention unless specifically designated by Applicant as such.

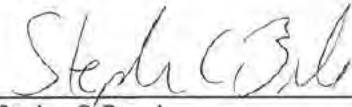
The filing of this IDS shall not be construed to mean that a search has been made or that no other material information, as defined in 37 CFR § 1.56, exists.

The attached IDS is being filed in accordance with 37 CFR §§ 1.97 and 1.98. This IDS is believed to be timely in that it is being submitted under 37 CFR §§ 1.97(b)(3) and 1.97(e)(1), that is before the mailing of a first Office Action on the merits and within three months of being cited by a foreign examiner. Thus, no petition or fee is required. However, if the undersigned representative of Applicant is in error in this regard, then the Examiner is requested to consider this IDS as filed under § 1.97(c) and is further authorized to charge any fee required by the filing of these papers to Lyon & Lyon's Deposit Account No. 12-2475.

Respectfully submitted,

LYON & LYON LLP

By:


Stephen C. Beuerle
Reg. No. 38,380

Dated: May 31, 2000

633 West Fifth Street, Suite 4700
Los Angeles, California 90071-2066
(858) 552-8400

SD-150594-1



UNITED STATES DEPARTMENT OF COMMERCE

Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/227,331	01/06/99	PU	Q 239/054

022249
LYON & LYON LLP
SUITE 4700
653 WEST FIFTH STREET
LOS ANGELES CA 90071-2056

PM82/1003

EXAMINER

PIPALA, E

ART UNIT

PAPER NUMBER

3661

DATE MAILED:

10/03/00

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/227,331	Applicant(s) Pu et al.
	Examiner Ed Pipala	Group Art Unit 3661

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

☒ Responsive to communication(s) filed on 6/5/00

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-28 is/are pending in the application.

Of the above claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) 1-28 is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claim(s) _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.

☐ received in Application No. (Series Code/Serial Number) _____.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

Attachment(s)

☒ Information Disclosure Statement(s), PTO-1449, Paper No(s). #2

☒ Notice of Reference(s) Cited, PTO-892

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Interview Summary, PTO-413

☐ Notice of Informal Patent Application, PTO-152

☐ Other _____

Office Action Summary

Serial Number: 09/227,331

Page 2

Art Unit: 3661

DETAILED ACTION

This Office action is in response to the application filed January 6, 1999 by Qing Kent Pu et al., for the invention titled "Mobile Navigation System".

Information Disclosure Statement

The IDS filed by applicant on June 5, 2000 has been fully considered by the Examiner, as indicated by the accompanying initialed copy of Applicant's form PTO-1449.

Claim Objections

Claim 3 is objected to because of the following informalities: in line 4, the recitation of "using" is unnecessary and confusing. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 1-28 are rejected under 35 U.S.C. 102(e) as being anticipated by DeLorme et al. (5,948,040).

Serial Number: 09/227,331

Page 3

Art Unit: 3661

Computerized travel reservation information and planning system that generates "map ticket" output in various media, for guidance and transactions en route. Such print or electronic documents can include bar or alphanumeric codes for automated recognition and/or access. WHERE?, WHO/WHAT?, WHEN? and HOW? menus enable flexible user inquiries accessing selectable geographic, topical, temporal and transactional data records and relational processing. Sub-menus provide further capabilities: e.g. routing, topical searching; searches of events calendars, almanacs, appointment books, related itinerary scheduling; trip budgeting issues, plus travel arrangement availabilities or other goods/services offers. Online communications links access updated or supplemental information on places, times, topics and other provider goods/service offers. Online computer-aided routing system enables input of selectable travel origin, destination, and waypoints to compute travel routes, available transportation services, costs, options, and schedules. A point-of-interest database lets users pick types of attractions or accommodations within a user-selected region around routes of travel. Users engage in an iterative planning process, revising or editing travel plans, previewing travelogs of alternate routes, selecting point of interest parameters, comparing times and costs of transportation options, in order to achieve a satisfactory travel plan. The system provides printed or electronic output that may include any one or more of text itinerary, ordered set of travel maps, customized collection of information on points of interest information and a selected array of valid reservation confirmations, tickets and/or discount coupons coded with elements for automated recognition and processing. Mobile users, including GPS-linked users, can access the system

Serial Number: 09/227,331

Page 4

Art Unit: 3661

via wireless communication units.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward Pipala whose telephone number is (703) 305-9785. The examiner can normally be reached on Monday through Friday from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Cuchlinski, can be reached on (703) 308-3873. The fax phone number for this Group is (703) 305-7687.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-1113.

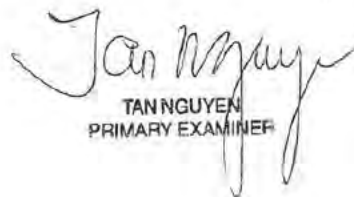
Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to: (703) 305-7687, (for formal communications intended for entry)

Hand-delivered responses should be brought to 5 Crystal Park, 2451 Crystal Drive,
Arlington, VA., Seventh Floor (Receptionist).

Edward Pipala
(703) 305-9785



TAN NGUYEN
PRIMARY EXAMINER

TO SEPARATE, HC .TOP AND BOTTOM EDGES, SNAP-APART AND DISCARD CARBON

FORM PTO-392 (REV. 2-92)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		SERIAL NO. 09/227,331	GROUP ART UNIT 3661	ATTACHMENT TO PAPER NUMBER 3			
NOTICE OF REFERENCES CITED				APPLICANT(S) Pu et al.					
U.S. PATENT DOCUMENTS									
*		DOCUMENT NO.	DATE	NAME	CLASS	SUB- CLASS	FILING DATE IF APPROPRIATE		
	A	5948040	9/1999	DeLorme et al.	701	201			
	B	6026309	2/2000	Moon et al.	701	200			
	C	6085098	7/2000	Moon et al.	455	457			
	D	5938721	8/2000	Dussell et al.	701	211			
	E								
	F								
	G								
	H								
	I								
	J								
	K								
FOREIGN PATENT DOCUMENTS									
*		DOCUMENT NO.	DATE	COUNTRY	NAME	CLASS	SUB- CLASS	PERTINENT SHTS. DWG.	PP. SPEC.
	L								
	M								
	N								
	O								
	P								
	Q								
OTHER REFERENCES (Including Author, Title, Date, Pertinent Pages, Etc.)									
	R								
	S								
	T								
	U								
EXAMINER Ed R. Gable			DATE 9/26/00						
* A copy of this reference is not being furnished with this office action. (See Manual of Patent Examining Procedure, section 707.05 (a).)									

FORM PTO-1449 LIST OF PATENTS AND OTHER REFERENCES FOR APPLICANT'S INFORMATION DISCLOSURE STATEMENT (Use several sheets if necessary)	ATTY. DOC. NO.	SERIAL NO.
	239/054	09/227,331
	APPLICANT:	
	Kent Qing Pu et al	
	FILING DATE:	GROUP:
	January 6, 1999	3661

U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	NAME	CLASS	SUB CLASS	FILING DATE
<i>EP</i>	AA	5,818,356	10/98	Schuessler	340	995	
<i>EP</i>	AB	5,808,566	9/98	Behr et al.	340	995	
<i>EP</i>	AC	5,745,867	4/98	Mills	455	456	
	AD						
	AE						
	AF						
	AG						
	AH						

FOREIGN PATENT DOCUMENTS							
EXAMINER INITIAL		DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUB CLASS	TRANSLATION YES NO
<i>EP</i>	AI	DE 197 50 778 A	6/25/98	Germany	—	—	X
<i>EP</i>	AJ	EP 0 800 092 A	10/8/97	EPO	—	—	X
<i>EP</i>	AK	EP 0 790 591 A	8/20/97	EPO	—	—	X

OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, etc.)							
	AL						
	AM						
	AN						
	AO						
	AP						

SD-150697.1 EXAMINER: <i>Ed Pipalan</i>	DATE CONSIDERED: <i>9/25/00</i>
EXAMINER: Initial if reference is considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not in conformance and not considered. Include a copy of this form with next communication to applicant	



**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/227,331	01/06/99	PU	Q 239/054

022249 PM51/1116
LYON & LYON LLP
SUITE 4700
633 WEST FIFTH STREET
LOS ANGELES CA 90071-2066

EXAMINER

PIPALA, E

ART UNIT

PAPER NUMBER

3661

DATE MAILED:

11/16/00

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Commissioner of Patents and Trademarks



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARK
Washington, D.C. 20231

APPLICATION NUMBER	11/06/00	FILING DATE	PM	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
					239/054

021242
LYON & LYON LLP
SUITE 4700
633 WEST FIFTH STREET
LOS ANGELES CA 90071-2066

PM51/1117

EXAMINER
PIPALA, E

ART UNIT	PAPER NUMBER
3551	#4

DATE MAILED: 11/17/00

INTERVIEW SUMMARY

All participants (applicant, applicant's representative, PTO personnel):

- (1) David Heisei reg. # 42051 (3)
(2) Edward Pipala (ex'r) (4)

Date of Interview: Nov. 13, 2000

Type: ☒ Telephonic ☐ Televideo Conference ☐ Personal (copy is given to ☐ applicant ☐ applicant's representative).

Exhibit shown or demonstration conducted: ☐ Yes ☒ No If yes, brief description: _____

Agreement ☐ was reached. ☒ was not reached.

Claim(s) discussed: 1-28 in general with particular emphasis on claims 1-4

Identification of prior art discussed: Dehorme et al. (5,948,040)

Description of the general nature of what was agreed to if an agreement was reached, or any other comments: applicant was advised to address the manner or nature in which the "natural language" description of an optimal route is use by or transmitted between each of the client and the server, as a way of overcoming the 102 rejection of the Office action mailed 10/3/00.

(A fuller description, if necessary, and a copy of the amendments, if available, which the examiner agreed would render the claims allowable must be attached. Also, where no copy of the amendments which would render the claims allowable is available, a summary thereof must be attached.)

☒ It is not necessary for applicant to provide a separate record of the substance of the interview.

Unless the paragraph above has been checked to indicate to the contrary, A FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION IS NOT WAIVED AND MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW.

Examiner Note: You must sign this form unless it is an attachment to another form.

Ed Pipala

FORM PTOL-413 (REV. 2-98)

Manual of Patent Examining Procedure, Section 713.04 Substance of Interview must Be Made of Record

Except as otherwise provided, a complete written statement as to the substance of any face-to-face or telephone interview with regard to an application must be made of record in the application, whether or not an agreement with the examiner was reached at the interview.

§1.133 Interviews * * * * *

(b) In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111 and 1.135. (35 U.S.C. 132)

§ 1.2. Business to be transacted in writing. All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete a two-sheet carbon interleaf Interview Summary Form for each interview held after January 1, 1978 where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks in neat handwritten form using a ball point pen. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, pointing out typographical errors or unreadable script in Office actions or the like, or resulting in an examiner's amendment that fully sets forth the agreement are excluded from the interview recordation procedures below.

The Interview Summary Form shall be given an appropriate paper number, placed in the right hand portion of the file, and listed on the "Contents" list on the file wrapper. In a personal interview, the duplicate copy of the Form is removed and given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephonic interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication.

The Form provides for recordation of the following information:

- Application Number of the application
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (personal or telephonic)
- Name of participant(s) (applicant, attorney or agent, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the claims discussed
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). (Agreements as to allowability are tentative and do not restrict further action by the examiner to the contrary.)
- The signature of the examiner who conducted the interview
- Names of other Patent and Trademark Office personnel present.

The Form also contains a statement reminding the applicant of his responsibility to record the substance of the interview.

It is desirable that the examiner orally remind the applicant of his obligation to record the substance of the interview in each case unless both applicant and examiner agree that the examiner will record same. Where the examiner agrees to record the substance of the interview, or when it is adequately recorded on the Form or in an attachment to the Form, the examiner should check a box at the bottom of the Form informing the applicant that he need not supplement the Form by submitting a separate record of the substance of the interview.

It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview:

A complete and proper recordation of the substance of any interview should include at least the following applicable items:

- 1) A brief description of the nature of any exhibit shown or any demonstration conducted,
- 2) an identification of the claims discussed,
- 3) an identification of specific prior art discussed,
- 4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the examiner.
- 5) a brief identification of the general thrust of the principal arguments presented to the examiner. The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he feels were or might be persuasive to the examiner.
- 6) a general indication of any other pertinent matters discussed, and
- 7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete or accurate, the examiner will give the applicant one month from the date of the notifying letter to complete the reply and thereby avoid abandonment of the application (37 CFR 1.135(c)).

Examiner to Check for Accuracy

Applicant's summary of what took place at the interview should be carefully checked to determine the accuracy of any argument or statement attributed to the examiner during the interview. If there is an inaccuracy and it bears directly on the question of patentability, it should be pointed out in the next Office letter. If the claims are allowable for other reasons of record, the examiner should send a letter setting forth his or her version of the statement attributed to him. If the record is complete and accurate, the examiner should place the indication "Interview record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

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Patent
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Qing Kent Pu, et al.

Serial No.: 09/227,331

Filed: January 6, 1999

For: MOBILE NAVIGATION SYSTEM

Group Art Unit: 3661

Examiner: E. Pipala



AMENDMENT TRANSMITTAL

Box Amend.—Fee
Commissioner for Patents
Washington, D.C. 20231

Sir:

Transmitted herewith is an Amendment for the above-identified application.

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SD-160439.1

CERTIFICATE OF MAILING
(37 C.F.R. §1.10)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as 'Express Mail Post Office To Addressee' in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

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Line Gauthier
Name of Person Mailing Paper

March 05, 2001
Date of Deposit

Line Gauthier
Signature of Person Mailing Paper

EL356083432US



Patent
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- ☒ Applicant(s) petitions for an extension of time under 37 CFR § 1.136 [fees: 37 CFR § 1.17(a)(1)-(5)] for the total number of months checked below:

EXTENSION (months)	FEE FOR SMALL ENTITY	FEE FOR OTHER THAN SMALL ENTITY
1 month	☐ \$55.00	☐ \$110.00
2 months	☒ \$195.00	☐ \$390.00
3 months	☐ \$445.00	☐ \$890.00
4 months	☐ \$695.00	☐ \$1,390.00
5 months	☐ \$945.00	☐ \$1,890.00

- ☐ An extension for _____ months has already been secured and the fee paid therefor of _____ is deducted from the total fee due for the total months of extension now requested.
- ☐ Extension fee due with this Request _____.
- ☒ If an additional extension of time is required, please consider this a petition therefor.

FEES FOR CLAIMS:

- ☒ Applicant claims small entity status pursuant to 37 CFR 1.27.

The fees for claims (37 CFR § 1.16(b)-(d)) have been calculated as shown below:

Total Claims	0	-	0	=	0	x	\$18.00	\$00.00
Independent Claims	2	-	0	=	2	x	\$80.00	\$160.00
Multiple Dependent Claims	\$270	(if applicable)				☐		\$0.00
TOTAL OF ABOVE CALCULATIONS								\$160.00
Reduction by ½ for Filing by Small Entity.								
Note 37 CFR §§ 1.9, 1.27, 1.28.								
TOTAL FEES FOR CLAIMS SUBMITTED HERewith								\$275.00

- ☐ A check in the amount of _____ is enclosed to cover the above fee(s).
- ☒ Charge Lyon & Lyon's Deposit Account No. 12-2475 in the amount of \$275.00.

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Patent Office

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☒ The Commissioner is authorized to charge Lyon & Lyon's Deposit Account No. **12-2475** for any fees required under 37 CFR §§ 1.16 and 1.17 that are not covered, in whole or in part, by a check enclosed herewith and to credit any overpayments to said Deposit Account **12-2475**.

Respectfully submitted,

LYON & LYON LLP

By:


Stephen C. Beuerle
Reg. No. 38,380

Dated: March 5, 2001

633 West Fifth Street, Suite 4700
Los Angeles, California 90071-2066
(858) 552-8400

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Qing Kent Pu, et al.

Serial No.: 09/227,331

Filed: January 6, 1999

For: MOBILE NAVIGATION SYSTEM

Group Art Unit: 3661

Examiner: E. Pipala

AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir: 1

In response to the Office Action dated October 3, 2000, Applicants respectfully request allowance of the present application in view of the following amendments and remarks:

IN THE SPECIFICATION:

Please enter the following amendments to the specification by respective replacement paragraphs (marked-up paragraphs in APPENDIX A):

Please substitute the paragraph beginning on page 15, line 12 (where "in" on line 12 after "found" is deleted), with the following paragraph:

Accordingly, in step 602, the start location is found within the local mapping database 208. Specific methods for searching the local mapping database 208 depend on the actual

SD-160041

CERTIFICATE OF MAILING
(37 C.F.R. §1.10)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as 'Express Mail Post Office To Addressee' in an envelope addressed to the Commissioner for Patents, Washington, D.C. 20231.

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Signature of Person Mailing Paper

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mapping database being used in each specific implementation of the present invention. Typically, standard map data accessing function calls are used in accordance with requirements of a predefined application-programming interface (API). Specific method steps for searching various types of mapping databases 208 would be apparent to persons skilled in the relevant art(s).

Please substitute the paragraph beginning on page 16, line 26 (where "614" on page 17, line 1 is replaced with "601") with the following paragraph:

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If in step 614, a match between the cross street and the turn street is found, control passes to step 616. In step 616, the process makes the turn as indicated in the link information. Control next passes back to step 604, where the next link is read. The process represented by steps 604-616 continues until step 608 determines that the last link has been processed, as described above.

Please substitute the paragraph beginning on page 20, line 20, (where "and" on line 21 is inserted after "wider") with the following paragraph:

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Accordingly, three sets of time zone division lines are stored, ranging in accuracy from course to medium to fine. The course time zone division lines are wider and not as accurate as the medium division lines, which in turn are wider and not as accurate as the fine division lines. As the level of accuracy increases, so does the number and complexity of the polygons that comprise the different sets of time zone lines. In other words, the course and medium time division lines are approximations that are used to quickly determine whether a current position is close to an actual time zone. If so, a more precise set of lines is used. The fine time zone division lines very accurately depict the shape and position of the actual time zone division lines. The fine set of lines is much more complex and requires more polygons than the less accurate course and medium sets of lines. This concept is illustrated in FIG. 8B.

IN THE CLAIMS:

Please enter the following amendments to the claims by respective replacement claims (marked-up claims in APPENDIX B):

1. A method for providing an optimal route using real-time information for a navigation system comprising a client and a server, said server coupled to a computer network, said method comprising the steps of:

establishing a wireless connection between the client and the server;
transmitting start and end route designations from the client to the server;
accessing real-time information by the server;
calculating the optimal route by the server, based on the real-time information and said start and end route designations;
formatting the optimal route into a non-proprietary, natural language description;
downloading said non-proprietary, natural language description to the client;
reconstructing the optimal route by the client using a local mapping database; and
displaying said optimal route on a display system coupled to the client.

2. The method of claim 1, wherein said step of formatting includes the step of dividing the optimal route into one or more links, wherein each link includes at least a street name and a turning orientation.

3. The method of claim 2, wherein said step of reconstructing includes the steps of:
searching said local mapping database for a closest match of said street name and said turning orientation for each of said links; and
building the optimal route by combining each of said closest matches from said searching step.

4. The method of claim 1, wherein said accessing step comprises the step of accessing a traffic database comprising current traffic conditions; and

querying said traffic database for determining current traffic conditions between locations defined by said start and end route designations.

5. The method of claim 1, wherein said real-time information includes one or more from the set of:

*Ad
Cont.*

current traffic conditions;
highway ramp configurations;
current weather conditions;
construction information;
road restrictions;
detour information; and
event traffic information.

6. The method of claim 1, wherein said wireless connection is accomplished using a cellular network.

7. The method of claim 1, wherein said transmitting step includes the step of entering into a keypad data entry field, said start and stop route designations including a name for one or more of:

a city;
a state;
a country; and
a street.

8. The method of claim 7, wherein said step of entering comprises the steps of:

comparing data entered into the keypad data entry field with a database of allowable entries;

determining a set of conforming data items associated with said entered data;

applying a criterion to said set of conforming data items to determine an anticipated data item; and

displaying said anticipated data item in the data entry field.

9. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that appears first alphabetically.

10. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most frequently.

11. The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most recently.

12. The method of claim 1, wherein said downloading step comprises the step of compressing said natural language description.

13. The method of claim 1, wherein said calculating step further comprises the step of reading user-specific data in calculating the optimal route.

14. The method of claim 1, wherein said computer network is the Internet.

15. A mobile navigation system comprising:

a navigation computer;

a wireless transceiver coupled to said navigation computer for connecting with a navigation server, said navigation server for calculating optimal routes based on

real-time information, said optimal routes being formatted using a non-proprietary, natural language description;

a mapping database coupled to said navigation computer for reconstructing said optimal route from said non-proprietary, natural language description; and

a display screen coupled to said navigation computer for displaying said optimal route using said mapping database.

16. The mobile navigation system of claim 15, further comprising:

a GPS receiver coupled to said navigation computer for monitoring position;

a telephonic device coupled to said wireless transceiver and said navigation computer for making and receiving telephone calls; and

a keypad coupled to said navigation computer for entering start and end route designations,

17. The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head right configuration.

18. The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head left configuration.

19. The mobile navigation system of claim 16, further including a clock coupled to said navigation computer, wherein said navigation computer is programmed to set said clock to an accurate local time in accordance with a time from said GPS receiver and a current time zone.

20. The mobile navigation system of claim 15, further including a clock coupled to said navigation computer, and said telephonic device, wherein said navigation computer is programmed to indicate from said clock a local time of a called party based on a dialed number.

21. A method for indicating a local time with respect to a called party, comprising the steps of:

parsing a dialed-out telephone number to extract location data comprising at least one of:

a country code;

a city code;

an area code; and

an exchange code;

querying a database to determine a time zone corresponding with said location data;

obtaining the current GMT time;

converting said current GMT time to a local time in accordance with said associated time zone; and

indicating said local time.

22. A method for determining a current time zone for a mobile navigation system having a GPS receiver comprising the steps of:

storing a digital representation of time zone division lines;

obtaining a position from the GPS; and

comparing said position with said digital representation to determine the current time zone.

23. The method of claim 22, further comprising the steps of:

obtaining current GMT from the GPS;

converting said GMT to local time in accordance with said current time zone; and

setting a clock on said mobile navigation system in accordance with said local time.

24. The method of claim 22, wherein:

said storing step further includes the step of storing three sets of time zone division lines, having different resolutions ranging from course to medium to fine; and

said comparing step further includes the step of comparing said position with said course set of time zone division lines, and if a match is found, comparing said position with said medium set of time zone division lines, and if a match is found comparing said position with said fine set of time zone division lines.

25. A method for displaying a representation of an automobile's bearing and position superimposed on a map for a mobile navigation system, said method comprising the steps of:

displaying the representation of the automobile to always point to the right; and continuously scrolling the map relative to said representation.

26. A method for displaying a representation of an automobile's bearing and position superimposed on a map for a mobile navigation system, said method comprising the steps of:

displaying the representation of the automobile to always point to the left; and continuously scrolling the map relative to said representation.

27. A method for entering data into a mobile navigation system using a keypad data entry field comprising the steps of:

comparing data entered into the keypad data entry field with a database of allowable entries;

determining a set of conforming data items associated with said entered data;

applying a criterion to said set of conforming data items to determine an anticipated data item; and

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displaying said anticipated data item in the keypad data entry field.

28. The method of claim 27, further comprising the step of:

limiting the set of characters that can be scrolled in each character position to a set of characters conforming to said set of conforming data items.

Please add the following new claims:

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cont.

21. (New) A method for providing an optimal route using real-time information from a server of a navigation system, the navigation system also comprising a client and said server coupled to a computer network, said method comprising the steps of:

establishing a wireless connection with the client;

receiving at the server start and end route designations from the client;

calculating at the server the optimal route based on real-time information at the server and said start and end route designations;

formatting at the server the optimal route into a non-proprietary, natural language description;

downloading from the server said non-proprietary, natural language description to the client so that the client can reconstruct the optimal route using a local mapping database and display said optimal route on a display system coupled to the client.

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20. (New) A method for providing an optimal route using real-time information at client of a navigation system, the navigation system also comprising a client and said server coupled to a computer network, said method comprising the steps of:

establishing a wireless connection with the server;

transmitting start and end route designations from the client to the server;

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receiving from the server an optimal route formatted in a non-proprietary, natural
language description and calculated based on real-time information and said start
and end route designations;
reconstructing the optimal route using a local mapping database; and
displaying said optimal route on a display system coupled to the client.

REMARKS

Claims 1-30 are pending in the present application and stand rejected under 35 U.S.C. 102(b). Claims 1, 3, 15, 20, 21, 22, 23, 25, and 26 have been amended. Claims 29 and 30 have been added. Replacement paragraphs/claims have been submitted above and marked-up paragraphs/claims are attached in APPENDICES A, B, respectively

Reconsideration and allowance of the application is respectfully requested in view of the above amendments and following remarks.

Claim objection:

In regard to the rejection of claim 3, this claim has been amended accordingly.

35 U.S.C. 102(b):

In regard to the rejection of claims 1-28 under 35 U.S.C. 102(b) in view of U.S. Patent No. 5,948,040 to DeLorme, et al. ("DeLorme"), Applicants respectfully traverse this rejection because DeLorme does not teach each and every element of the claims.

In regard to claims 1-20, DeLorme does not disclose, teach, or suggest, among other things, formatting the optimal route into a non-proprietary, natural language description and downloading the non-proprietary, natural language description to the client. The TRIPS system described in DeLorme is no different than the navigation systems distinguished in the Background of the Invention of the present application in that in these systems, all geographical data transmitted by the server is in a propriety format so that the downloaded information used to describe geographical data, such as point-of-interest addresses and detailed map data, includes data points, indices and the like that are specific to the particular mapping database used on the client. Accordingly, the client navigation system must have a particular pre-defined mapping database installed in order to work with the server and, in some cases, the mapping database used by the client and server must be identical. If there is a mismatch between the expected mapping database and the actual mapping database used on the client, the client cannot properly interpret the geographical data downloaded from the server and the system will fail to operate.

Accordingly, customers using these current systems must obtain the latest version of the mapping database software available. This presents a major burden for customers and manufacturers alike due to the high frequency in which these databases must be updated.

In addition, the data downloaded by the client generally requires high bandwidth communication channels due the sheer volume of data transmitted by these current systems. Such high bandwidth communication channels are expensive and may not be readily available in all areas.

Another problem with systems such as the DeLorme's TRIPS navigation system is that the client must include sophisticated algorithms for calculating optimal routes. In addition, these route-calculating algorithms in the client must be updated in accordance with current services and options available on the server. For example, if the server were updated to provide a new or modified feature to the client, the client must be specifically customized to support the new or modified feature. Thus, a very close coordination between the software installed on the server and the software installed on the clients must be maintained. This creates an additional economic burden for customers.

A further problem with DeLorme's TRIPS navigation system is that the proprietary server cannot be used with navigation systems and mapping databases provided by other manufacturers. The client software must be frequently customized and very specific mapping software must be used.

In the claimed method and navigation system, formatting the optimal route into a non-proprietary, natural language description and downloading the non-proprietary, natural language description to the client allows the navigation system to be used with any mapping database installed on the client navigation system. The level of detail necessary for the client-installed mapping database is minimal. The claimed invention also alleviates the need to have specific pre-defined turn-by-turn mapping databases installed on the client. Another advantage of the claimed invention is that the client navigation system can be made much less complex than those used in current systems. The server performs routing generation on behalf of the client, alleviating the need to install sophisticated and expensive routing algorithms and/or complex hardware components on the client that are used to perform local routing calculations. The role

of the client system may be limited to displaying routes generated by the server. The claimed invention also does not require software changes on the client navigation systems whenever the server provides new and/or modified features. All enhancements to the services provided by the server are independent from the software installed on the client. The claimed invention also alleviates the need for users to update their mapping database whenever a new version is available. Navigation client systems from any vendor can be easily adapted to work with the server of the present invention because natural language is used to describe optimal routing information. A further advantage of the claimed invention is that low bandwidth communication channels can be used to download the information from the server to the clients. A further advantage of the present invention is that the natural language routing descriptions can be highly compressed to thereby reduce the already low bandwidth requirements of the wireless communication channels. The natural language description is completely independent from the local mapping database software used on the clients, and can therefore be used in conjunction with any type of mapping database software. DeLorme does not disclose teach or suggest the claimed method nor any of the advantages enumerated above.

In regard to claim 21, DeLorme does not disclose, teach, or suggest a method of indicating local time with respect to a called party, especially the recited steps of parsing a dialed-out telephone number to extract location data, querying a database to determine a time zone corresponding with the location data, obtaining the current GMT time, converting the current GMT time to a local time in accordance with the associated time zone, and indicating the local time. This is advantageous in navigation systems as well as other applications because a caller can determine upon initiating a call what time it is at the called party's location so, for example, the caller does not accidentally wake a called party in the middle of the night. DeLorme does not disclose teach or suggest the claimed method nor any of the attendant advantages.

In regard to claims 22-24, DeLorme does not disclose, teach, or suggest a method for determining a current time zone for a mobile navigation system having a GPS receiver, especially, among other things, the recited steps of storing a digital representation of the time zone division lines, obtaining a position from the GPS, and comparing the position with the digital representation to determine the current time zone. This method allows the clock of the

mobile navigation system to be set to a highly accurate local time, taking changes in time zone into consideration.

In regard to claims 25 and 26, DeLorme does not disclose, teach, or suggest displaying a representation of an automobile superimposed on a map for a mobile navigation system where that the automobile always points to the right and left, respectively. This method maximizes the amount of information that can be displayed in front of the superimposed automobile, making many mobile navigation system displays (e.g., wide, narrow automobile navigation system displays) more efficient and allowing for more look-ahead space.

In regard to claims 27 and 28, DeLorme does not disclose, teach, or suggest a method for entering data into a mobile navigation system using a keypad data entry field, especially, among other things, the recited steps of comparing data entered into the keypad data entry field with a database of allowable entries, determining a set of conforming data items associated with the entered data, applying a criterion to the set of conforming data items to determine an anticipated data item, and displaying the anticipated data item in the keypad data entry field. This "auto complete" feature anticipates data being entered by users to minimize the data-entry process, making it especially useful in a mobile navigation system such as an automobile navigation system due to the inherent difficulty in entering data while driving.

Therefore, Applicants respectfully submit that claims 1-28 are not anticipated by DeLorme and respectfully request this rejection be withdrawn.

New Claims 29, 30:

These method claims generally resemble method claim 1, but from a server and a client perspective, respectively.

CONCLUSION

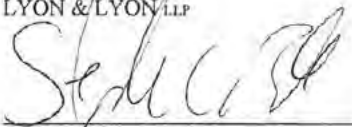
On the basis of the above, reconsideration and allowance of the application is believed to be warranted and such action is respectfully requested. If the Examiner has any questions or

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comments regarding this amendment, the Examiner is respectfully urged to contact the undersigned at the number listed below.

Respectfully submitted,

LYON & LYON LLP



Dated: March 5, 2001

By:

Stephen C. Beuerle
Reg. No. 38,380

633 West Fifth Street, Suite 4700
Los Angeles, California 90071-2066
(858) 552-8400

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EXHIBIT A



239/054
Patent

APPENDIX A

VERSION WITH MARKINGS TO SHOW CHANGES MADE TO SPECIFICATION

Paragraph beginning on page 15, line 12:

Accordingly, in step 602, the start location is found [in] within the local mapping database 208. Specific methods for searching the local mapping database 208 depend on the actual mapping database being used in each specific implementation of the present invention. Typically, standard map data accessing function calls are used in accordance with requirements of a predefined application-programming interface (API). Specific method steps for searching various types of mapping databases 208 would be apparent to persons skilled in the relevant art(s).

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Paragraph beginning on page 16, line 26:

If in step 614, a match between the cross street and the turn street is found, control passes to step 616. In step 616, the process makes the turn as indicated in the link information. Control next passes back to step [614] 604, where the next link is read. The process represented by steps 604-616 continues until step 608 determines that the last link has been processed, as described above.

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TO 3600 MAIL ROOM

Paragraph beginning on page 20, line 20:

Accordingly, three sets of time zone division lines are stored, ranging in accuracy from course to medium to fine. The course time zone division lines are wider and not as accurate as the medium division lines, which in turn are wider and not as accurate as the fine division lines. As the level of accuracy increases, so does the number and complexity of the polygons that comprise the different sets of time zone lines. In other words, the course and medium time division lines are approximations that are used to quickly determine whether a current position is close to an actual time zone. If so, a more precise set of lines is used. The fine time zone division lines very accurately depict the shape and position of the actual time zone division lines. The fine set of lines is much more complex and requires more polygons than the less accurate course and medium sets of lines. This concept is illustrated in FIG. 8B.



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EXHIBIT B



239/054
Patent

APPENDIX B

(VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS)

1. (Amended) A method for providing an optimal route using real-time information for a navigation system comprising a client and a server, said server coupled to a computer network, said method comprising the steps of:

establishing a wireless connection between the client and the server;
transmitting start and end route designations from the client to the server;
accessing real-time information by the server;
calculating the optimal route by the server, based on the real-time information and said start and end route designations;
formatting the optimal route into a non-proprietary, natural language description;
downloading said non-proprietary, natural language description to the client;
reconstructing the optimal route by the client using a local mapping database; and
displaying said optimal route on a display system coupled to the client.

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2. (Recited) The method of claim 1, wherein said step of formatting includes the step of dividing the optimal route into one or more links, wherein each link includes at least a street name and a turning orientation.

3. (Amended) The method of claim 2, wherein said step of reconstructing includes the steps of:

searching said local mapping database for a closest match of said street name and said turning orientation for each of said links; and

building the optimal route [using] by combining each of said closest matches from said searching step.

4. (Recited) The method of claim 1, wherein said accessing step comprises the step of accessing a traffic database comprising current traffic conditions; and

querying said traffic database for determining current traffic conditions between locations defined by said start and end route designations.

5. (Recited) The method of claim 1, wherein said real-time information includes one or more from the set of:

current traffic conditions;

highway ramp configurations;

current weather conditions;

construction information;

road restrictions;

detour information; and

event traffic information.

6. (Recited) The method of claim 1, wherein said wireless connection is accomplished using a cellular network.

7. (Recited) The method of claim 1, wherein said transmitting step includes the step of entering into a keypad data entry field, said start and stop route designations including a name for one or more of:

- a city;
- a state;
- a country; and
- a street.

8. (Recited) The method of claim 7, wherein said step of entering comprises the steps of:

- comparing data entered into the keypad data entry field with a database of allowable entries;
- determining a set of conforming data items associated with said entered data;
- applying a criterion to said set of conforming data items to determine an anticipated data item; and
- displaying said anticipated data item in the data entry field.

9. (Recited) The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that appears first alphabetically.

10. (Recited) The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most frequently.
11. (Recited) The method of claim 8, wherein said criterion defines a data item in said set of conforming data items that is used most recently.
12. (Recited) The method of claim 1, wherein said downloading step comprises the step of compressing said natural language description.
13. (Recited) The method of claim 1, wherein said calculating step further comprises the step of reading user-specific data in calculating the optimal route.
14. (Recited) The method of claim 1, wherein said computer network is the Internet.
15. (Amended) A mobile navigation system comprising:
 - a navigation computer;
 - a wireless transceiver coupled to said navigation computer for connecting with a navigation server, said navigation server for calculating optimal routes based on real-time information, said optimal routes being formatted using a non-proprietary natural language description;
 - a mapping database coupled to said navigation computer for reconstructing said optimal route from said non-proprietary natural language description; and

a display screen coupled to said navigation computer for displaying said optimal route using said mapping database.

16. (Recited) The mobile navigation system of claim 15, further comprising:

a GPS receiver coupled to said navigation computer for monitoring position;

a telephonic device coupled to said wireless transceiver and said navigation computer for making and receiving telephone calls; and

a keypad coupled to said navigation computer for entering start and end route designations;

17. (Recited) The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head right configuration.

18. (Recited) The mobile navigation system of claim 15, wherein said display screen is used to display the mapping database in a head left configuration.

19. (Recited) The mobile navigation system of claim 16, further including a clock coupled to said navigation computer, wherein said navigation computer is programmed to set said clock to an accurate local time in accordance with a time from said GPS receiver and a current time zone.

20. (Amended) The mobile navigation system of claim 15, further including a clock coupled to said navigation computer, and said telephonic device, wherein said navigation computer is programmed to [display] indicate from [on] said clock a local time of a called party based on a dialed number.

21. (Amended) A method for [displaying] indicating a local time with respect to a called party, comprising the steps of:

parsing a dialed-out telephone number to extract location data comprising at least one of:

a country code;

a city code;

an area code; and

an exchange code;

querying a database to determine a time zone corresponding with said location data;

obtaining the current GMT time;

converting said current GMT time to a local time in accordance with said associated time zone; and

[displaying] indicating said local time.

22. (Amended) A method for determining a current time zone for a mobile navigation system having a GPS receiver comprising the steps of:

storing a digital representation of time zone division lines;

obtaining a position from the GPS; and

comparing said position with said digital representation to determine the current time zone.

23. (Amended) The method of claim 22, further comprising the steps of:

obtaining current GMT from the GPS;

converting said GMT to local time in accordance with said current time zone; and

setting a clock on said mobile navigation system in accordance with said local time.

24. (Recited) The method of claim 22, wherein:

said storing step further includes the step of storing three sets of time zone division lines, having different resolutions ranging from course to medium to fine; and

said comparing step further includes the step of comparing said position with said course set of time zone division lines, and if a match is found, comparing said position with said medium set of time zone division lines, and if a match is found comparing said position with said fine set of time zone division lines.

25. (Amended) A method for displaying a representation of an automobile's bearing and position superimposed on a map for a mobile navigation system, said method comprising the steps of:

displaying the representation of the automobile to always point to the right; and

continuously scrolling the map relative to said representation.

26. (Amended) A method for displaying a representation of an automobile's bearing and position superimposed on a map for a mobile navigation system, said method comprising the steps of:

displaying the representation of the automobile to always point to the left; and
continuously scrolling the map relative to said representation.

27. (Recited) A method for entering data into a mobile navigation system using a keypad data entry field comprising the steps of:

comparing data entered into the keypad data entry field with a database of allowable entries;
determining a set of conforming data items associated with said entered data;
applying a criterion to said set of conforming data items to determine an anticipated data item; and
displaying said anticipated data item in the keypad data entry field.

28. (Recited) The method of claim 27, further comprising the step of:
limiting the set of characters that can be scrolled in each character position to a set of characters conforming to said set of conforming data items.



UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

WV

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/227,331 01/06/99 PU

Q 239/054

022249
LYON & LYON LLP
SUITE 4700
633 WEST FIFTH STREET
LOS ANGELES CA 90071-2066

PM82/0516

EXAMINER

PIPALA, E

ART UNIT

PAPER NUMBER

3661

DATE MAILED: 05/16/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/227,331	Applicant(s) Pu et al.
	Examiner Ed Pipala	Group Art Unit 3661

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

☒ Responsive to communication(s) filed on 3/5/01
☒ This action is **FINAL**.
☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 1-30 is/are pending in the application.
 Of the above claim(s) _____ is/are withdrawn from consideration.
☒ Claim(s) 1-20, 29 & 30 is/are allowed.
☒ Claim(s) 21-28 is/are rejected.
☐ Claim(s) _____ is/are objected to.
☐ Claim(s) _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.
☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.
☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
☐ The specification is objected to by the Examiner.
☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been received.
☐ received in Application No. (Series Code/Serial Number) _____
☐ received in this national stage application from the International Bureau (PCT Rule 1.7.2(a)).
 *Certified copies not received: _____

Attachment(s)

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____
☐ Notice of Reference(s) Cited, PTO-892
☒ Notice of Draftsperson's Patent Drawing Review, PTO-948
☐ Interview Summary, PTO-413
☐ Notice of Informal Patent Application, PTO-152
☐ Other _____

Serial Number: 09/227,331

Page 2

Art Unit: 3661

DETAILED ACTION

This Office action is in response to Applicant's amendments and remarks filed 3/5/01.

Claims 1-30 are presently pending in this application.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

Claims 21-28 are rejected under 35 U.S.C. 102(e) as being anticipated by DeLorme et al.

Claims 21-24 relate to a method of determining the local time of a called party by first determining GMT time and therefrom determining the time zone of the party in question by means of at least one of a country code, city code, area code or an exchange, as well as using information with respect to time zone division lines of different resolution.

In this regard please see column 23, lines 45-56 which teach accessing time of day (or night), and/or seasonal related factors, as well as lines 50-59 of column 24 which further teach the

Art Unit: 3661

capability of zooming to different scale maps with variable resolutions, as well as locating map display named places by zip code, phone exchange, street address, or other ordinary language geographic location and direction identifiers. Additionally, lines 35-45 of column 25 which teach that the system of DeLorme et al., can also implement or be complemented by a dynamic calendar, clock and/or timetable graphic user interface (GUI).

Also please see col. 28, lines 29-40 and col. 33 lines 18-51 (of which time zone information is necessarily inherent).

Claims 25 and 26 relate to a method of displaying a representation of an automobile's bearing and position (where the scrolling position is either always to the right or always to the left, respectively), and wherein claims 28 and 28 relate to a simplified method of keypad data entry.

Once again please note lines 51-54 of column 24 which teach the capability to zoom to different map scales, and to pan or shift seamlessly across to other map locations (where an up, down, left or right preference selection is inherent in a display of this type).

With respect to the manner of data entry please see the top of column 24 which teaches (starting in line 7), that these input means include natural language text queries, keystroke, or mouse input devices which may include "relational data queries and/or other state of the art input means known or readily implemented in the digital computer software field".

Art Unit: 3661

Allowable Subject Matter

Claims 1-20, 29 and 30 are allowed over the prior art of record.

As per current Office policy formal drawings are required in response to this Office action.

Conclusion

The Examiner has fully considered Applicant's arguments with respect to the presently rejected claims (21-28), and in response thereto has attempted to specifically direct Applicant's attention to the appropriate portions of the reference (DeLorme et al., P.N. 5,984,040), which either teach these aspects outright, or which provide a general teaching thereof such that Applicant's claimed invention is necessarily inherent in order to perform the functionality disclosed by DeLorme et al.

As per the interview of 11/13/00, claims 1-20, 29 and 30 have been allowed.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

Serial Number: 09/227,331

Page 5

Art Unit: 3661

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward Pipala whose telephone number is (703) 305-9785. The examiner can normally be reached on Monday through Friday from 8:30 to 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Cuchlinski, can be reached on (703) 308-3873. The fax phone number for this Group is (703) 305-7687.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-1113.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks
Washington, D.C. 20231

or faxed to: (703) 305-7687, (for formal communications intended for entry)

Hand-delivered responses should be brought to 5 Crystal Park, 2451 Crystal Drive,
Arlington, VA., Seventh Floor (Receptionist).

Edward Pipala

(703) 305-9785



WILLIAM A. CUCHLINSKI, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3600

09/22/99

NOTICE OF DRAFTPERSON'S
PATENT DRAWING REVIEWThe drawing filed (insert date) 1/6/99 are:A. ☐ not objected to by the Draftperson under 37 CFR 1.84 or 1.152.B. ☒ objected to by the Draftperson under 37 CFR 1.84 or 1.152 as indicated below. The Examiner will require submission of new, corrected drawings where necessary. Corrected drawings must be submitted according to the instructions on the back of this notice.1. DRAWINGS. 37 CFR 1.84(a): Acceptable categories of drawings:
Black ink. Color.☐ Color drawing are not acceptable until petition is granted.

Fig.(s) _____

☐ Pencil and non black ink is not permitted. Fig(s) _____

2. PHOTOGRAPHS. 37 CFR 1.84(b)

☐ Photographs are not acceptable until petition is granted,☐ 3 full-tone sets are required. Fig(s) _____☐ Photographs not properly mounted (must bristol board or photographic double-weight paper). Fig(s) _____☐ Poor quality (half-tone). Fig(s) _____

3. TYPE OF PAPER. 37 CFR 1.84(e)

☐ Paper not flexible, strong, white and durable.

Fig.(s) _____

☐ Erasures, alterations, overwritings, interlineations, folds, copy machine marks not acceptable. (too thin)☐ Mylar, vellum paper is not acceptable (too thin).

Fig(s) _____

4. SIZE OF PAPER. 37 CFR 1.84(F): Acceptable sizes:

☐ 21.0 cm by 29.7 cm (DIN size A4)☐ 21.6 cm by 27.9 cm (8 1/2 x 11 inches)☐ All drawings sheets not the same size.

Sheet(s) _____

5. MARGINS. 37 CFR 1.84(g): Acceptable margins:

Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm

SIZE: A4 Size

Top 2.5 cm Left 2.5 cm Right 1.5 cm Bottom 1.0 cm

SIZE: 8 1/2 x 11

☒ Margins not acceptable. Fig(s) 13-7B, 10A☒ Top (T) ☒ Left (L)☒ Right (R) ☐ Bottom (B)

6. VIEWS. 37 CFR 1.84(h)

REMINDER: Specification may require revision to correspond to drawing changes.

☐ Views connected by projection lines or lead lines.

Fig.(s) _____

Partial views. 37 CFR 1.84(h)(2)

☐ Brackets needed to show figure as one entity.

Fig.(s) _____

☐ Views not labeled separately or properly.

Fig.(s) _____

☐ Enlarged view not labeled separately or properly.

Fig.(s) _____

7. SECTIONAL VIEWS. 37 CFR 1.84(h)(3)

☐ Hatching not indicated for sectional portions of an object.

Fig.(s) _____

☐ Sectional designation should be noted with Arabic or

Roman numbers. Fig.(s) _____

8. ARRANGEMENT OF VIEWS. 37 CFR 1.84(i)

☐ Words do not appear on a horizontal, left-to-right fashion when page is either upright or turned, so that the top becomes the right side, except for graphs. Fig.(s) _____☐ Views not on the same plane on drawing sheet. Fig.(s) _____

9. SCALE. 37 CFR 1.84(k)

☐ Scale not large enough to show mechanism with crowding when drawing is reduced in size to two-thirds in reproduction.

Fig.(s) _____

10. CHARACTER OF LINES, NUMBERS, & LETTERS. 37 CFR 1.84(l)

☐ Lines, numbers & letters not uniformly thick and well defined, clean, durable and black (poor line quality).

Fig.(s) _____

11. SHADING. 37 CFR 1.84(m)

☐ Solid black areas pale. Fig.(s) _____☐ Solid black shading not permitted. Fig.(s) _____☐ Shade lines, pale, rough and blurred. Fig.(s) _____

12. NUMBERS, LETTERS, & REFERENCE CHARACTERS.

37 CFR 1.48(p)

☐ Numbers and reference characters not plain and legible.

Fig.(s) _____

☐ Figure legends are poor. Fig.(s) _____☐ Numbers and reference characters not oriented in the same direction as the view. 37 CFR 1.84(p)(3) Fig.(s) _____☐ English alphabet not used. 37 CFR 1.84(p)(3) Fig.(s) _____☒ Numbers, letters and reference characters must be at least.32 cm (1/8 inch) in height. 37 CFR 1.84(p)(3) Fig.(s) 7-11

13. LEAD LINES. 37 CFR 1.84(q)

☐ Lead lines cross each other. Fig.(s) _____☐ Lead lines missing. Fig.(s) _____

14. NUMBERING OF SHEETS OF DRAWINGS. 37 CFR 1.48(t)

☐ Sheets not numbered consecutively, and in Arabic numerals beginning with number 1. Fig.(s) _____

15. NUMBERING OF VIEWS. 37 CFR 1.84(u)

☐ Views not numbered consecutively, and in Arabic numerals, beginning with number 1. Fig.(s) _____

16. CORRECTIONS. 37 CFR 1.84(w)

☐ Corrections not made from PTO-948 dated _____

17. DESIGN DRAWINGS. 37 CFR 1.152

☐ Surface shading shown not appropriate. Fig.(s) _____☐ Solid black shading not used for color contrast.

Fig.(s) _____

COMMENTS

REVIEWER

Tang

DATE

9/26/00

TELEPHONE NO.

203 305 1038

ATTACHMENT TO PAPER NO.

#6

PTO COPY

REMINDER

Drawing changes may also require changes in the specification, e.g., if Fig. I is changed to Fig. IA, Fig. IB, Fig. IC, etc., the specification, at the Brief Description of the Drawings, must likewise be changed. Please make such changes by 37 CFR 1.312 Amendment at the time of submitting drawing changes.

INFORMATION ON HOW TO EFFECT DRAWING CHANGES

1. Correction of Informalities--37 CFR 1.85

File new drawings with the changes incorporated therein. The application number or the title of the invention, inventor's name, docket number (if any), and the name and telephone number of a person to call if the Office is unable to match the drawings to the proper application, should be placed on the back of each sheet of drawings in accordance with 37 CFR 1.84(c). Applicant may delay filing of the new drawings until receipt of the Notice of Allowability (PTOL-37). Extensions of time may be obtained under the provisions of 37 CFR 1.136. The drawing should be filed as a separate paper with a transmittal letter addressed to the Drawing Review Branch.

2. Timing of Corrections

Applicant is required to submit **acceptable** corrected drawings within the three-month shortened statutory period set in the Notice of Allowability (PTOL-37). If a correction is determined to be unacceptable by the Office, applicant must arrange to have acceptable correction resubmitted within the original three-month period to avoid the necessity of obtaining an extension of time and paying the extension fee. Therefore, applicant should file corrected drawings as soon as possible.

Failure to take corrective action within set (or extended) period will result in **ABANDONMENT** of the Application.

3. Corrections other than Informalities Noted by the Drawing Review Branch on the Form PTO 948

All changes to the drawings, other than informalities noted by the Drawing Review Branch, **MUST** be approved by the examiner before the application will be allowed. No changes will be permitted to be made, other than correction of informalities, unless the examiner has approved the proposed changes.



3614

Patent
239/054

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Qing Kent Pu, et al.

Serial No.: 09/227,331

Filed: January 6, 1999

For: MOBILE NAVIGATION SYSTEM

Group Art Unit: 3661

Examiner: E. Pipala

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JUN 19 2001

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FORMAL DRAWINGS TRANSMITTALCommissioner for Patents
Washington, D.C. 20231

Sir:

Transmitted herewith for filing in the above-referenced application are ten (10) sheets of formal drawings. Applicants believe that no fees are due. However, if Applicants are in error, the Commissioner is hereby authorized to charges any appropriate fee in connection with this filing to Lyon & Lyon Deposit Account No. 12-2475.

Respectfully submitted,
LYON & LYON LLPDate: June 11, 2001
633 West Fifth Street, 47th Floor
Los Angeles, CA 90071-2066
(858) 552-8400

By:

Stephen C. Beuerle
Reg. No. 38,380

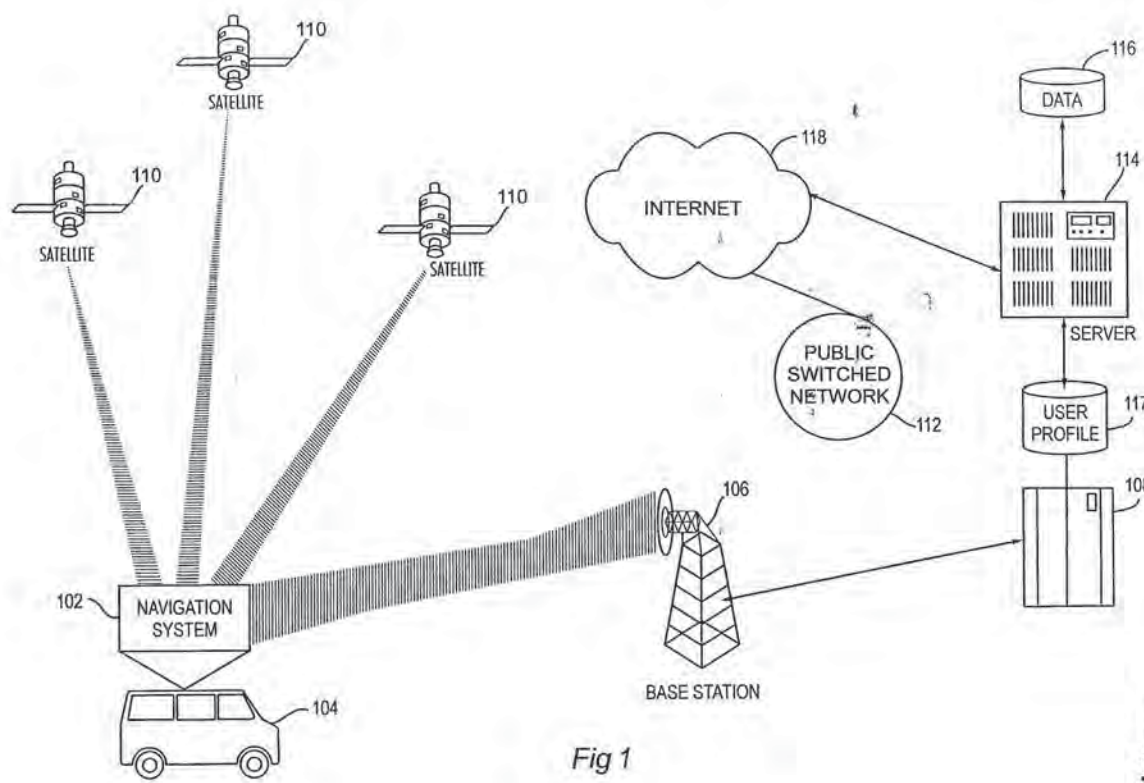
SD-163844.1

CERTIFICATE OF MAILING
(37 C.F.R. §1.8a)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as First Class Mail in an envelope addressed to the Commissioner for Patents, Washington, D.C. 20231.

June 11, 2001
Date of DepositLine Gauthier
Name of Person Mailing Paper

Signature of Person Mailing Paper



APPROVED
BY CLASS SUBCLASS
701 202
DEFTSMAN

MOBILE NAVIGATION SYSTEM
Inv: Keni Qing Pu
S.N. 09227.331

016292743

APPROVED	O.G. FIG.
BY	CLASS SUBCLASS
DRAFTSMAN	

MOBILE NAVIGATION SYSTEM
 Inv.: Kent Qing Pu
 S.N. 09/227,331

02/10

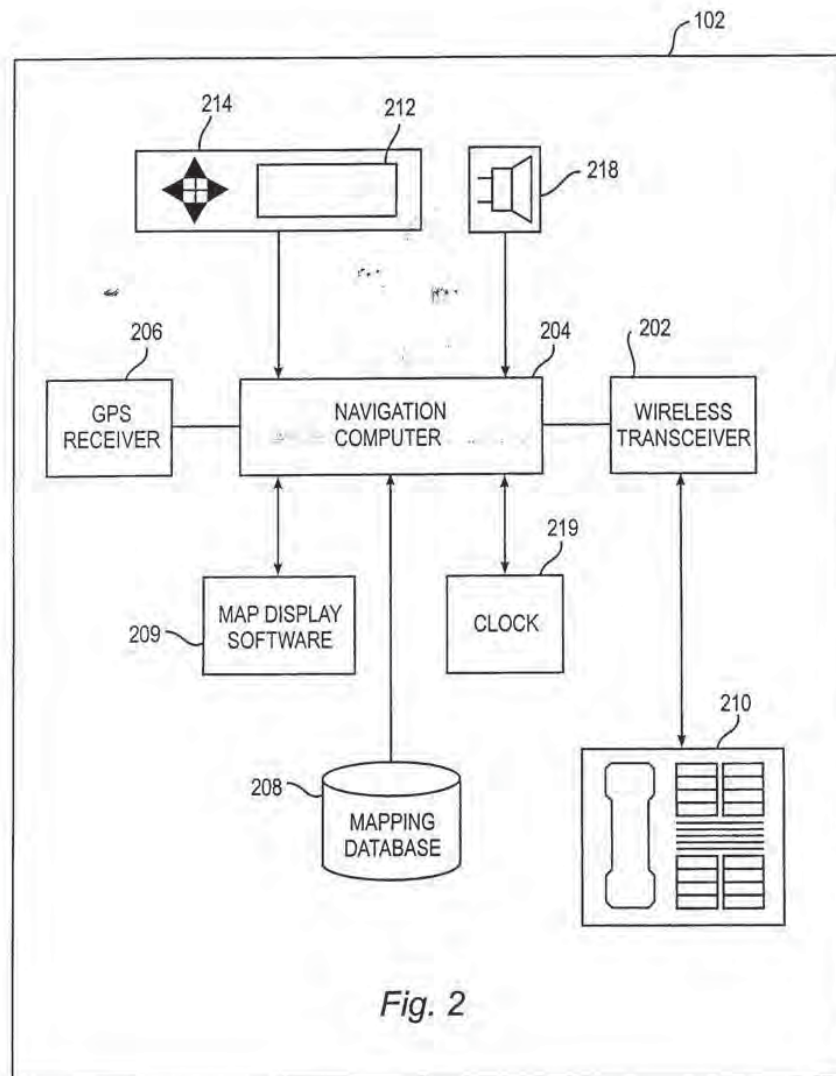


Fig. 2

APPROVED	O.G. FIG.
BY	CLASS SUBCLASS
DRAFTSMAN	

MOBILE NAVIGATION SYSTEM
Inv.: Kent Qing Pu
S.N. 09/227,331

03/09

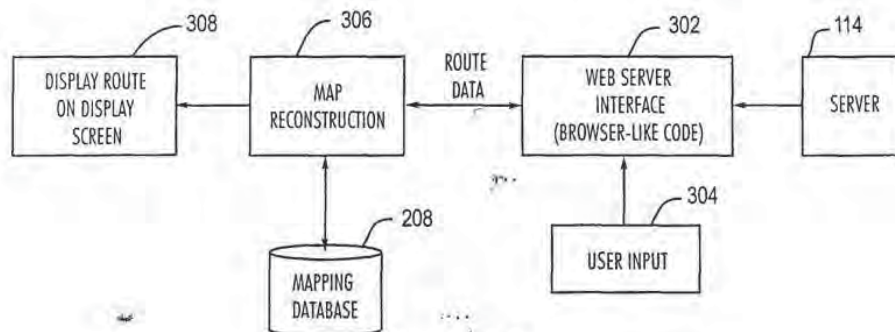


Fig. 3

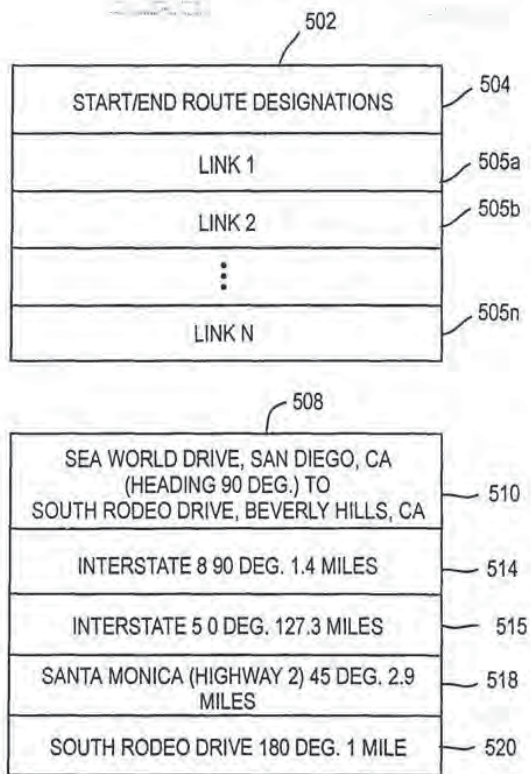


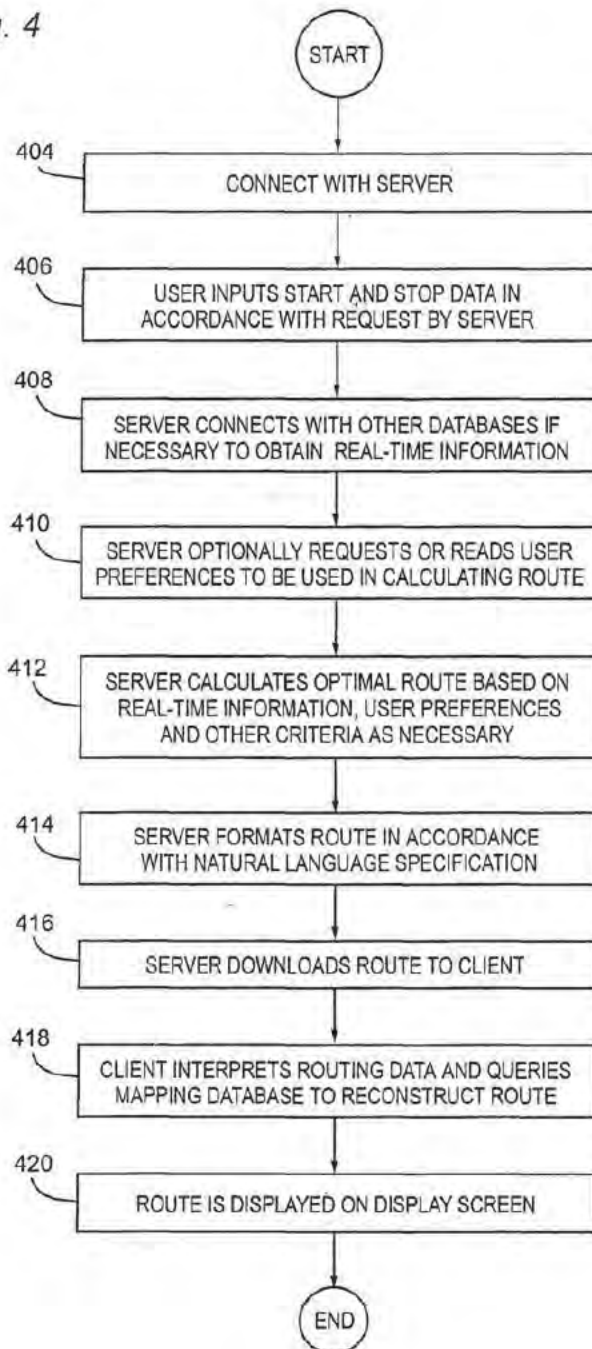
Fig. 5

APPROVED	O.G. FIG.	
BY	CLASS	SUBCLASS
CRAFTSMAN		

MOBILE NAVIGATION SYSTEM
Inv.: Kent Qing Pu
S.N. 09/227,331

04/10

Fig. 4

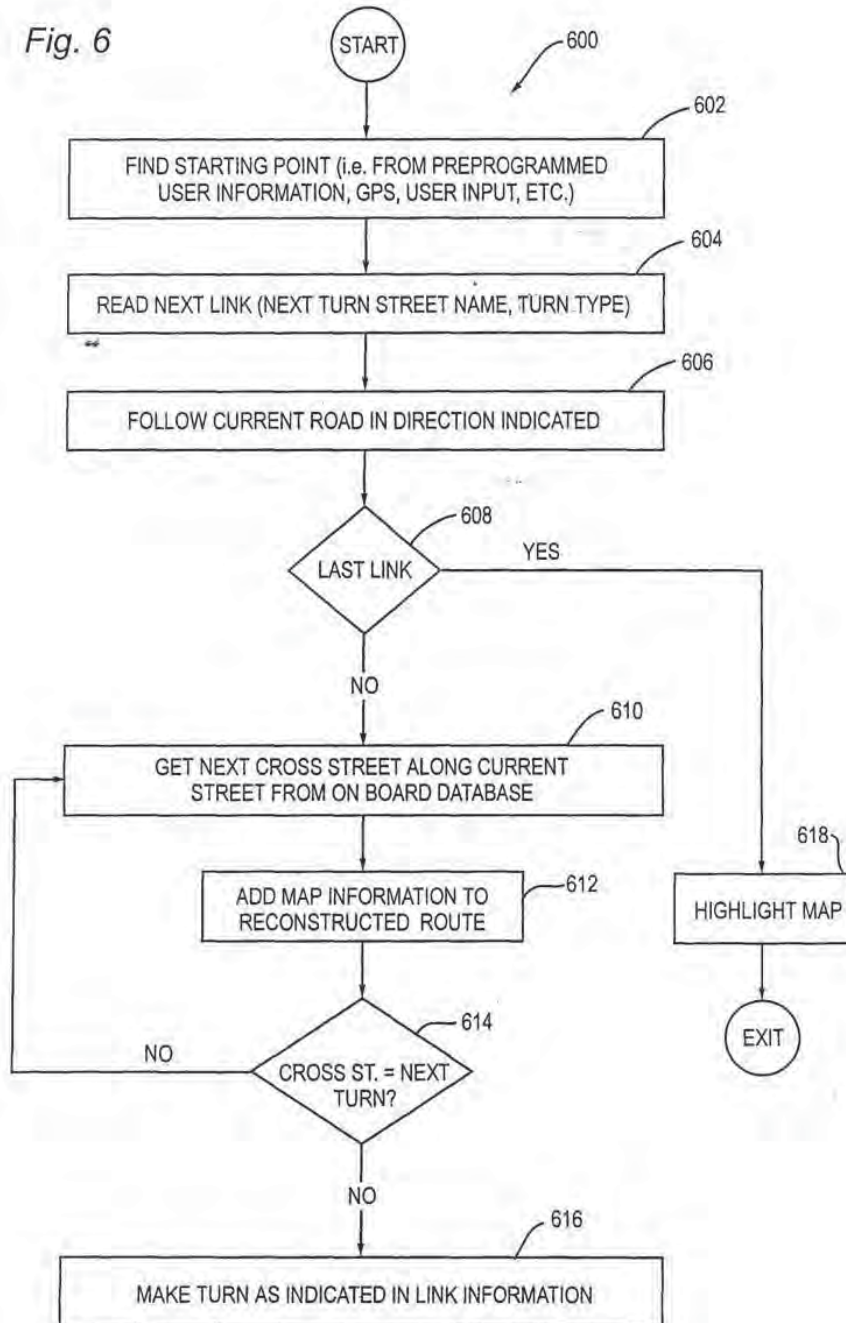


APPROVED	O.G. FIG.
BY	CLASS SUBCLASS
DRAFTSMAN	

MOBILE NAVIGATION SYSTEM
Inv.: Kent Qing Pu
S.N. 09/227,331

05/10

Fig. 6



APPROVED	FIG.	
BY	CLASS	SUBCLASS
DRAFTSMAN		

MOBILE NAVIGATION SYSTEM
 Inv.: Kent Qing Pu
 S.N. 09/227,331

06/10

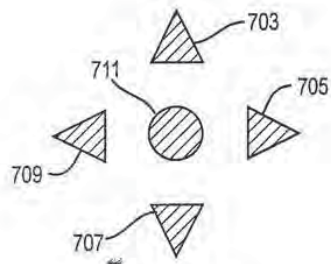


Fig. 7A

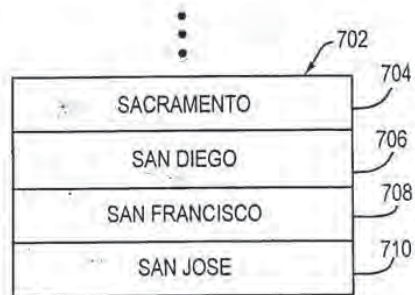


Fig. 7B

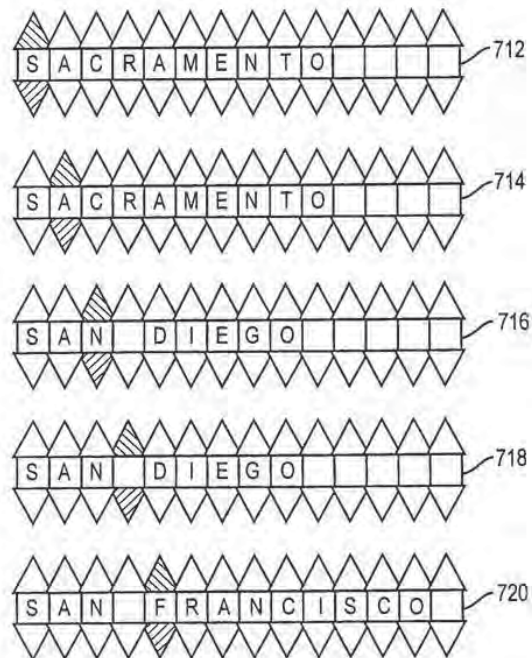


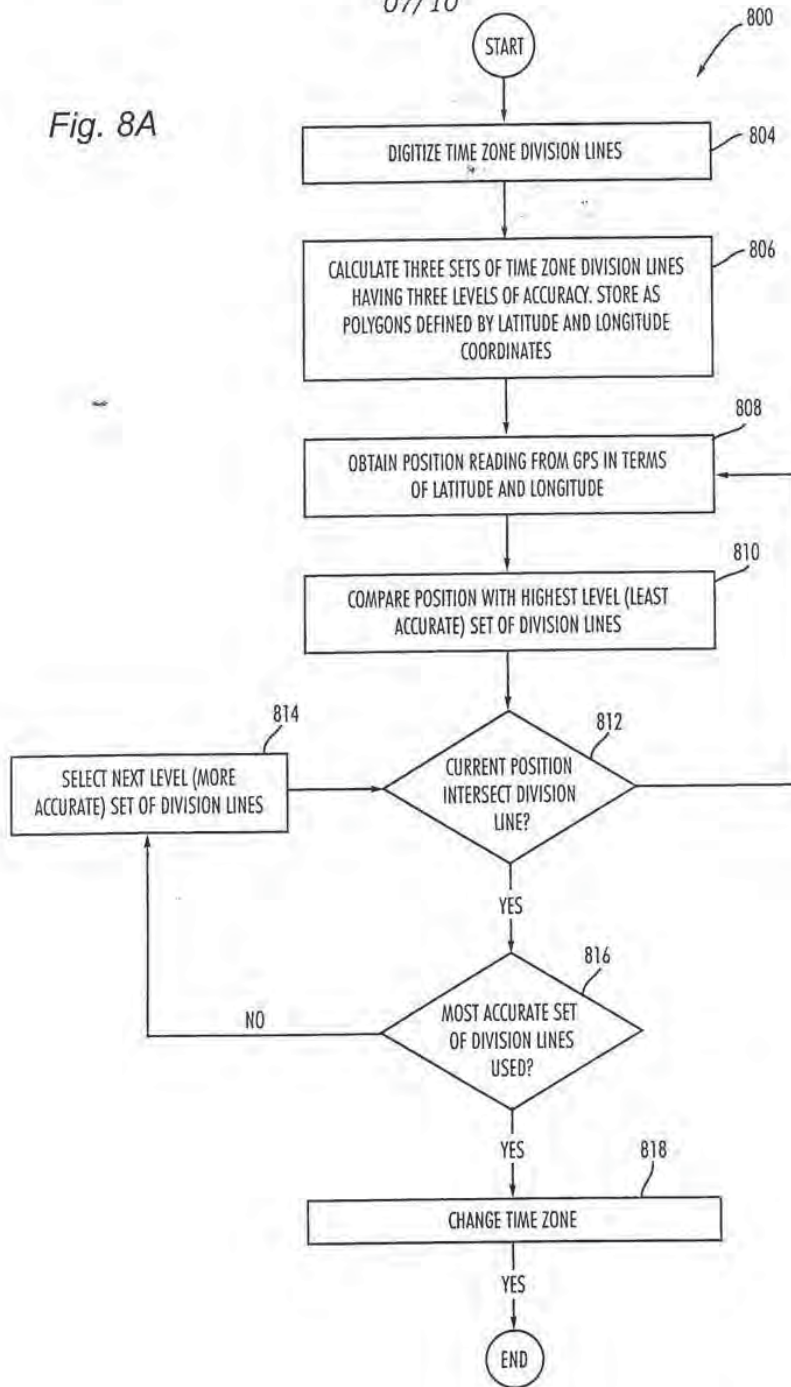
Fig. 7C

APPROVED	O.G. FIG.
BY	CLASS/SUBCLASS
DRAFTSMAN	

MOBILE NAVIGATION SYSTEM
Inv.: Kent Qing Pu
S.N. 09/227,331

07/10

Fig. 8A



APPROVED	O.G. FIG.
BY	CLASS SUBCLASS
DRAFTSMAN	

MOBILE NAVIGATION SYSTEM
 Inv.: Kent Qing Pu
 S.N. 09/227,331

08/10

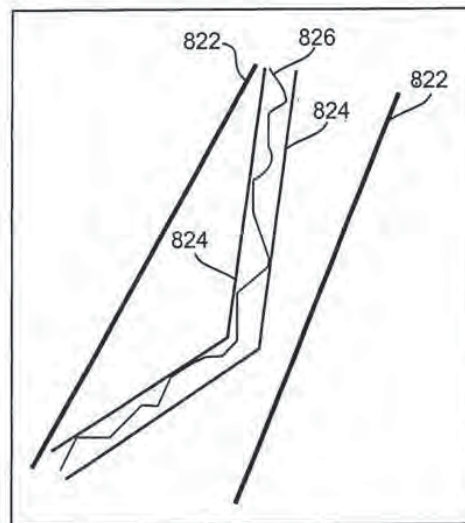


Fig. 8B

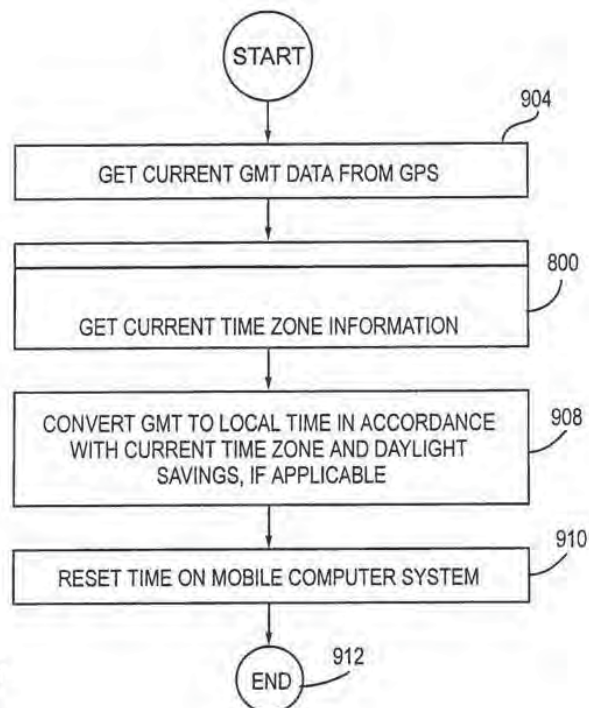


Fig. 9

APPROVED	O.G. FIG.
BY	CLASS SUBCLASS
DRAFTSMAN	

MOBILE NAVIGATION SYSTEM
 Inv.: Kent Qing Pu
 S.N. 09/227,331

09/10

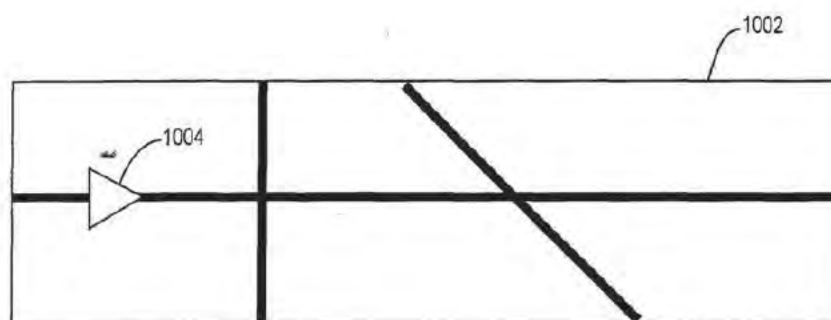


Fig. 10A

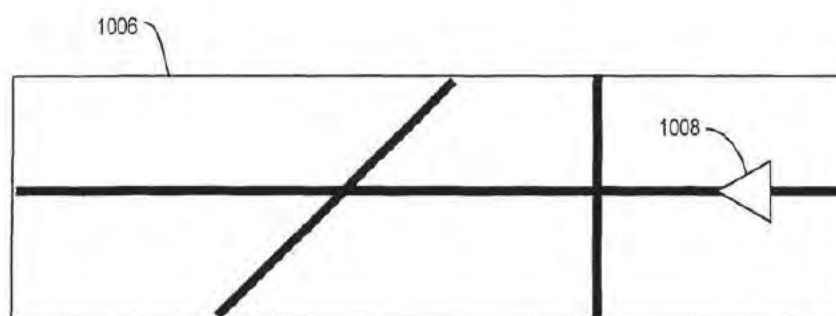


Fig. 10B

APPROVED	O. G. FIG.
BY	CLASS SUBCLASS
DRAFTSMAN	

MOBILE NAVIGATION SYSTEM
Inv.: Kent Qing Pu
S.N. 09/227,331

10/10

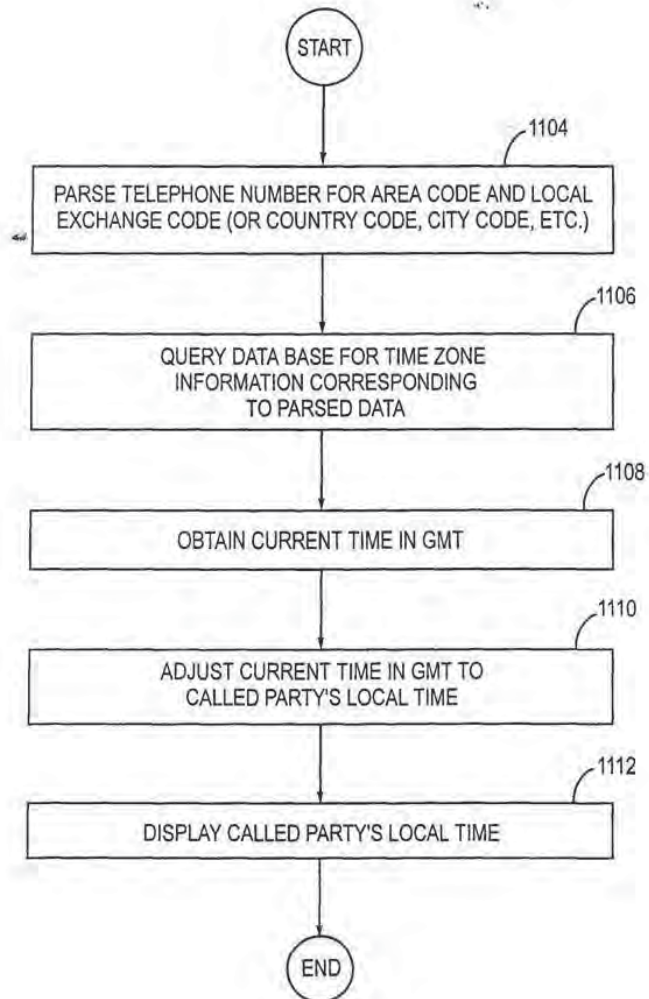


Fig. 11

09/227,331


**UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office**

 Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
--------------------	-------------	-----------------------	---------------------

09/227,331 01/06/99 PU

Q 239/054

 022249 PM82/0702
 LYON & LYON LLP
 SUITE 4700
 633 WEST FIFTH STREET
 LOS ANGELES CA 90071-2066

EXAMINER

PTPAIA F
ART UNIT PAPER NUMBER

3661

DATE MAILED:

07/02/01

 #7 B/Brow
 7/2/01

 This is a communication from the examiner in charge of your application.
 COMMISSIONER OF PATENTS AND TRADEMARKS
NOTICE OF ALLOWABILITY

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance and Issue Fee Due or other appropriate communication will be mailed in due course.

☒ This communication is responsive to phone interviews of 6/8/01
☒ The allowed claim(s) is/are 1-20, 29 & 30
☒ The drawings filed on 6/15/01 are acceptable.

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

 A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE **THREE MONTHS** FROM THE "DATE MAILED" of this Office action. Failure to timely comply will result in ABANDONMENT of this application. ~~Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).~~
☐ Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.

☐ Applicant MUST submit NEW FORMAL DRAWINGS

☐ because the originally filed drawings were declared by applicant to be informal.

☐ including changes required by the Notice of Draftperson's Patent Drawing Review, PTO-948, attached hereto or to Paper No. _____.

☐ including changes required by the proposed drawing correction filed on _____, which has been approved by the examiner.

☐ including changes required by the attached Examiner's Amendment/Comment.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the reverse side of the drawings. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftperson.

☐ Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Any response to this letter should include, in the upper right hand corner, the APPLICATION NUMBER (SERIES CODE/SERIAL NUMBER). If applicant has received a Notice of Allowance and Issue Fee Due, the ISSUE BATCH NUMBER and DATE of the NOTICE OF ALLOWANCE should also be included.

Attachment(s)
☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Notice of Draftperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

☐ Interview Summary, PTO-413

☒ Examiner's Amendment/Comment cancelling claims 21-28
☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

☐ Examiner's Statement of Reasons for Allowance

 WILLIAM A. CUCHLINSKI, JR.
 SUPERVISORY PATENT EXAMINER
 TECHNOLOGY CENTER 3600

Application/Control Number: 09/227,331

Page 2

Art Unit: 3661

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Stephen C. Beuerle on about June 8, 2001.

The application has been amended as follows:
previously rejected claims ~~20~~-28 have been canceled.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edward Pipala whose telephone number is (703) 305-9785. The examiner can normally be reached on Monday through Thursday from 7:30 to 6:00.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's Supervisor, Bill Cuchlinski, can be reached on (703) 308-3873. The fax phone number for this Group is (703) 305-7687.

Application/Control Number: 09/227,331

Page 3

Art Unit: 3661

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-1113.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to: (703) 305-7687, (for formal communications intended for entry)

Hand-delivered responses should be brought to 5 Crystal Park, 2451 Crystal Drive, Arlington, VA.,
Seventh Floor (Receptionist).


WILLIAM A. CUCHLINSKI, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 3600

Edward Pipala

(703) 305-9785



UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office

NOTICE OF ALLOWANCE AND ISSUE FEE DUE

022249
LYON & LYON LLP
SUITE 4700
633 WEST FIFTH STREET
LOS ANGELES CA 90071-2066

PM82/0702

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/227,331	01/06/99	022	PIPALA, E 3661	07/02/01
First Named Applicant	PU,	35 USC 154(b) term ext. = 0 Days.		

TITLE OF INVENTION: MOBILE NAVIGATION SYSTEM

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2 239/054	701-202.000	I58	UTILITY	YES	\$620.00	10/02/01

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED.

THE ISSUE FEE MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED.

HOW TO RESPOND TO THIS NOTICE:

I. Review the SMALL ENTITY status shown above.
If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

- A. If the status is changed, pay twice the amount of the FEE DUE shown above and notify the Patent and Trademark Office of the change in status, or
- B. If the status is the same, pay the FEE DUE shown above.

If the SMALL ENTITY is shown as NO:

- A. Pay FEE DUE shown above, or
- B. File verified statement of Small Entity Status before, or with, payment of 1/2 the FEE DUE shown above.

II. Part B-Issue Fee Transmittal should be completed and returned to the Patent and Trademark Office (PTO) with your ISSUE FEE. Even if the ISSUE FEE has already been paid by charge to deposit account, Part B Issue Fee Transmittal should be completed and returned. If you are charging the ISSUE FEE to your deposit account, section "4b" of Part B-Issue Fee Transmittal should be completed and an extra copy of the form should be submitted.

III. All communications regarding this application must give application number and batch number.
Please direct all communications prior to issuance to Box ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PATENT AND TRADEMARK OFFICE COPY

PTOL-85 (REV. 10-96) Approved for use through 06/30/99. (0651-0033)

Form B—ISSUE FEE TRANSMITTAL

Complete and mail this form, together with applicable fees, to: **Box ISSUE FEE**
Assistant Commissioner for Patents
Washington, D.C. 20231

MAILING INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE. Blocks 1 through 4 should be completed where appropriate. All further correspondence including the Issue Fee Receipt, the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Legibly mark-up with any corrections or use Block 1)

022249
 LYON & LYON LLP
 SUITE 4700
 633 WEST FIFTH STREET
 LOS ANGELES CA 90071-2066



Note: The certificate of mailing below can only be used for domestic mailings of the Issue Fee Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing.

Certificate of Mailing

I hereby certify that this Issue Fee Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Box Issue Fee address above on the date indicated below.

ALMA VASQUEZ

(Depositor's name)

Alma Vasquez

(Signature)

8/3/01

(Date)

APPLICATION NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
09/227,331	01/06/99	022	PIPALA, E 3661	07/02/01

First Named Applicant **PU, QING KENT**

TITLE OF INVENTION **MOBILE NAVIGATION SYSTEM**

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any prepayment to Deposit Account No. 12-2475. A duplicate copy of this sheet is enclosed.

ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
2 239/054	701-202.000	I58	UTILITY	YES	\$620.00	10/02/01

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363). Use of PTO form(s) and Customer Number are recommended, but not required.

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47) attached.

2. For printing on the patent front page, list (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. **LYON & LYON LLP**

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
 PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. Inclusion of assignee data is only appropriate when an assignment has been previously submitted to the PTO or is being submitted under separate cover. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE
INFORMATION CORPORATION
 (B) RESIDENCE: (CITY & STATE OR COUNTRY)
SAN DIEGO, CALIFORNIA

Please check the appropriate assignee category indicated below (will not be printed on the patent).
☐ Individual ☒ Corporation or other private group entity ☐ government

4a. The following fees are enclosed (make check payable to Commissioner of Patents and Trademarks):
 CHECK NO. **14468**

☒ Issue Fee
☒ Advance Order - # of Copies **14**

4b. The following fees or deficiency in these fees should be charged to:

DEPOSIT ACCOUNT NUMBER **12-2475**
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☒ Issue Fee
☒ Advance Order - # of Copies

The COMMISSIONER OF PATENTS AND TRADEMARKS IS requested to apply the Issue Fee to the application identified above.

(Authorized Signature)

[Signature]

(Date)
8/25/01

NOTE: The Issue Fee will not be accepted from anyone other than the applicant, a registered attorney or agent, or the assignee or other party in interest as shown by the records of the Patent and Trademark Office.

Burden Hour Statement: This form is estimated to take 0.2 hours to complete. Time will vary depending on the needs of the individual case. Any comments on the amount of time required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, D.C. 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND FEES AND THIS FORM TO: Box Issue Fee, Assistant Commissioner for Patents, Washington D.C. 20231

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08/08/2001 NTUSUF2 00000066 09227331

01 FC:242
 02 FC:561

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Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

Procopio
Cory
Hargreaves
& Savitch

LLP

Founded 1946



530 B Street • Suite 2100 • San Diego • California 92101-4469
Telephone 619/238-1900 • Facsimile 619/235-0398 • www.procopio.com

DSD

Stephen C. Beuerle
Direct Dial: (619) 515-3267
E-mail: scb@procopio.com

March 1, 2002

Commissioner for Patents
Washington, D.C. 20231

Re: **U.S. Patent No. 6,292,743**
Corresponding to U.S. Patent Application No. 09/227,331
Title: MOBILE NAVIGATION SYSTEM
Subject: Revocation and Grant of Power of Attorney
Old Reference No. 239/054
Our Reference No. 109892-02

Sir:

Enclosed please find the following with regard to the captioned patent:

- ◆ Revocation and Grant of Power of Attorney; and
- ◆ Return Postcard.

So that we may have a timely record of this filing, please date-stamp the enclosed self-addressed stamped postcard and deposit it in the U.S. mail.

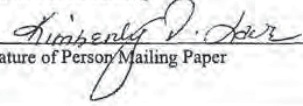
Please send all future correspondence related to this matter to Stephen C. Beuerle, at Procopio, Cory, Hargreaves & Savitch, LLP, 530 B Street, Suite 2100, San Diego, California 92101-4469, Customer No. 27189.

CERTIFICATE OF MAILING
(37 CFR 1.8a)

I hereby certify that this paper (along with any referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as First Class Mail in an envelope addressed to the Commissioner for Patents, Washington, D.C. 20231.

March 1, 2002
Date of Deposit

Kimberly N. Lane
Name of Person Mailing Paper


Signature of Person Mailing Paper

109892.000002/326657.01

LAW OFFICES OF
PROCOPIO, CORY, HARGREAVES & SAVITCH LLP

Commissioner for Patents
March 1, 2002
Page 2

If you have any questions, please do not hesitate to contact this office.

Sincerely,



STEPHEN C. BEUERLE, for
Procopio, Cory, Hargreaves
& Savitch LLP
Registration No. 38,380

SCB/knl
Enclosure

109892.000002/326657.01

This file wrapper was thoroughly reviewed by our technical staff. Pages 1-3 are missing in the file.

This has been brought to your attention so that you will know it has not been overlooked.



Patent

REVOCATION AND GRANT OF POWER OF ATTORNEY

Commissioner for Patents
Washington, D.C. 20231

Sir:

Infogation Corporation, assignee of the patent and patent application below, hereby revokes all previous powers of attorney or authorizations of agent and appoints as its attorneys and/or agents, with full power of substitution and revocation, to prosecute this patent and patent application and transact all business in the United States Patent and Trademark Office, and in countries other than the United States, and to do all things necessary or appropriate therefore before any competent international authorities in connection with any international patent applications corresponding to this patent and patent application, Stephen C. Beuerle, Reg. No. 38,380, Troy M. Schmelzer, Reg. No. 36,667; Anthony Dain, Reg. No. 46,651; Kamwah W. Li, Reg. No. 34,211; John S. Kyle, Reg. No. 48,318; and Vahid Sharifi, Reg. No. 45,828.

- 1) U.S. Patent No. 6,292,743 (Application No. 09/227,331)
- 2) U.S. Application No. 09/935,463

Please direct all correspondence to the attention of:



Stephen C. Beuerle
PROCOPIO, CORY, HARGREAVES & SAVITCH LLP
530 B Street, Suite 2100
San Diego, CA 92101-4469
Tel: (619) 238-1900
Fax: (619) 235-0398

The undersigned is authorized to sign this document on behalf of Infogation Corporation.

Respectfully submitted,
Infogation Corporation

Dated: 2/8/02

By: [Signature]

Kent Pu, President

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PAGE 04

INFOGATION CORP

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UNITED STATES PATENT AND TRADEMARK OFFICE

COMMISSIONER FOR PATENTS
UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. 20231
www.uspto.gov

APPLICATION NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/227,331	01/06/1999	QING KENT PU	239/054

CONFIRMATION NO. 8444

27189
PROCOPIO, CORY, HARGREAVES & SAVITCH LLP
530B STREET
SUITE 2100
SAN DIEGO, CA 92101



Date Mailed: 03/29/2002

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/26/2002.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

DAVID O LIPSCOMB
OPR (703) 308-7127

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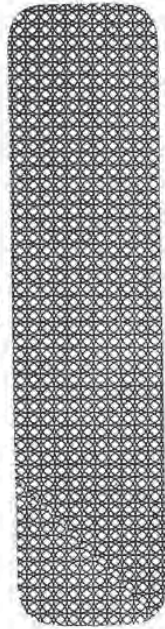
10515 Vista Sorrento Parkway • San Diego • CA • 92121 • U.S.

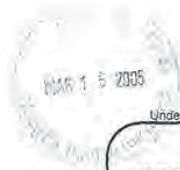


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	Issue Date
	Application Number
	Filing Date
	First Named Inventor
	Attorney Docket Number

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This form will not affect any "fee address" provided for the above-identified patent. To change a "fee address" use the "Fee Address Indication Form" (PTO/SB/47).		
I am the:		
☒ Patentee.		
☐ Assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed. (Form PTO/SB/96).		
☐ Attorney or agent of record. Registration Number _____		
Typed or Printed Name	Qing Keng Pu	
Signature		
Date	3/10/2005	Telephone (408)777-8873
NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.		

☐ *Total of _____ forms are submitted.

This collection of information is required by 37 CFR 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Post Issue, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

01/25/1999 JMWASHING 00000002 09227331

01 FC:201	380.00 OP
02 FC:202	156.00 OP
03 FC:203	72.00 OP

PTO-1556
(5/87)

*U.S. GPO: 1998-433-214/80404

5/18/95
2/18/95

ISSUE SLIP STAPLE AREA (for additional cross references)

POSITION	INITIALS	ID NO.	DATE
FEE DETERMINATION	<i>YFW</i>	75331	
O.I.P.E. CLASSIFIER			
FORMALITY REVIEW	<i>LA</i>	<i>63390</i>	<i>1/24/99</i>

INDEX OF CLAIMS

✓ Rejected N Non-elected
 = ... Allowed I Interference
 - (Through numeral)... Canceled A Appeal
 + ... Restricted O Objected

Claim	Final	Original	Date
1	✓	✓	
2	✓	✓	
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If more than 150 claims or 10 actions
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PATENT APPLICATION FEE DETERMINATION RECORD Effective November 10, 1998					Application or Docket Number 227331	
CLAIMS AS FILED - PART I (Column 1) (Column 2)						
FOR	NUMBER FILED	NUMBER EXTRA				
BASIC FEE						
TOTAL CLAIMS	28 minus 20 =	8				
INDEPENDENT CLAIMS	7 minus 3 =	4				
MULTIPLE DEPENDENT CLAIM PRESENT						
* If the difference in column 1 is less than zero, enter "0" in column 2						
CLAIMS AS AMENDED - PART II (Column 1) (Column 2) (Column 3)						
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total *	30 Minus	28	=	2	
	Independent *	9 Minus	7	=	2	
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total *	Minus	=			
	Independent *	Minus	=			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA			
	Total *	Minus	=			
	Independent *	Minus	=			
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20." *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3." The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.						

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	FEE		RATE	FEE
	380.00	(2) OR		760.00
X\$ 9=	72.00	OR	X\$18=	
X39=	156.00	OR	X78=	
+130=		OR	+260=	
TOTAL	608.00	OR	TOTAL	

SMALL ENTITY TYPE ☐		OR	OTHER THAN SMALL ENTITY	
RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X\$ 9=	18.00	OR	X\$18=	
X39=	80.00	OR	X78=	
+130=		OR	+260=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	



SEARCHED			
Class	Sub.	Date	Exmr.
701,	200,201, 202,207, 208,209, 211,213, 117	9/25/00	EF
340	988, 990, 995	}	
455	456,457,		
updated above			
updated above		3/19/01	EF
updated above		5/13/01	EF
updated above		6/28/01	EF

INTERFERENCE SEARCHED			
Class	Sub.	Date	Exmr.
701	200-202, 207-209, 211,213, 117	6/28/01	EF
340	988,990, 995		
455	456,457		

SEARCH NOTES (INCLUDING SEARCH STRATEGY)		
	Date	Exmr.

(RIGHT OUTSIDE)