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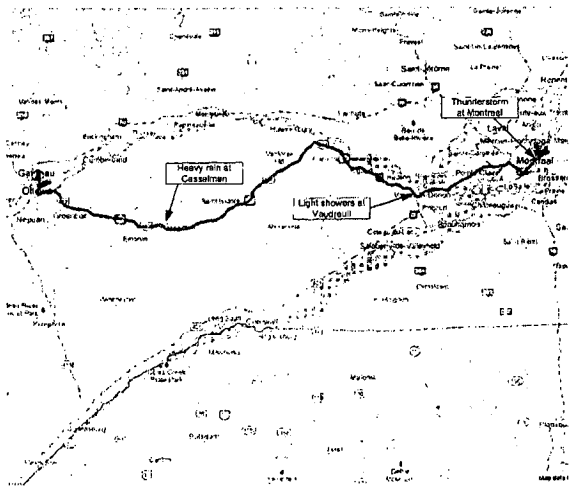


FIGURE 5a

(57) Abstract: Provided are the methods, devices, systems and computer readable mediums that utilize a weather forecast for generating an itinerary on a map. For example, a server may receive a map request from a user or a device. The request may include a departure location and a destination location. In response to receiving said map request, the server may obtain map data, which may be suitable for display on a display device. The map data may comprise a route drawn between the departure location and the destination location. The server may further obtain a weather forecast associated with one or more key points along the route. Based on the weather forecast, the server may modify the map data such that it includes a visual indicator representing at least one weather forecast associated with a key point on the route. The server may output the modified map data to a computing device to be displayed for a user.

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METHOD AND SYSTEM FOR DISPLAYING NOWCASTS ALONG A ROUTE ON A MAP

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority of co-owned and co-invented U.S. Patent Application No. 13/856,923 filed on April 4, 2013, U.S. Patent Application No. 13/922,800, filed on June 20, 2013, U.S. Patent Application No. 13/947,331, filed on July 22, 2013, U.S. Provisional Application No. 61/839,675, filed on June 26, 2013, U.S. Provisional Application No. 61/835,626, filed on June 16, 2013, and U.S. Provisional Application No. 61/836,713, filed on June 19, 2013, the entire disclosures of which are hereby incorporated by reference.

BACKGROUND

Field

[0002] The subject matter disclosed generally relates to a system for determining weather forecasts.

Related Prior Art

[0003] Conventional weather forecasting systems provide weather predictions twelve hours to a few days from the present time. If one needs a short term forecast or a forecast with a fine time scale, the best information available usually is an hourly forecast for the day.

[0004] Conventional weather forecasts are average forecasts for the area for which they are generated. Thus, a forecast may be inaccurate for a precise location within this area, and even the present weather displayed for an area may differ from the actual weather for a precise location within this area.

[0005] Moreover, conventional weather forecasts are displayed at a time scale that is too coarse to allow a user to know when a weather event takes place in a precise location and time. Even for hourly conventional weather forecasts, it is impossible for

the user to know if the forecasted weather event lasts one hour or one minute and, for the latter, at what time it takes place exactly within the hour.

[0006] There is a need in the market for a method which allow for estimating the weather along the route between the departure location and the destination location so that the user may attempt to take alternative routes to avoid extreme weather conditions.

SUMMARY

[0007] According to an embodiment, there is provided a computer implemented method for generating maps comprising receiving a map request including a departure location and a destination location. In response to receiving said map request, the method comprises obtaining map data which when implemented on a display device cause the display device to show a map including a route drawn between the departure location and said destination location. The method also comprises obtaining nowcasts for one or more key points along said route, modifying said map data including adding a visual indicator representing one of the nowcasts for each key point on the route drawn on the map, and outputting modified map data to a computing device for display to a user.

[0008] According to an embodiment, the method further comprises sending a location information associated with each key point to a nowcaster for obtaining nowcasts.

[0009] According to an embodiment, the method further comprises sending a time for which the nowcasts are needed for each key point.

[0010] According to an embodiment, sending a time comprises sending a current time.

[0011] According to an embodiment, sending a time comprises estimating an arrival time representing the time at which the user starting from a current location will arrive at a given key point.

[0012] According to an embodiment, estimating the arrival time is based on at least one of: departure time, weather conditions, speed limit, current speed, and distance between the current location and the key point.

[0013] According to an embodiment, the method further comprises receiving

updated positional information representing the current location of the computing device on which the map is displayed, and using the current location as a new departure location updating the nowcasts on the map.

[0014] According to an embodiment, obtaining map data comprises generating the map data using information stored locally.

[0015] According to an embodiment, obtaining map data comprises forwarding the map request to a remote server.

[0016] In another aspect, there is provided a method for providing nowcasts on a map displayed on a GPS navigation device (GPS), the method comprising receiving from said GPS location information including a departure location and a destination location, and a pre-determined route between the departure location and the destination location, identifying one or more key points along said route, associating a time with each point, obtaining nowcasts for each key points, and forwarding said nowcasts for displaying on the route drawn between the departure location and the destination location, on a display associated with said GPS for display to a user.

[0017] According to an embodiment, the method further comprises sending a location information associated with each key point to a nowcaster for obtaining nowcasts.

[0018] According to an embodiment, the method further comprises sending a time for which the nowcasts are needed for each key point.

[0019] According to an embodiment, sending a time comprises sending a current time.

[0020] According to another embodiment, sending a time comprises estimating an arrival time representing the time at which the user starting at a current location will arrive at a given key point.

[0021] According to an embodiment, estimating the arrival time is based on at least one of: departure time, weather conditions, speed limit, current speed, and distance between the current location and the key point.

[0022] According to an embodiment, the method further comprises receiving updated positional information representing the current location of the GPS on which the map is displayed, and using the current location as a new departure location

updating the nowcasts on the map.

[0023] Definitions

[0024] A nowcaster is a weather forecasting device which prepares very short term (e.g., 1 min., 5 mins., 15 mins., 30 mins., etc.) forecasts for a very small region on Earth (5 meters, 10 meters, 50 meters, 100 meters, 500 meters, 1,000 meters, etc.).

[0025] A weather-related observation may be an image, a video, a free form text (tweet, message, email, etc.), a weather value of any sort such as temperature, pressure, visibility, precipitation type and intensity, accumulation, cloud cover, wind, etc.

[0026] A weather-related event is, for example, at least one of hail, a wind gust, lightning, a temperature change, etc.

[0027] A point observation is an observation, as defined herein, made at a particular position (sometimes also referred to as referred to as a "location") at a given time.

[0028] The particular position is the position on Earth at which the observation is made. A precision of 5 meters to 10 meters is appropriate for the embodiments described herein, but the variation in the position may be greater such as 25 meters, 50 meters, 100 meters, 1000 meters or more (i.e., less precision). The means for obtaining the particular position include any type of geo-location means or positioning system available at the time of filing this patent application. The geo-location means or positioning system may be automated or not. Automated geo-location means or positioning system include global positioning systems, RF location systems, radiolocation technologies, Internet Protocol (IP) address, MAC address, WiFi, Radio Frequency Identification (RFID), etc. The positioning systems may also be manual such as providing a street address, street corner, building or landmark, etc.

[0029] A given time is defined as the hour, minute and second at which the point observation is made in the time zone corresponding to the particular position. The hour, minute and second for the given time can also be recorded according to Coordinated Universal Time (UTC) or Greenwich Mean Time (GMT) such that the given time is independent of the particular position. The precision of the given time may be more or less than one second. For example, in some embodiments, a precision

of 5s, 10s, 30s, 60s or more may be sufficient for the embodiments described herein.

[0030] A user is a person to whom or a machine to which a weather forecast is forwarded.

[0031] An observer is an entity providing automated and/or manned observations. An observer may be a person or an automated machine. An observer may also be a user as defined herein.

[0032] A gridded image is an image which comprises latitude and longitude coordinates. It is therefore a collection of bi-dimensional geo-localized points / pixels.

[0033] Each pixel in a gridded image corresponds to a position and can either represent a single weather value, a probability distribution of values or a level of confidence.

[0034] Features and advantages of the subject matter hereof will become more apparent in light of the following detailed description of selected embodiments, as illustrated in the accompanying figures. As will be realized, the subject matter disclosed and claimed is capable of modifications in various respects, all without departing from the scope of the claims. Accordingly, the drawings and the description are to be regarded as illustrative in nature, and not as restrictive and the full scope of the subject matter is set forth in the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] Further features and advantages of the present disclosure will become apparent from the following detailed description, taken in combination with the appended drawings, in which:

[0036] Figure 1 is a block diagram of system for displaying nowcasts along a route on a map;

[0037] Figure 2 is a block diagram of a suitable nowcaster for implementing the embodiments;

[0038] Figures 3a to 3c illustrate examples of maps and directions returned by a map generating module;

[0039] Figure 4 illustrates an example of a GPS navigating device;

[0040] Figures 5a & 5b illustrate examples of maps showing a route and a

plurality nowcasts for a plurality of key points along the route;

[0041] Figure 6 is an example of a network environment in which the embodiments may be practiced;

[0042] Figure 7 is an example of another network environment in which the embodiments may be practiced;

[0043] Figure 8 is a flowchart of a computer-implemented method for generating maps, according to an embodiment.

[0044] Figure 9 illustrates an exemplary diagram of a suitable computing operating environment in which embodiments of the invention may be practiced.

[0045] It will be noted that throughout the appended drawings, like features are identified by like reference numerals.

DETAILED DESCRIPTION

[0046] The embodiments will now be described more fully hereinafter with reference to the accompanying drawings, which form a part hereof, and which show, by way of illustration, specific embodiments by which the embodiments may be practiced. The embodiments are also described so that the disclosure conveys the scope of the invention to those skilled in the art. The embodiments may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein.

[0047] Among other things, the present embodiments may be embodied as methods or devices. Accordingly, the embodiments may take the form of an entirely hardware embodiment, an entirely software embodiment, an embodiment combining software and hardware aspects, etc. Furthermore, although the embodiments are described with reference to a portable or handheld device, they may also be implemented on desktops, laptop computers, tablet devices or any computing device having sufficient computing resources to implement the embodiments.

[0048] Briefly stated, the present embodiments describe a system and method for displaying nowcasts along a route on a map. The system receives a map request including a departure location and a destination location from a user, and obtains map data including a route between the destination location and the departure location. A

nowcaster is used for outputting nowcasts for a number of key points along the route. The system modifies the map data to include a visual indicator for the nowcast associated with each key point such that when the modified map data is executed on a display the nowcasts are displayed along the route between the departure location and the destination location.

[0049] Figure 1 is a block diagram of system **300** for displaying nowcasts along a route on a map. As shown in Figure 1, the system **300** comprises a nowcaster **200** (aka system for generating nowcasts), a map generating module **310**, and an intelligence module **312** for communicating between the map generating module **310** and the nowcaster **200** to output a map showing nowcasts for a number of key points along the route.

[0050] Nowcaster

[0051] Figure 2 is a block diagram of a suitable nowcaster **200** such as that described in co-owned and co-invented US patent application No.13/856923 filed on April 4, 2013.

[0052] As shown in Figure 2, the nowcaster **200** receives weather observations from different sources **201** such as weather observations sources including but not limited to: point observations **201-2** (e.g. feedback provided by users and automated stations), weather radars **201-3**, satellites **201-4** and other types of weather observations **201-1**, and weather forecast sources such as numerical weather prediction (NWP) model output **201-5** and weather forecasts and advisories **201-6**.

[0053] In an embodiment, the nowcaster **200** comprises a PType distribution forecaster **202** and a PRate distribution forecaster **204**. The PType forecaster **202** receives the weather observations from the different sources **201** and outputs a probability distribution of precipitation type over an interval of time, for a given latitude and longitude (and/or location). In one non-limiting example, it could be:

1) Snow: 10%
2) Rain: 30%
3) Freezing Rain: 60%
4) Hail: 0%
5) Ice Pellets: 0%

[0054] As will be apparent to a person of ordinary skill in the art, there can be various other types and numbers of categories than the example provided above.

[0055] Similarly, the PRate forecaster **204** receives the weather observations for a given latitude and longitude from the different sources **201** and outputs a probability distribution forecast of a precipitation rate (PRate) in a representation that expresses the uncertainty. For example, the PRate may be output as a probability distribution of precipitation rates or a range of rates over an interval of time, for a given latitude and longitude. In one non-limiting example, it could be:

1) No Precip: 30%
2) Light: 40%
3) Moderate: 20%
4) Heavy: 10%

[0056] As will be apparent to a person of ordinary skill in the art, there can be various other types and numbers of categories than the example provided above.

[0057] The PRate and PType values output by the PRate forecaster **204** and the PType forecaster **202** are sent to a forecast combiner **206** to combine these values into a single value PTypeRate which represents the precipitation outcomes. For example, if the value of PType is "Snow", and the value of "PRate" is heavy, the combined value of PTypeRate may be "heavy snow".

[0058] For a given latitude and longitude, the system outputs forecasted PTypeRate Distributions for predefined time intervals, either fixed (ex: 1 minute) or variable (ex: 1 minute, then 5 minutes, then 10 minutes, etc). The system can either pre-calculate and store forecasted PTypeRate Distributions in a sequence of time intervals, or calculate it on the fly. A PTypeRate Distribution represents, for each time interval, the certainty or uncertainty that a PTypeRate will occur.

[0059] With reference to Figure 2, the forecast combiner **206** receives the final PRate distribution from the PType forecaster **202** and the final PRate distribution from the PRate forecaster **204** to combine them into a group of PTypeRate distribution values each representing the probability of receiving a certain type of precipitation at a certain rate. An example is provided below.

[0060] Assuming that the PType distribution is as follows: Snow: 50%, Rain

0%, Freezing rain: 30%, Hail 0%, Ice pellets 20%, and the PRate distribution is as follows: None: 0%, light: 10%, moderate:20%, Heavy: 30%, Very heavy 40%, the PTypeRate distributions may be as follows:

[0061] Table 1: An Example of PTypeRate Distribution Table

PType / PRate	Snow 50%	Rain 0%	Freez. Rain 30%	Hail 0%	Ice Pellets 20%
None 0%	No precipitation	No precipitation	No precipitation	No precipitation	No precipitation
Light 10%	5% light snow	No precipitation	3% light freezing rain	No precipitation	2% light ice pellets
Moderate 20%	10% moderate snow	No precipitation	6% moderate freezing rain	No precipitation	4% moderate ice pellets
Heavy 30%	15% heavy snow	No precipitation	9% heavy freezing rain	No precipitation	6% heavy ice pellets
Very Heavy 40%	20% heavy snow	No precipitation	12% very heavy freezing rain	No precipitation	8% very heavy ice pellets

[0062] Accordingly, the forecast combiner **206** multiplies the probability of each type of precipitation by the probability of each rate of precipitation to obtain a probability of receiving a certain type of precipitation at a certain rate for example, 20% chance of heavy snow, or 12% chance of very heavy freezing rain. In an embodiment, it is possible to associate probability ranges with textual information for displaying the textual information to the user instead of the probabilities in numbers. For example, probabilities that are between 5% and 15% may be associated with the text: "low chance", while probabilities that are between 40% and 70% may be associated with the text "high chance", or "very likely" etc. whereby, instead of displaying: 60% chance of heavy snow, it is possible to display: "high chance of heavy snow".

[0063] In another embodiment, it is possible to combine two or more different PTypeRates along one or more dimensions (the dimensions including: the rate, type,

or probability). For example, results of such combination may include: Likely light to moderate rain, Likely light to moderate rain or heavy snow; Likely moderate rain or snow; likely rain or snow; chance of light to moderate rain or heavy snow or light hail; chance of moderate rain, snow or hail; chance of rain, snow or hail, etc.

[0064] Accordingly, the nowcaster **200** receives the location for which the nowcasts are needed and the time and/or time interval for which the nowcasts are needed and outputs the PtypRate distribution for the given location and for the specific time.

[0065] There may be another embodiment of the nowcaster 200. In this embodiment, the nowcaster comprises a PType selector/receiver and a PRate distribution forecaster. Similar to the embodiment shown in Figure 2, the PRate distribution forecaster receives the weather observations for a given latitude and longitude from the different sources and outputs a probability distribution forecast of a precipitation rate (PRate) in a representation that expresses the uncertainty. For example, the PRate may be output as a probability distribution of precipitation rates or a range of rates over an interval of time, for a given latitude and longitude. In one non-limiting example, it could be:

1) No Precip.: 30%
2) Light: 40%
3) Moderate: 20%
4) Heavy: 10%

[0066] As will be apparent to a person of ordinary skill in the art, there can be various other types and numbers of categories than the example provided above.

[0067] However, the PType selector/receiver does not output a probability distribution associated with different types of precipitation. Instead, the PType selector/receiver receives weather observations for a given latitude and longitude from the different sources to select one precipitation type from a list of different precipitation types. For example, based on the inputs received from the sources, the PType selector/receiver selects a single precipitation type that is most likely to occur in the given latitude and longitude (and/or location) from the following list of precipitation types:

1) Snow
2) Rain
3) Freezing Rain
4) Hail
5) Ice Pellets
6) Mix (e.g., a+c, a+d, b+c, a+e, c+e, d+e, etc.)

[0068] From the list of precipitation types such as the one above, only one precipitation type is selected for a given location. For example, a mix of snow and freezing rain can be selected as the most likely precipitation type for a given location at a given time. The precipitation type is not associated with a probability value. In fact, since only one precipitation type is selected for any given location and time corresponding to the location, the selected precipitation type will have the effective probability value of 100%.

[0069] The list of precipitation types that are available for selection of one type may include a mix type that represents a mix of two different precipitation types (e.g., snow and freezing rain, hail and ice pellets, etc.). A mix type is considered as a distinct precipitation type available for selection and, as shown above in (f) of the list, there can be many different mix types representing the mix of different pairs of various precipitation types.

[0070] In another embodiment, the precipitation type is not selected by the PType selector/receiver but instead is received from a source outside the nowcaster. In other words, the nowcaster 200 may request to a remote source (e.g., a third-party weather service) identification of the precipitation type that is most likely to occur for a given location at a given time and receive a response from the source identifying the most likely precipitation type. In this case, selection of the precipitation type is not performed by the nowcaster. The nowcaster merely is inputted with the already-selected precipitation type and thereby can save computational power of the nowcaster that would otherwise have been needed to perform the selection.

[0071] The selected precipitation type and the PRate values respectively output by the PType selector/receiver and the PRate distribution forecaster are combined. For example, if the selected precipitation type is snow, and the PRate values are as described above, the combined information would indicate:

1) No Snow: 30%

2) Light Snow: 40%
3) Moderate Snow: 20%
4) Heavy Snow: 10%.

[0072] As only one precipitation type is concerned, only minimal amount of computational power is needed to perform the combining to output the final weather forecast data. Since the PType selector/receiver will output one (1) precipitation type for a given location and time, if the PRate distribution forecaster outputs a number m of probability distribution, the final weather forecast data will comprise only a number m (m*1) of weather forecast distribution.

[0073] In outputting the final weather forecast data, it is possible to associate probability ranges with textual information for displaying the textual information to the user instead of the probabilities in numbers, similar to the embodiment shown in Figure 2. For example, probabilities that are between 5% and 15% may be associated with the text: "low chance," while probabilities that are between 40% and 70% may be associated with the text "high chance," or "very likely," etc. whereby, instead of displaying: "60% chance of heavy snow," it is possible to display: "high chance of heavy snow." As will be appreciated by a person of ordinary skill in the art, there can be many other variations than the examples provided herein.

[0074] Accordingly, the nowcaster receives the location for which the nowcasts are needed and the time and/or time interval for which the nowcasts are needed and outputs the selected PType and PRate distribution for the given location and for the specific time.

[0075] The nowcaster according to this another embodiment of the nowcaster may be advantageous over the embodiment shown in Figure 2 in certain circumstances in which efficiency is desired. This another embodiment can be implemented using much less processing power than the embodiment of Figure 2. However, the embodiment of Figure 2 may be more suitable than this another embodiment described above in providing more detailed and accurate snapshot of weather forecast data for any given location and time.

[0076] Map Generation Module

[0077] The map generating module 310 may be a web-based module and/or a GPS

based module for generating routes and directions.

[0078] An example of such web-based modules may include MapquestTM, YahooTM Maps, GoogleTM Maps, and so on. In this type of modules the data relating to the generation or routes and/or maps is stored on a remote server 250 that is accessible via a telecommunications network 254 such the internet. Using these modules, the user may request to view the map for a certain location e.g. city, town, country, street etc. and/or may request directions from a first location A to a second location B, whereby the module may return a list of directions for the displacement from A to B as shown in Figure 3a and/or a route drawn on a map as shown in Figure 3b. In an embodiment the map generating module 310 may provide one or more choices of routes for the user to choose from as exemplified in Figure 3c.

[0079] In another embodiment, the data may be downloaded and/or pushed from the server 250 to the computing device on which the embodiments are practiced, whereby the route and/or map may be displayed without accessing the remote server 250.

[0080] In an embodiment, the map generating module 310 may also include a GPS navigation device 330 which determines the current position of the user using a connection with satellite 332. The GPS unit may be embedded in a portable device such as an IPhone TM or the like. In another example, the GPS navigation device 330 may be embedded in a handheld GPS navigation device such as the series of devices manufactured by GarminTM or MagellanTM etc. An example of which is shown in Figure 4.

[0081] Intelligence module

[0082] In an embodiment, the intelligence module 312 may be linked to a user interface for receiving the user's entries such the identification of the locations A and B, departure time, and the user preferences regarding the locations for which the nowcasts are needed.

[0083] The intelligence module 312 transfers the identification of the locations A and B to the map generating module 310, and in return, it receives a map on which the route between A and B is drawn as exemplified in Figure 3b.

[0084] Based on the user's preferences, the intelligence module 312 may

identify/receive the key points along the route. For example, the user may choose to view the nowcasts for major cities along the route, or by increments of for example 30Km, etc. The intelligence module 312 sends the location information associated with each key point to the nowcaster 200 along with a time or time interval. In response, the Intelligence module 312 receives the nowcasts from the nowcaster 200 and adds some or all (depending on the resolution and size of the display and the zoom level) of these nowcasts on the map received from the map generating module 310, as exemplified in Figure 5a.

[0085] In one embodiment, the intelligence module 312 may send the location information of the each key point along with the current time whereby the user may see the current weather conditions in the different locations along the route.

[0086] In another embodiment, the intelligence module 312 may estimate a time of arrival for each key point which represents the estimated time at which the user is expected to arrive at a given key point. Estimation of the arrival time may depend on several factors including: the departure time (which unless specified by the user is taken as the present time), the distance between the departure point and the respective key point, traffic information received from the map generating module 310 (or another source), weather information, current speed, and speed limit associated with each segment of the route between the current position and the respective key point.

[0087] As discussed above, the map generating module 310 may provide different choices of routes whereby the user may view the weather conditions along different key points and select one the routes for navigation.

[0088] In an embodiment, if the user is viewing the map using a GPS and/or web enabled computing device, the nowcasts may be updated on the map based on the advancement of the user on the route and the changes in weather conditions.

[0089] In an embodiment, the nowcasts may be provided on the map along with the time/ time interval associated with each nowcast, as exemplified in Figure 5b. In an embodiment, the time shown on the map is the estimated time of arrival which is estimated by the intelligence module 312 based on the current location, speed, and weather and traffic conditions.

[0090] Figure 6 is an example of a network environment in which the

embodiments may be practiced. The nowcaster 200 may be implemented on a server 250 which is accessible by a plurality of client computers 252 over a telecommunications network 254. The client computers 252 may include but not limited to: laptops, desktops, portable computing devices, tablets and the like. Using a client computer 252, each user may enter the directions between two locations and preferably the time of departure (otherwise the current time is used to replace this). The information is sent to the remote server 250 over a telecommunications network 254. The server 250 returns a list of directions along with a map including a route from locations A to B along with nowcasts at certain key points on the route. The server accesses weather source 201 over a telecommunications network 254 as discussed in connection with Figure 2. The server 250 may have map data stored thereon and may also access map sources 320 provided by a third entity.

[0091] Preferably, the client computer 252 is GPS enabled. In which case, the computing device may provide updates to the server 250 for updating the nowcasts along the route, as discussed above.

[0092] Figure 7 is an example of another network environment in which the embodiments of a method for providing nowcasts may be practiced. In this embodiment, the user enters the destination and views the map on a GPS navigation device. The GPS navigation device takes the departure location as the current location. The current position and the end destination along with a pre-determined route which is chosen by a satellite 332 may be sent to the server 250 via the satellite 332. The intelligence module 312 implemented in the server 250 may return the nowcasts for key points along the route, and send the nowcasts and an identification of the key points to the GPS navigation device 330 for adding to the map shown on the display of the GPS navigation device 330.

[0093] Figure 8 illustrates a computer implemented method 800 for generating maps. It comprises receiving a map request 810 including a departure location and a destination location. In response to receiving the map request 810, the computer implemented method 800 comprises obtaining map data 820 which, when implemented on a display device, cause the display device to show a map display 830 including a route drawn between the departure location and said destination location.

It also performs obtaining nowcasts 840 for one or more key points along the route and modifies the map data 820 (including adding a visual indicator) for the representation 850 of one of the nowcasts for each key point on the route drawn on the map. The computer-implemented method 800 eventually outputs modified map data for display 860 to a user.

[0094] Hardware and Operating Environment

[0095] Figure 9 illustrates an exemplary diagram of a suitable computing operating environment in which embodiments of the invention may be practiced. The following description is associated with Figure 9 and is intended to provide a brief, general description of suitable computer hardware and a suitable computing environment in conjunction with which the embodiments may be implemented. Not all the components are required to practice the embodiments, and variations in the arrangement and type of the components may be made without departing from the spirit or scope of the embodiments.

[0096] Although not required, the embodiments are described in the general context of computer-executable instructions, such as program modules, being executed by a computer, such as a personal computer, a hand-held or palm-size computer, Smartphone, or an embedded system such as a computer in a consumer device or specialized industrial controller. Generally, program modules include routines, programs, objects, components, data structures, etc., that perform particular tasks or implement particular abstract data types.

[0097] Moreover, those skilled in the art will appreciate that the embodiments may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, network PCS, minicomputers, mainframe computers, cellular telephones, smart phones, display pagers, radio frequency (RF) devices, infrared (IR) devices, Personal Digital Assistants (PDAs), laptop computers, wearable computers, tablet computers, a device of the IPOD or IPAD family of devices manufactured by Apple Computer, integrated devices combining one or more of the preceding devices, or any other computing device capable of performing the methods and systems described herein. The embodiments may also be practiced in distributed computing environments where

tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing environment, program modules may be located in both local and remote memory storage devices.

[0098] The exemplary hardware and operating environment of Figure 9 includes a general purpose computing device in the form of a computer 720, including a processing unit 721, a system memory 722, and a system bus 723 that operatively couples various system components including the system memory to the processing unit 721. There may be only one or there may be more than one processing unit 721, such that the processor of computer 720 comprises a single central-processing unit (CPU), or a plurality of processing units, commonly referred to as a parallel processing environment. The computer 720 may be a conventional computer, a distributed computer, or any other type of computer; the embodiments are not so limited.

[0099] The system bus 723 may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The system memory may also be referred to as simply the memory, and includes read only memory (ROM) 724 and random access memory (RAM) 725. A basic input/output system (BIOS) 726, containing the basic routines that help to transfer information between elements within the computer 720, such as during start-up, is stored in ROM 724. In one embodiment of the invention, the computer 720 further includes a hard disk drive 727 for reading from and writing to a hard disk, not shown, a magnetic disk drive 728 for reading from or writing to a removable magnetic disk 729, and an optical disk drive 730 for reading from or writing to a removable optical disk 731 such as a CD ROM or other optical media. In alternative embodiments of the invention, the functionality provided by the hard disk drive 727, magnetic disk 729 and optical disk drive 730 is emulated using volatile or non-volatile RAM in order to conserve power and reduce the size of the system. In these alternative embodiments, the RAM may be fixed in the computer system, or it may be a removable RAM device, such as a Compact Flash memory card.

[00100] In an embodiment of the invention, the hard disk drive 727, magnetic disk drive 728, and optical disk drive 730 are connected to the system bus 723 by a hard

disk drive interface 732, a magnetic disk drive interface 733, and an optical disk drive interface 734, respectively. The drives and their associated computer-readable media provide nonvolatile storage of computer-readable instructions, data structures, program modules and other data for the computer 720. It should be appreciated by those skilled in the art that any type of computer-readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, random access memories (RAMs), read only memories (ROMs), and the like, may be used in the exemplary operating environment.

[00101] A number of program modules may be stored on the hard disk, magnetic disk 729, optical disk 731, ROM 724, or RAM 725, including an operating system 735, one or more application programs 736, other program modules 737, and program data 738. A user may enter commands and information into the personal computer 720 through input devices such as a keyboard 740 and pointing device 742. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner, touch sensitive pad, or the like. These and other input devices are often connected to the processing unit 721 through a serial port interface 746 that is coupled to the system bus, but may be connected by other interfaces, such as a parallel port, game port, or a universal serial bus (USB). In addition, input to the system may be provided by a microphone to receive audio input.

[00102] A monitor 747 or other type of display device is also connected to the system bus 723 via an interface, such as a video adapter 748. In one embodiment of the invention, the monitor comprises a Liquid Crystal Display (LCD). In addition to the monitor, computers typically include other peripheral output devices (not shown), such as speakers and printers. The monitor may include a touch sensitive surface which allows the user to interface with the computer by pressing on or touching the surface.

[00103] The computer 720 may operate in a networked environment using logical connections to one or more remote computers, such as a remote computer 749. These logical connections are achieved by a communication device coupled to or a part of the computer 720; the embodiment is not limited to a particular type of communications device. The remote computer 749 may be another computer, a server,

a router, a network PC, a client, a peer device or other common network node, and typically includes many or all of the elements described above relative to the computer 720, although only a memory storage device 750 has been illustrated in Figure 6. The logical connections depicted in Figure 6 include a local-area network (LAN) 751 and a wide-area network (WAN) 752. Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets and the Internet.

[00104] When used in a LAN-networking environment, the computer 720 is connected to the local network 751 through a network interface or adapter 753, which is one type of communications device. When used in a WAN-networking environment, the computer 720 typically includes a modem 754, a type of communications device, or any other type of communications device for establishing communications over the wide area network 752, such as the Internet. The modem 754, which may be internal or external, is connected to the system bus 723 via the serial port interface 746. In a networked environment, program modules depicted relative to the personal computer 720, or portions thereof, may be stored in the remote memory storage device. It is appreciated that the network connections shown are exemplary and other means of and communications devices for establishing a communications link between the computers may be used.

[00105] The hardware and operating environment in conjunction with which embodiments of the invention may be practiced has been described. The computer in conjunction with which embodiments of the invention may be practiced may be a conventional computer a hand-held or palm-size computer, a computer in an embedded system, a distributed computer, or any other type of computer; the invention is not so limited. Such a computer typically includes one or more processing units as its processor, and a computer-readable medium such as a memory. The computer may also include a communications device such as a network adapter or a modem, so that it is able to communicatively couple other computers.

[00106] While preferred embodiments have been described above and illustrated in the accompanying drawings, it will be evident to those skilled in the art that modifications may be made without departing from this disclosure. Such modifications are considered as possible variants comprised in the scope of the

disclosure.

CLAIMS:

1. A computer implemented method for generating a map comprising a weather forecast, the method comprising:
    - receiving a map request including a departure location and a destination location;
    - in response to receiving said map request, obtaining map data which when implemented on a display device cause the display device to show at least a portion of a map including a route drawn between the departure location and said destination location;
    - obtaining a weather forecast associated with one or more key points along said route;
    - modifying said map data such that it comprises a visual indicator representing at least one weather forecast for a key point on the route; and
    - outputting the modified map data to a computing device for presentation to a user.
2. The method of claim 1, further comprising sending a location information associated with one or more key points to a nowcaster server for before obtaining the weather forecast.
3. The method of claim 2, further comprising sending, to the nowcaster server, a time associated with the one or more key points.
4. The method of claim 3, wherein the time sent to the nowcaster server comprises sending a current time.
5. The method of claim 3, comprising estimating an arrival time of a user at a key point on the route based at least on the user's current location.
6. The method of claim 5, wherein the arrival time is determined based on at least one of: departure time, weather conditions, speed limit, current speed, and distance between the current location and the key point.
7. The method of claim 6, further comprising:
    - receiving updated positional information representing the current

location of the computing device on which the map is displayed; and

- using the current location as a new departure location updating the weather forecast on the map.

8. The method of any of claims 1-7, wherein the map data is generated using information stored locally.

9. The method of any of claims 1-8, wherein the map request is forwarded to a remote server, and the map data is obtained from the remote server.

10. A method for providing nowcasts on a map displayed on a navigation device, the method comprising:

- receiving from said GPS location information including a departure location and a destination location, and a pre-determined route between the departure location and the destination location; - identifying one or more key points along said route;
- associating a time with each point;
- obtaining nowcasts for each key points; and
- forwarding said nowcasts for displaying on the route drawn between the departure location and the destination location, on a display associated with said GPS for display to a user.

11. The method of claim 10, further comprising sending a location information associated with each key point to a nowcaster for obtaining nowcasts.

12. The method of claim 11, further comprising sending a time for which the nowcasts are needed for each key point.

13. The method of claim 12, wherein sending a time comprises sending a current time.

14. The method of claim 12 or 13, wherein sending a time comprises estimating an arrival time representing the time at which the user starting at a current location will arrive at a given key point.

15. The method of claim 14, wherein estimating the arrival time is based on at least one of: departure time, weather conditions, speed limit, current speed, and distance between the current location and the key point.

16. The method of claim 15, further comprising:

- receiving updated positional information representing the current location of the GPS on which the map is displayed; and
- using the current location as a new departure location updating the nowcasts on the map.

17. A device for generating a map comprising a weather forecast, comprising:

one or more processors,

a display device, and

a memory storing instructions for the one or more processors,

wherein when the one or more processors execute the instructions stored in the memory, the device is caused to:

receive a map request including a departure location and a destination location;

in response to receiving said map request, obtain map data which is displayed on the display device to show at least a portion of the obtained map data including a route between the departure location and said destination location;

obtain nowcasts associated with one or more key points along said route;

modify said map data such that it includes a visual indicator representing at least one nowcast associated with a key point on the route; and

display the modified map data on the display device.

18. A device for generating a map comprising a weather forecast, comprising:

one or more processors,

a display device, and

a memory storing instructions for the one or more processors,

wherein when the one or more processors execute the instructions stored in the memory, the device is caused to:

receive from said GPS location information including a departure location and a destination location, and a pre-determined route between the departure location and the destination location;

identifying one or more key points along said route;

associate a time with each point;

obtain nowcasts for each key points; and

forward said nowcasts for displaying on the route drawn between the departure location and the destination location, on a display associated with said GPS for display to a user.

19. A system comprising a server and a remote device that is connected to the server via a communication network, wherein

the server comprises a computer and a non-transitory computer readable medium storing instructions for the computer such that when the instructions are executed by the computer, the server is caused to:

receive from the remote device information including a departure location and a destination location, and a pre-determined route between the departure location and the destination location;

identify one or more key points along said route;

associate a time with each key point;

obtain nowcasts for each key point;

forward said nowcasts to the remote device, and .

the remote device comprises one or more processors, a display and a non-transitory medium comprising a program for the one or more processors such that when the program is executed by the one or more processors, the remote device is caused to:

obtain the nowcasts from the server;

determine a second route between the departure location and the destination location based at least on the nowcasts obtained from the server; and

cause, on the display, a display of at least part of the second route.

20. A non-transitory computer readable medium storing instructions comprising the steps of any of claims 1-16.

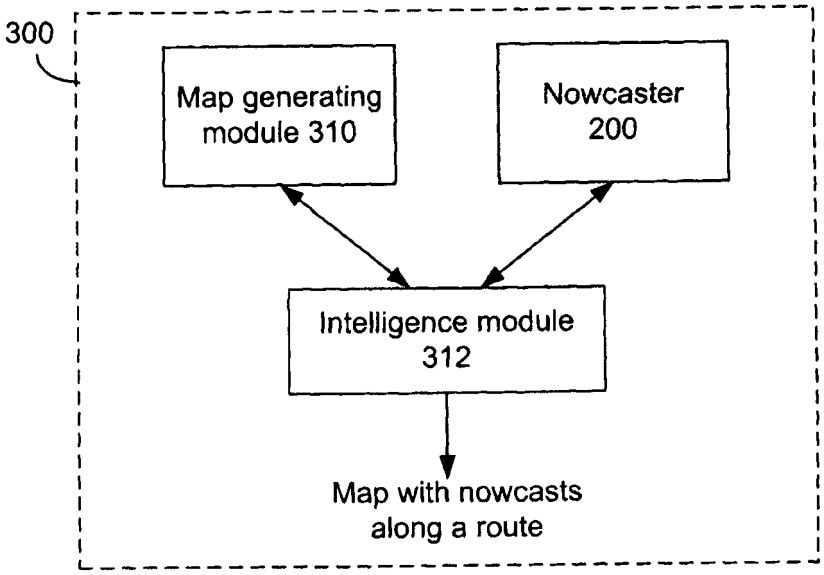

300
Map generating module 310
Nowcaster 200
Intelligence module 312
Map with nowcasts along a route

FIGURE 1

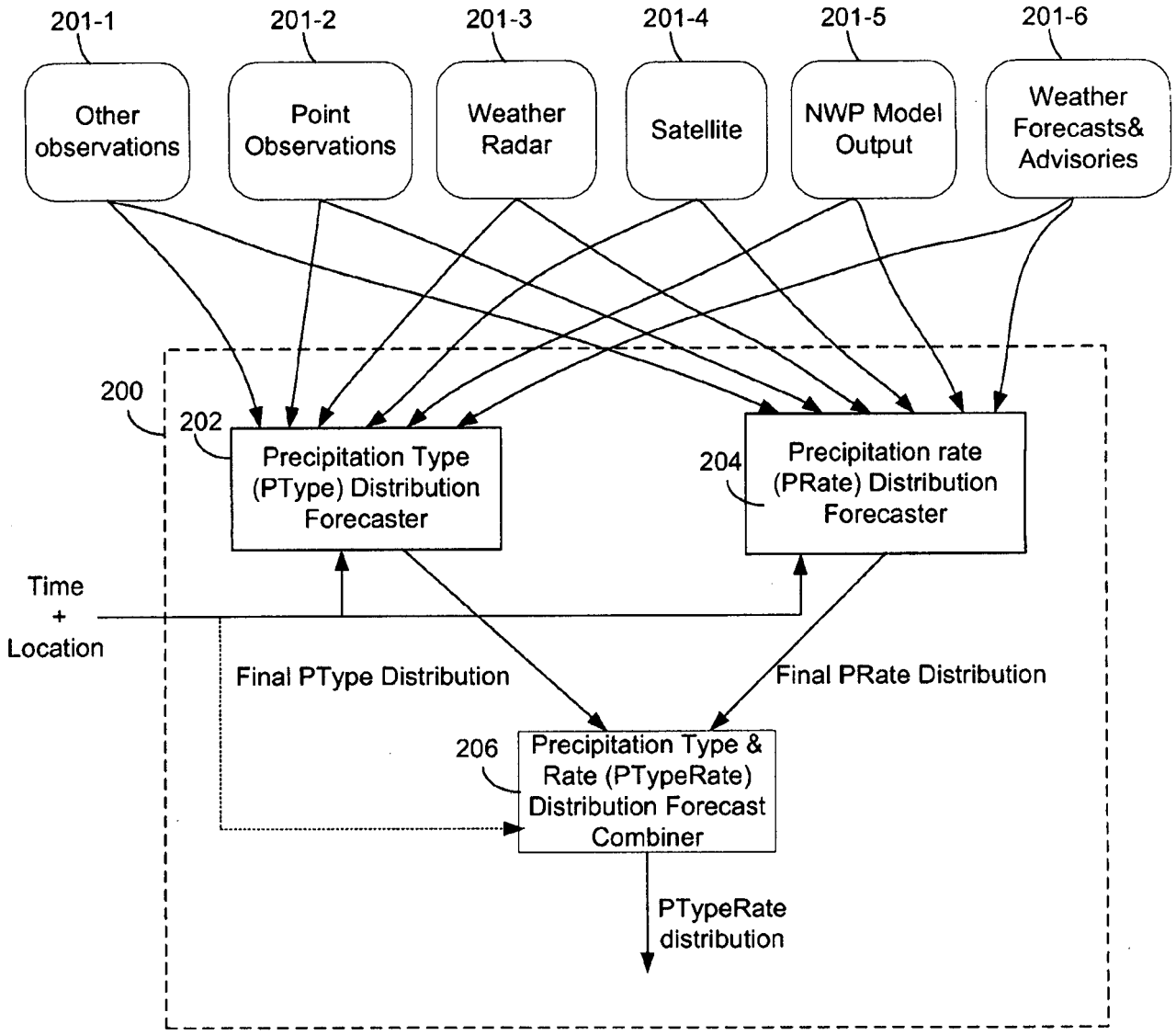

201-1
201-2
201-3
201-4
201-5
201-6
Other observations
Point Observations
Weather Radar
Satellite
NWP Model Output
Weather Forecasts& Advisories
200
202
Precipitation Type (PType) Distribution Forecaster
204
Precipitation rate (PRate) Distribution Forecaster
Time + Location
Final PType Distribution
Final PRate Distribution
206
Precipitation Type & Rate (PTypeRate) Distribution Forecast Combiner
PTypeRate distribution

FIGURE 2

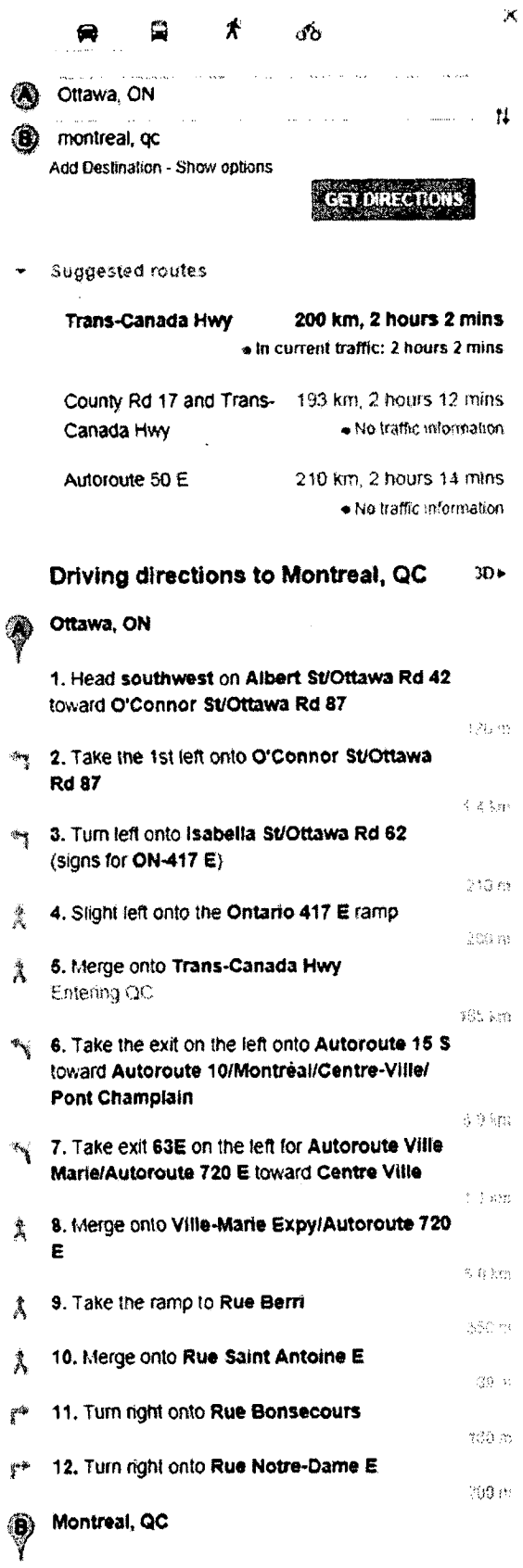

Ottawa, ON
montreal, qc
Add Destination - Show options
GET DIRECTIONS
Suggested routes
Trans-Canada Hwy
200 km, 2 hours 2 mins
In current traffic: 2 hours 2 mins
County Rd 17 and Trans-Canada Hwy
193 km, 2 hours 12 mins
No traffic information
Autoroute 50 E
210 km, 2 hours 14 mins
No traffic information
Driving directions to Montreal, QC
3D
Ottawa, ON
1. Head southwest on Albert St/Ottawa Rd 42 toward O'Connor St/Ottawa Rd 87
2. Take the 1st left onto O'Connor St/Ottawa Rd 87
3. Turn left onto Isabella St/Ottawa Rd 62 (signs for ON-417 E)
4. Slight left onto the Ontario 417 E ramp
5. Merge onto Trans-Canada Hwy
Entering QC
6. Take the exit on the left onto Autoroute 15 S toward Autoroute 10/Montréal/Centre-Ville/ Pont Champlain
7. Take exit 63E on the left for Autoroute Ville Marie/Autoroute 720 E toward Centre Ville
8. Merge onto Ville-Marie Expy/Autoroute 720 E
9. Take the ramp to Rue Berri
10. Merge onto Rue Saint Antoine E
11. Turn right onto Rue Bonsecours
12. Turn right onto Rue Notre-Dame E
Montreal, QC

FIGURE 3a

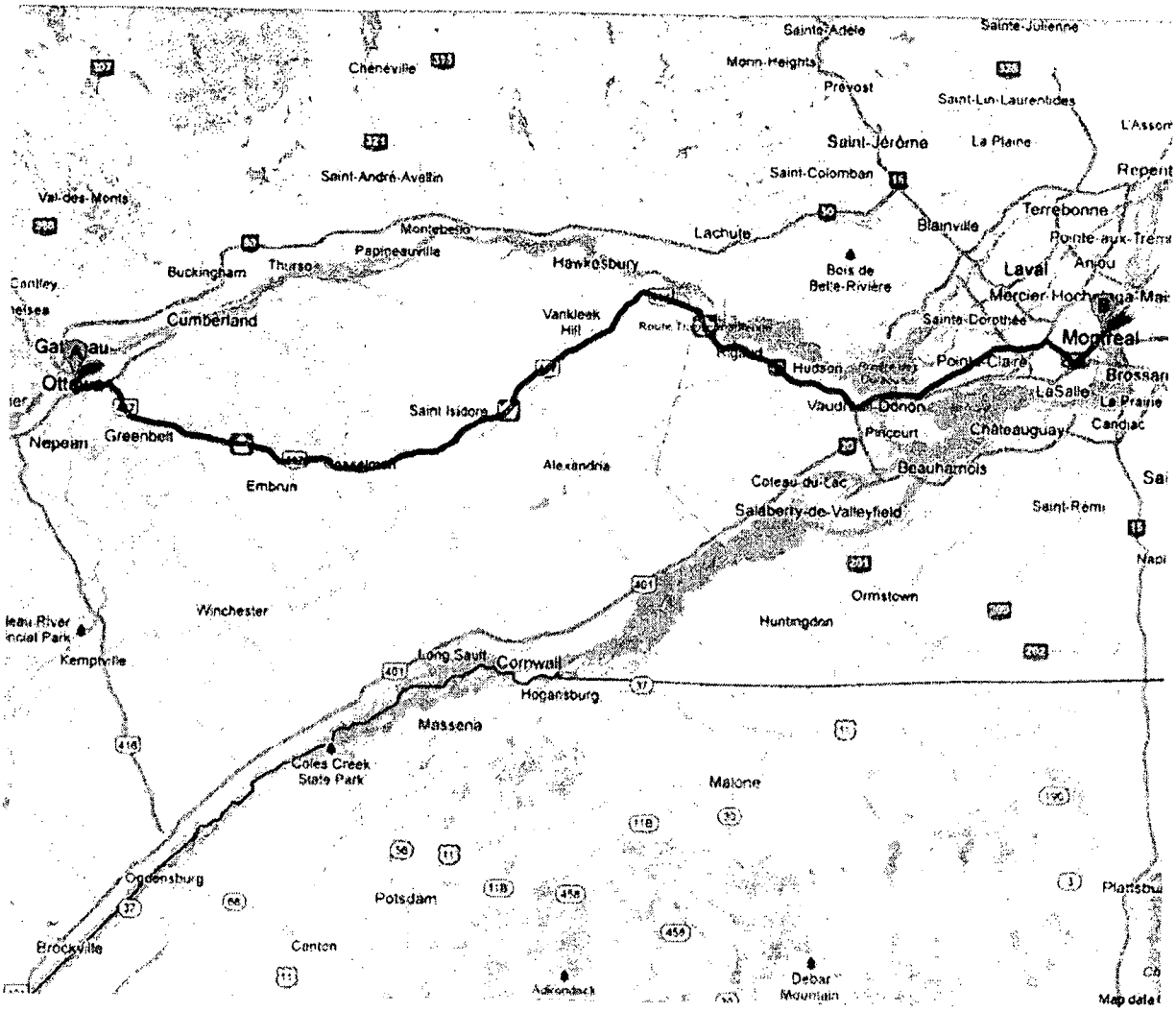


FIGURE 3b

Suggested routes

Trans-Canada Hwy	**200 km, 2 hours 2 mins**
	In current traffic: 2 hours 2 mins
County Rd 17 and Trans-Canada Hwy	193 km, 2 hours 12 mins
	No traffic information
Autoroute 50 E	210 km, 2 hours 14 mins
	No traffic information

FIGURE 3c

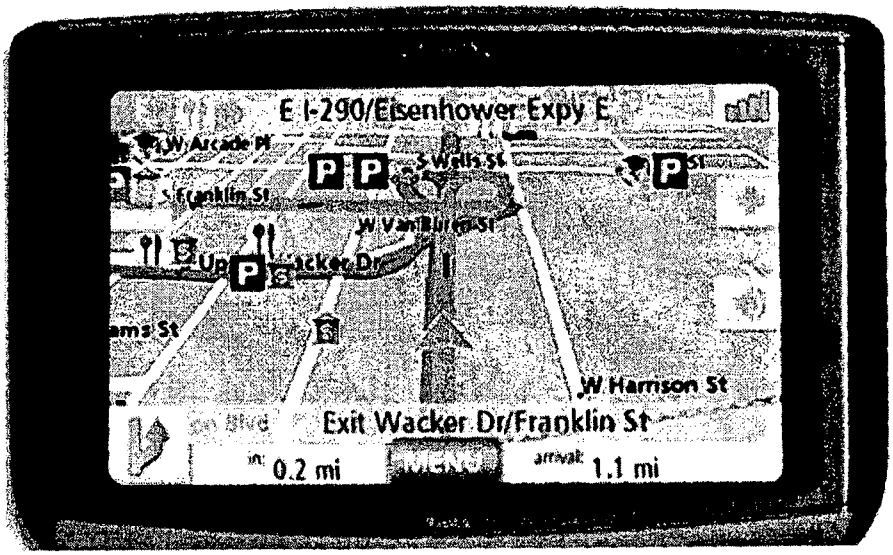

E I-290/Eisenhower Expy E
W Arcade Pl
S Wells St
W Harrison St
Exit Wacker Dr/Franklin St
0.2 mi
1.1 mi

FIGURE 4

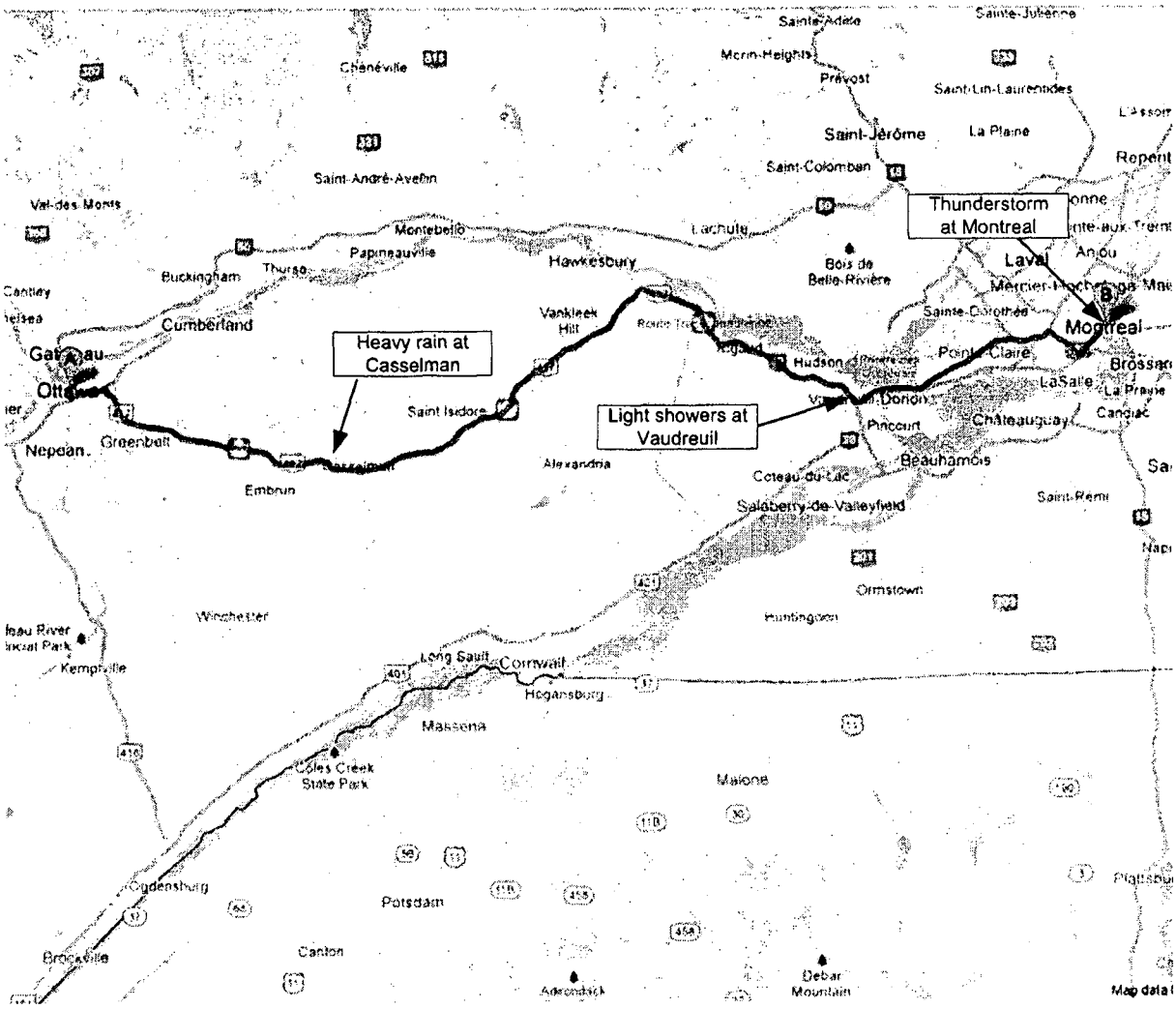

Thunderstorm at Montreal
Heavy rain at Casselman
Light showers at Vaudreuil
Saint-Jérôme
Saint-Colomban
Laval
Montreal
Hawkesbury
Cumberland
Gatineau
Ottawa
Nepean
Greenbelt
Embrun
Saint Isidore
Vankleek Hill
Alexandria
Coteau-du-Lac
Salaberry-de-Valleyfield
Beauharnois
Pincourt
Châteauguay
Ormstown
Winchester
Kemptville
Long Sault
Cornwall
Hogansburg
Massena
Malone
Potsdam
Ogdensburg
Brockville
Canton
Adirondack
Debar Mountain
Map data

FIGURE 5a

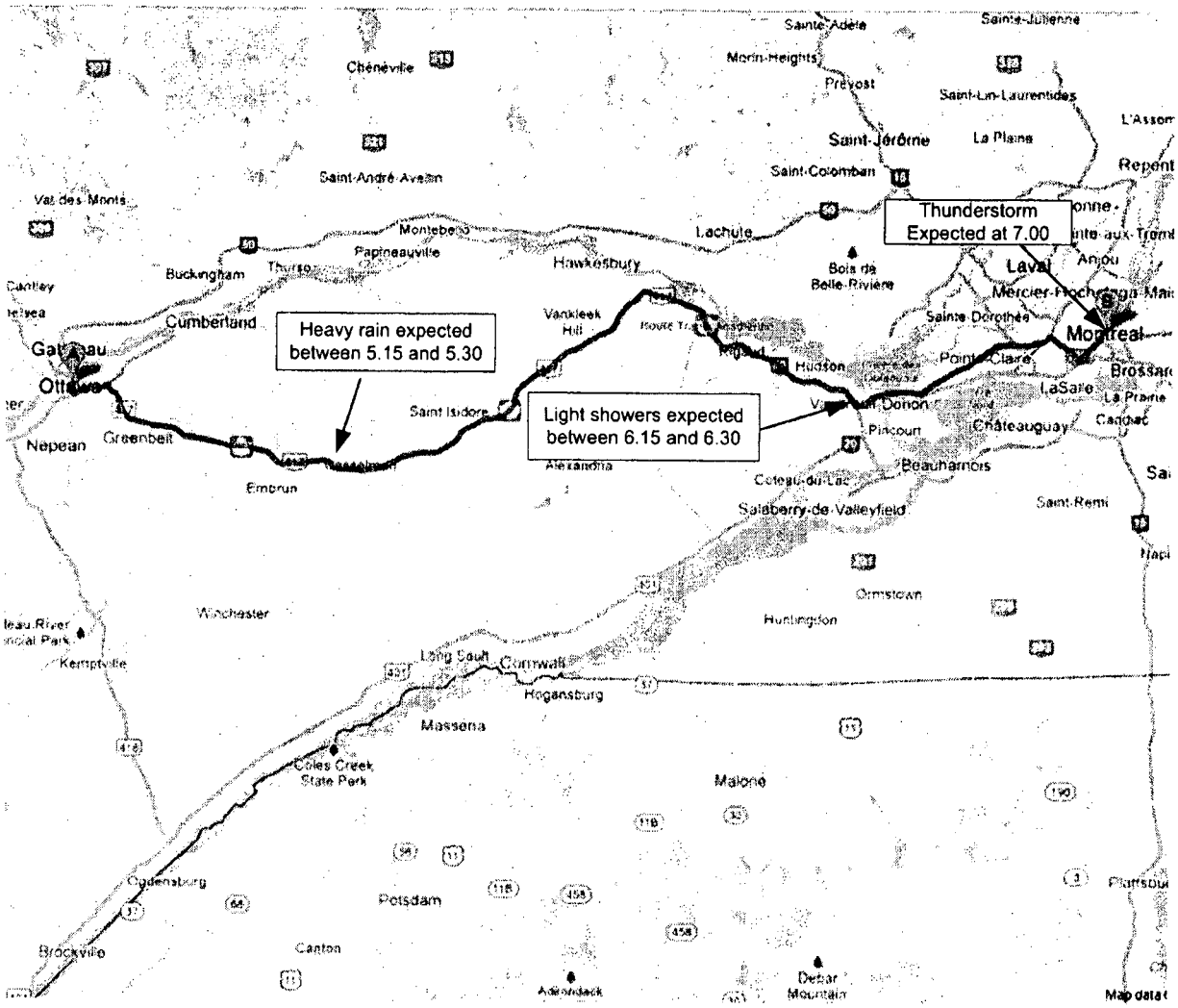

Thunderstorm Expected at 7.00
Heavy rain expected between 5.15 and 5.30
Light showers expected between 6.15 and 6.30
Ottawa
Gatineau
Montreal
Laval
Lachute
Hawkesbury
Cornwall
Massena
Potsdam
Malone
Huntingdon
Beauharnois
Salaberry-de-Valleyfield
Chateauguay
Nepean
Greenbelt
Cumberland
Buckingham
Papineauville
Saint-Jerome
Saint-Colomban
Sainte-Adele
Morin-Heights
Prevost
Saint-Andre-Avellin
Chenaville
Vankleek Hill
Saint Isidore
Alexandria
Embrun
Winchester
Kemptville
Long Sault
Ormstown
Saint-Remi
Coles Creek State Park
Ogdensburg
Brockville
Canton
Adirondack
Repent
Anjou
Pincourt
Dorion
Hudson
Point-Claire
LaSalle
Sainte Dorothee
Bois de Belle-Riviere
La Plaine
Saint-Lin-Laurentides
Sainte-Julienne

FIGURE 5b

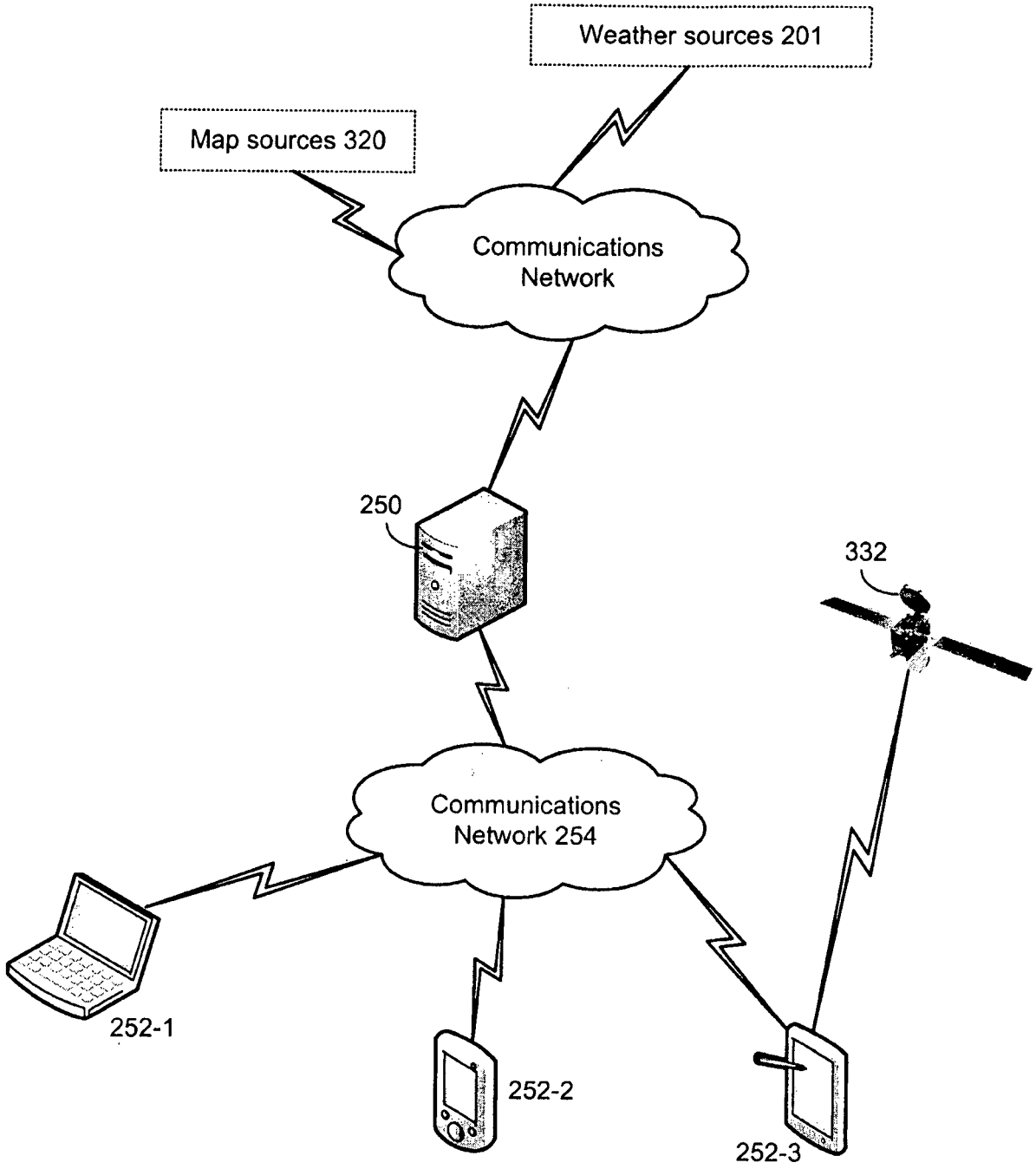

Weather sources 201
Map sources 320
Communications Network
250
332
Communications Network 254
252-1
252-2
252-3

FIGURE 6

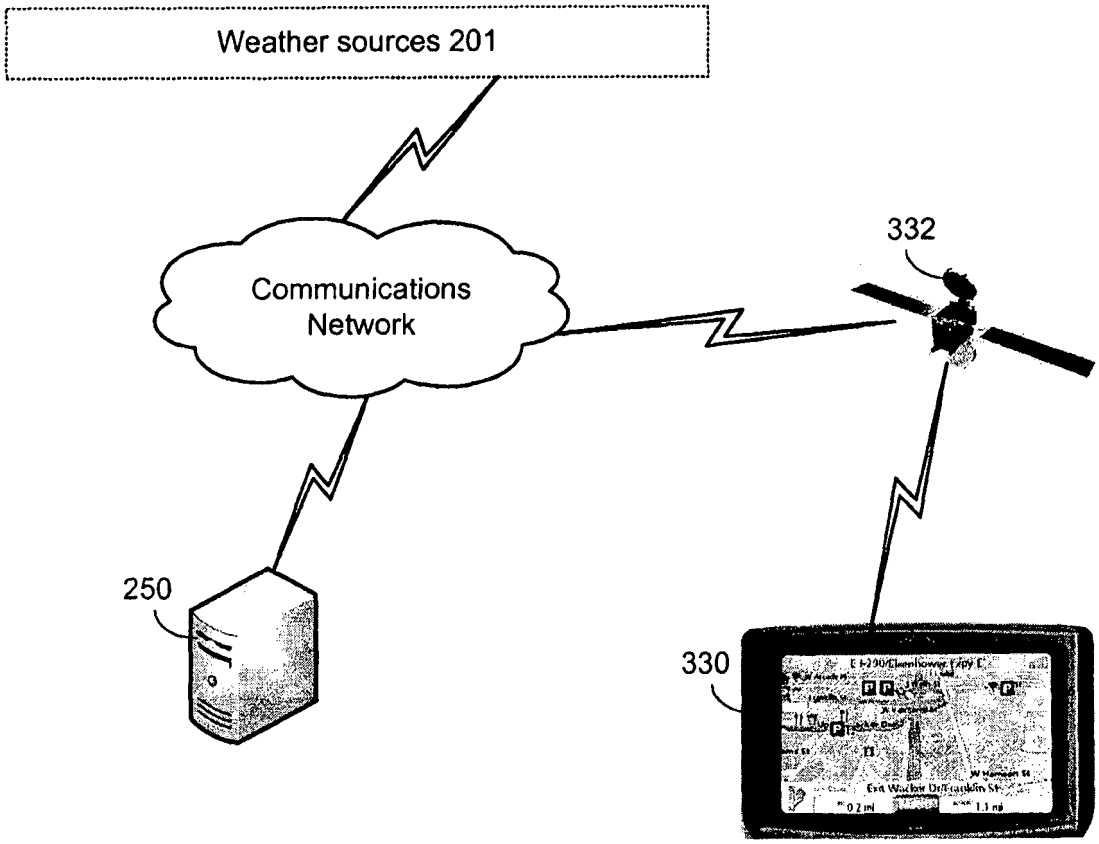


FIGURE 7

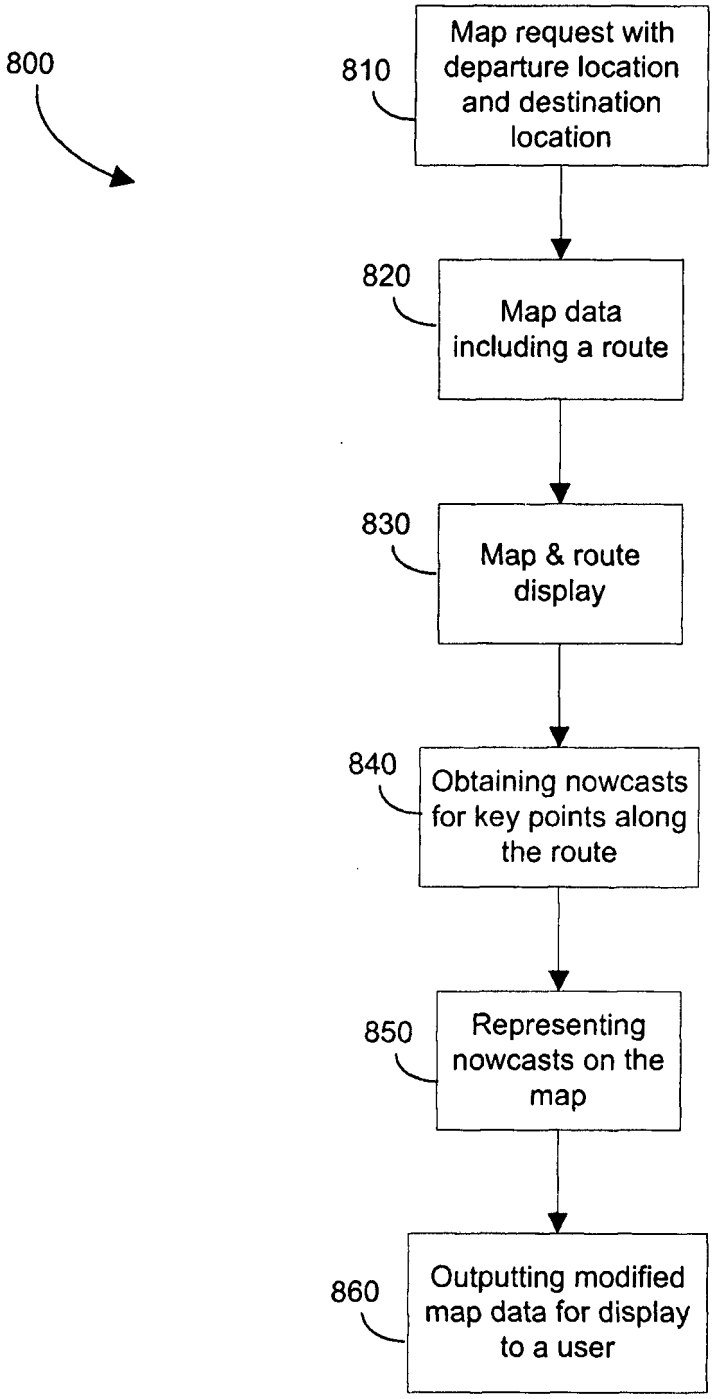

800
810
Map request with departure location and destination location
820
Map data including a route
830
Map & route display
840
Obtaining nowcasts for key points along the route
850
Representing nowcasts on the map
860
Outputting modified map data for display to a user

FIGURE 8

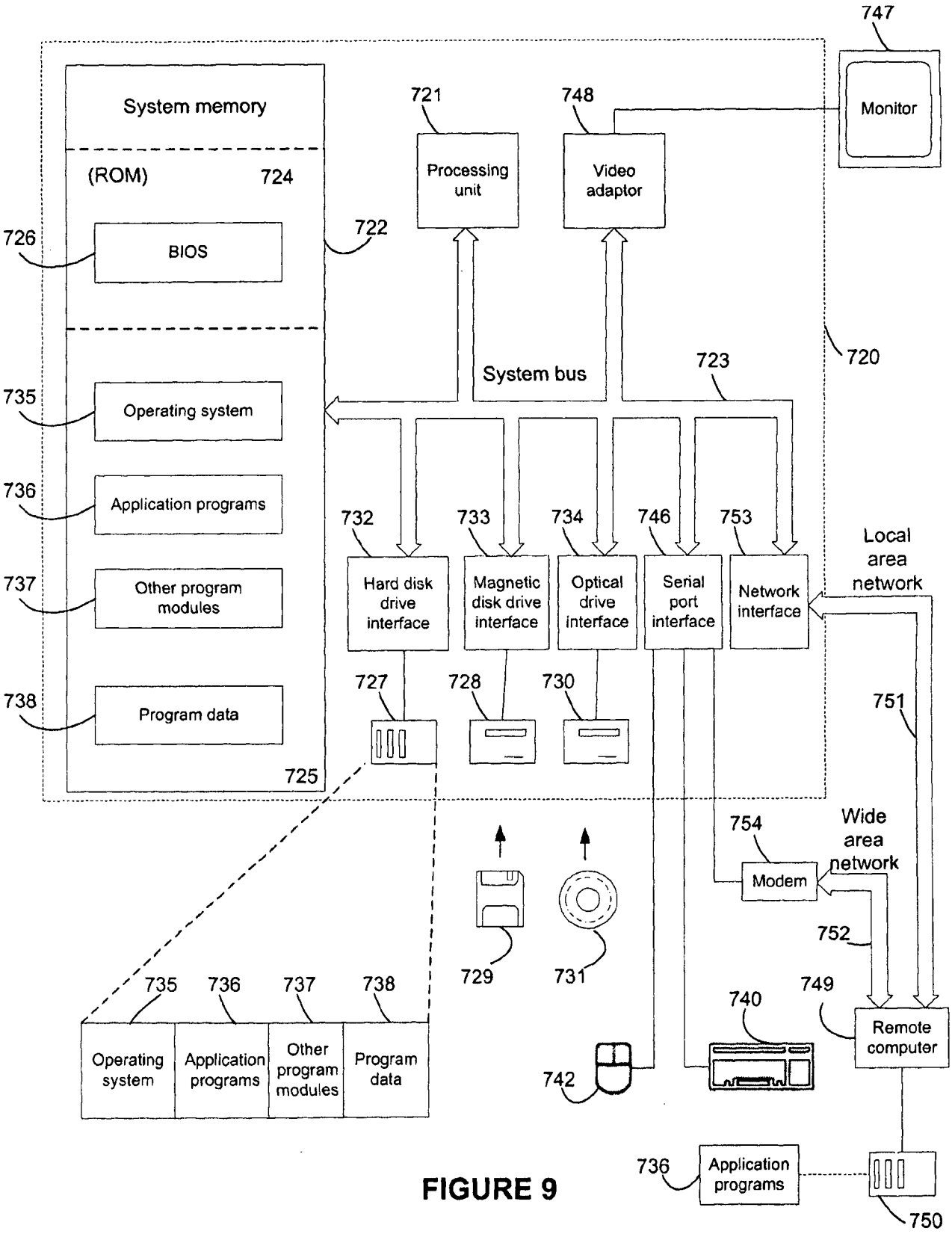

747
Monitor
721
Processing unit
748
Video adaptor
System memory
(ROM) 724
726
BIOS
722
720
System bus
723
735
Operating system
736
Application programs
737
Other program modules
738
Program data
725
732
733
734
746
753
Hard disk drive interface
Magnetic disk drive interface
Optical drive interface
Serial port interface
Network interface
Local area network
727
728
730
751
754
Wide area network
Modem
752
729
731
749
740
Remote computer
742
736
Application programs
750
735
736
737
738
Operating system
Application programs
Other program modules
Program data

FIGURE 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2014/000313

A. CLASSIFICATION OF SUBJECT MATTER
IPC: ***G01C 21/36*** (2006.01), *G01W 1/10* (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: ***G01C 21/36*** (2006.01), *G01W 1/10* (2006.01)

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

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Canadian Patent Database, Questel Orbit (Keywords: gps, navigation, weather forecasting, nowcaster, route, display, visual indicator, map, nowcasting)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/0307168 (Kieff) 15 December 2011 (15-12-2011) (abstract, Figure 1)	1-20
A	US 6,317,686 (Ran) 13 November 2001 (13-11-2001) (see whole document)	1-20
A	US 2009/0088965 (Burchart et al.) 2 April 2009 (02-04-2009) (see whole document)	1-20

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

☑ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent but published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 22 July 2014 (22-07-2014)	Date of mailing of the international search report 23 July 2014 (23-07-2014)
Name and mailing address of the ISA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001-819-953-2476	Authorized officer Camran Syed (819) 934-4550

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2014/000313

Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US2011307168A1	15 December 2011 (15-12-2011)	US2011307168A1	15 December 2011 (15-12-2011)
		EP2580558A2	17 April 2013 (17-04-2013)
		WO2011159340A2	22 December 2011 (22-12-2011)
		WO2011159340A3	09 February 2012 (09-02-2012)
US6317686B1	13 November 2001 (13-11-2001)	US6317686B1	13 November 2001 (13-11-2001)
		AU7691701A	05 February 2002 (05-02-2002)
		CN1434946A	06 August 2003 (06-08-2003)
		GB0300932D0	12 February 2003 (12-02-2003)
		GB2381355A	30 April 2003 (30-04-2003)
		WO0208922A1	31 January 2002 (31-01-2002)
US2009088965A1	02 April 2009 (02-04-2009)	None	

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13/922,800 2013.06.20 US
61/839,675 2013.06.26 US
13/947,331 2013.07.22 US
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(71)申请人 天气变化研究无限责任公司
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(74)专利代理机构 中国国际贸易促进委员会专利商标事务所 11038
代理人 李玲
(51)Int.Cl.
G01C 21/36(2006.01)
G01W 1/10(2006.01)

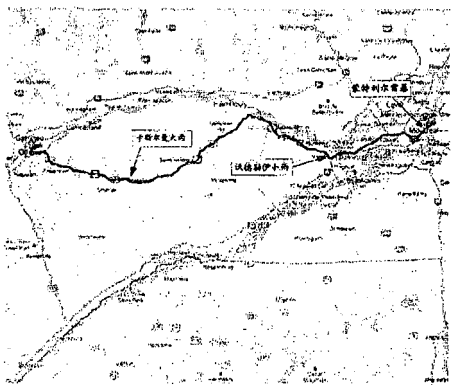
权利要求书3页 说明书11页 附图11页

(54)发明名称

用于显示沿地图上的路线的短时预报的方法与系统

(57)摘要

提供了一种使用气象预报在地图上生成路线的方法、设备、系统和计算机可读介质。例如，服务器可以从用户或设备接收地图请求。请求可以包括出发位置和目的位置。响应于接收到所述地图请求，服务器可以获得可适于在显示设备上显示的地图数据。地图数据可以包括在所述出发位置与所述目的位置之间绘制的路线。服务器还可以获得与沿着所述路线的一个或多个关键点相关联的气象预报。基于气象预报，服务器可以修改所述地图数据从而使得地图数据包括表示与路线上关键点相关联的至少一个气象预报的可视指示符。服务器可以向计算设备输出修改后的地图数据以向用户显示。



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1. 一种用于生成包括气象预报的地图的计算机实现的方法，该方法包括：

接收包括出发位置和目的位置的地图请求；

响应于接收到所述地图请求，获得地图数据，其中当在显示设备上实现所述地图数据时使所述显示设备显示地图的包括在所述出发位置与所述目的位置之间绘制的路线的至少一部分；

获得与沿着所述路线的一个或多个关键点相关联的气象预报；

修改所述地图数据从而使得所述地图数据包括表示针对所述路线上的关键点的至少一个气象预报的可视指示符；以及

向计算设备输出修改后的地图数据以呈现给用户。

2. 根据权利要求 1 所述的方法，还包括将与一个或多个关键点相关联的位置信息发送到短时预报器服务器，以用于提前获得气象预报。

3. 根据权利要求 2 所述的方法，还包括将与一个或多个关键点相关联的时间发送到短时预报器服务器。

4. 根据权利要求 3 所述的方法，其中发送时间到短时预报器服务器包括发送当前时间。

5. 根据权利要求 3 所述的方法，还包括至少基于用户的当前位置估计用户到所述路线上的关键点的到达时间。

6. 根据权利要求 5 所述的方法，其中基于以下至少一者来确定所述到达时间：出发时间、气象条件、限速、当前速度、以及当前位置与关键点之间的距离。

7. 根据权利要求 6 所述的方法，还包括：

接收更新的位置信息，所述更新的位置信息表示其上显示有地图的计算设备的当前位置；以及

将所述当前位置用作更新所述地图上的气象预报的新的出发位置。

8. 根据权利要求 1-7 中任意一项所述的方法，其中使用本地存储的信息生成所述地图数据。

9. 根据权利要求 1-8 中任一项所述的方法，其中所述地图请求被转发到远程服务器，并且所述地图数据从所述远程服务器获得。

10. 一种用于在导航设备上显示的地图上提供短时预报的方法，该方法包括：

从所述 GPS 接收位置信息，所述位置信息包括出发位置和目的位置，以及所述出发位置与所述目的位置之间的预定路线；识别沿所述路线的一个或多个关键点；

将时间与每个关键点相关联；

获得针对每个关键点的短时预报；以及

转发所述短时预报以用于在与所述 GPS 相关联的用于向用户显示的显示器上、在所述出发位置与所述目的位置之间绘制的路线上显示。

11. 根据权利要求 10 所述的方法，还包括将与每个关键点相关联的位置信息发送到短时预报器，以用于获得短时预报。

12. 根据权利要求 11 所述的方法，还包括发送针对每个关键点的需要进行短时预报的时间。

13. 根据权利要求 12 所述的方法，发送时间包括发送当前时间。

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14. 根据权利要求 12 或 13 所述的方法，其中发送时间包括估计到达时间，该到达时间表示从当前位置开始的用户将到达给定关键点的时间。

15. 根据权利要求 14 所述的方法，其中估计到达时间基于以下至少一者：出发时间、气象条件、限速、当前速度、以及当前位置与关键点之间的距离。

16. 根据权利要求 15 所述的方法，还包括：

接收更新的位置信息，所述更新的位置信息表示其上显示有地图的 GPS 的当前位置；以及

将当前的位置用作更新所述地图上的短时预报的新的出发位置。

17. 一种用于生成包括气象预报的地图的设备，该设备包括：

一个或多个处理器，

显示设备，以及

存储用于所述一个或多个处理器的指令的存储器，

其中当所述一个或多个处理器执行存储在所述存储器中的指令时，使所述设备：

接收包括出发位置和目的位置的地图请求；

响应于接收到所述地图请求，获得地图数据，所述地图数据被显示在所述显示设备上以显示所获得的地图数据的包括在所述出发位置与所述目的位置之间的路线的至少一部分；

获得与沿着所述路线的一个或多个关键点相关联的短时预报；

修改所述地图数据从而使得所述地图数据包括表示与所述路线上的关键点相关联的至少一个短时预报的可视指示符；以及

在所述显示设备上显示修改后的地图数据。

18. 一种用于生成包括气象预报的地图的设备，该设备包括：

一个或多个处理器，

显示设备，以及

存储用于所述一个或多个处理器的指令的存储器，

其中当所述一个或多个处理器执行存储在所述存储器中的指令时，使所述设备：

从所述 GPS 接收位置信息，所述位置信息包括出发位置和目的位置，以及所述出发位置与所述目的位置之间的预定路线；

识别沿所述路线的一个或多个关键点；

将时间与每个关键点相关联；

获得针对每个关键点的短时预报；以及

转发所述短时预报以用于在与所述 GPS 相关联的用于向用户显示的显示器上、在所述出发位置与所述目的位置之间绘制的路线上显示。

19. 一种系统，包括服务器和经由通信网络连接到所述服务器上的远程设备，其中

所述服务器包括计算机和存储用于所述计算机的指令的非临时性计算机可读介质，从而当由所述计算机执行所述指令时，使所述服务器：

从所述远程设备接收包括出发位置和目的位置以及所述出发位置与所述目的位置之间的预定路线的信息；

识别沿所述路线的一个或多个关键点；

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将时间与每个关键点相关联；

获得针对每个关键点的短时预报；

转发所述短时预报到所述远程设备，以及

所述远程设备包括一个或多个处理器、显示器和包含用于所述一个或多个处理器的程序的非临时性介质，从而当由所述一个或多个处理器执行所述程序时，使所述远程设备：

从所述服务器获得所述短时预报；

至少基于从所述服务器获得的短时预报来确定所述出发位置与所述目的位置之间的第二路线；以及

使得在显示器上显示所述第二路线的至少一部分。

20. 一种非临时性计算机可读介质，存储包括权利要求 1-16 中任一项所述的步骤的指令。

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用于显示沿地图上的路线的短时预报的方法与系统

[0001] 相关申请的交叉引用

[0002] 本申请要求2013年4月4日提交的共同拥有和共同发明的美国专利申请No.13/856,923、2013年6月20日提交的美国专利申请No.13/922,800、2013年7月22日提交的美国专利申请No.13/947,331、2013年6月26日提交的美国临时专利申请No.61/839,675、2013年6月16日提交的美国临时专利申请No.61/835,626、和2013年6月19日提交的美国临时专利申请No.61/836,713的优先权，其全部内容通过引用被合并于此。

技术领域

[0003] 所公开的主题总的来说涉及一种用于确定气象预报的系统。

背景技术

[0004] 传统的气象预报系统提供距目前12小时到几天的气象预测。如果有人需要短期预报或时间尺度非常精细的预报，则对于一天来说通常可获得的最佳信息是按小时的预报。

[0005] 传统的气象预报是对生成预报的区域的平均预报。因此，对于该区域内的精确位置预报可能是不精确的，甚至对区域所显示的当前气象可能与该区域内的精确位置的实际气象是不同的。

[0006] 而且，传统的按时间尺度来显示的气象预报太粗略，不能允许用户知道什么时候在精确位置和时间发生气象事件。即使对于按小时的传统气象预报，用户也不能知道预报的气象事件是持续一个小时还是一分钟，以及对于是一分钟的情况，气象事件准确地发生在一个小时内的什么时候。

[0007] 市场上需要一种允许沿出发位置与目的位置之间的路线估计气象的方法，从而用户可以尝试采取替代路线来避免极端气象条件。

发明内容

[0008] 根据实施方式，提供了一种用于生成地图的计算机实现的方法，该方法包括接收包括出发位置和目的位置的地图请求。响应于接收到所述地图请求，该方法包括获得地图数据，当在显示设备上实现所述地图数据时使显示设备显示包括在所述出发位置与所述目的位置之间绘制的路线的地图。方法还包括获得针对沿着所述路线的一个或多个关键点的短时预报、修改所述地图数据（包括添加表示针对地图上绘制的路线上的每个关键点的短时预报中的一个短时预报的可视指示符）、和向计算设备输出修改后的地图数据以向用户显示。

[0009] 根据实施方式，该方法还包括将与每个关键点相关联的位置信息发送到短时预报器(nowcaster)，以获得短时预报。

[0010] 根据实施方式，该方法还包括对每个关键点发送需要短时预报的的时间。

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[0011] 根据实施方式，发送时间包括发送当前时间。

[0012] 根据实施方式，发送时间包括估计到达时间，该到达时间表示从当前位置开始的用户将到达给定关键点的时间。

[0013] 根据实施方式，估计到达时间基于以下至少一者：出发时间、气象条件、限速、当前速度、以及当前位置与关键点之间的距离。

[0014] 根据实施方式，该方法还包括接收更新的位置信息，所述更新的位置信息表示其上显示有地图的计算设备的当前位置，以及使用当前的位置作为新的出发位置来更新地图上的短时预报。

[0015] 根据实施方式，获得地图数据包括使用本地存储的信息生成地图数据。

[0016] 根据实施方式，获得地图数据包括将地图请求转发到远程服务器。

[0017] 在另一方面，提供了一种用于在 GPS 导航设备 (GPS) 上显示的地图上提供短时预报的方法，该方法包括从所述 GPS 接收位置信息，所述位置信息包括出发位置和目的位置，以及出发位置与目的位置之间的预定路线，识别沿所述路线的一个或多个关键点、将时间与每个点相关联、获得对每个关键点的短时预报、以及转发所述短时预报以用于在与所述 GPS 关联的用于向用户显示的显示器上、在出发位置与目的位置之间绘制的路线上显示。

[0018] 根据实施方式，该方法还包括将与每个关键点相关联的位置信息发送到短时预报器，以获得短时预报。

[0019] 根据实施方式，该方法还包括针对每个关键点发送需要短时预报的时间。

[0020] 根据实施方式，发送时间包括发送当前时间。

[0021] 根据实施方式，发送时间包括估计到达时间，该到达时间表示从当前位置开始的用户将到达给定关键点的时间。

[0022] 根据实施方式，估计到达时间基于以下至少一者：出发时间、气象条件、限速、当前速度、以及当前位置与关键点之间的距离。

[0023] 根据实施方式，该方法还包括接收更新的位置信息，所述更新的位置信息表示其上显示有地图的 GPS 的当前位置，以及使用该当前位置作为新的出发位置来更新地图上的短时预报。

[0024] 定义

[0025] 短时预报器是针对地球上非常小的区域 (5 米、10 米、50 米、100 米、500 米、1000 米等）准备非常短期（例如，1 分钟、5 分钟、15 分钟、30 分钟等）的预报的气象预报设备。

[0026] 气象有关的观测资料可以是图像、视频、自由格式的文本（推特 (tweet)、消息、电子邮件等等）、任何种类的气象值（诸如温度、气压、能见度、降水类型和强度、积聚、云量、风等等）。

[0027] 气象有关的事件例如可以为以下至少一者：冰雹、阵风、雷电、温度变化等等。

[0028] 点观测，如在此所定义的，为在给定时间在特定地点（有时也被称为“位置”）进行的观测。

[0029] 特定地点是在地球上进行观测的位置。对于在此所述的实施方式 5 米到 10 米的精度比较合适，但是地点的变化可以更大，诸如 20 米、50 米、100 米、1000 米或更大（即，精度较低）。用于获得特定地点的方式包括在提交本专利申请时可获得的任何类型的地理定位装置或定位系统。地理定位装置或定位系统可以是自动或非自动的。自动地理定位装置或

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定位系统包括全球定位系统、射频定位系统、无线电定位技术、互联网协议（IP）地址、MAC地址、WiFi、无线射频识别（RFID）等等。定位系统也可以为手动的，例如提供街道地址、街角、建筑物或地标等等。

[0030] 给定时间被定义为在对应于特定地点的时区中进行点观测的小时、分钟和秒。还可以根据协调世界时（UTC）或格林威治标准时间（GMT）来记录用于给定时间的小时、分钟和秒，从而使得给定时间独立于特定地点。给定时间的精度可以多于或少于一秒。例如，在一些实施方式中，对于在此所述的实施方式，5s、10s、30s、60s 或更大的精度可以是足够的。

[0031] 用户是气象预报所转发到的人或机器。

[0032] 观测者是提供自动和 / 或人工观测的实体。观测者可以为人或自动机器。观测者也可以为在此所定义的用户。

[0033] 网格图像是包括纬度和经度坐标的图像。因此，网格图像是二维的地理局部化的点 / 像素的集合。

[0034] 网格图像中的每个像素对应于地点，并且可以表示单个气象值、值的概率分布或可信度。

[0035] 如附图所示，根据下面对选择的实施方式的详细描述，本主题的特征和优点将会变得更加明显。如将会意识到的，公开和要求保护的主题能够在各个方面做出修改，只要所有这些不脱离权利要求的范围即可。因此，附图和说明书在本质上应被视为说明性的而非限制性的，以及在权利要求中阐明主题的全部范围。

附图说明

[0036] 结合附图，根据下面的详细描述，本公开的进一步的特征和优点将会变得明显，在所述附图中：

[0037] 图 1 是用于沿着地图上的路线显示短时预报的系统的框图；

[0038] 图 2 是用于实现实施方式的合适的短时预报器的框图；

[0039] 图 3a 到 3c 示出了通过地图生成模块返回的地图和方向的示例；

[0040] 图 4 示出了 GPS 导航设备的示例；

[0041] 图 5a 和 5b 示出了显示了路线以及针对沿着路线的多个关键点的多个短时预报的地图的示例；

[0042] 图 6 是其中实施方式可以实施的网络环境的示例；

[0043] 图 7 是其中实施方式可以实施的另一个网络环境的示例；

[0044] 图 8 是用于根据一种实施方式生成地图的计算机实现的方法的流程图；

[0045] 图 9 示出了其中本发明的实施方式可以实施的合适的计算操作环境的示例图。

[0046] 要注意的是，在附图中，相似的特征由相似的参考标记来标识。

具体实施方式

[0047] 现在将参考附图在下面更充分地描述实施方式，所述附图构成实施方式的一部分并通过说明的方式显示了可用来实现实施方式的特定实施方式。描述实施方式还为了使得本公开可以向本领域的技术人员表达本发明的范围。然而，实施方式可以以不同的形式实现，而不应该解释为限于在此提出的实施方式。

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[0048] 此外，这些实施方式可以被实施为方法或设备。因此，实施方式可以采用整体硬件实施方式、整体软件实施方式、软件与硬件方面结合的实施方式等的形式。而且，虽然参考便携式或手持式设备描述了实施方式，但是也可以在台式机、笔记本电脑、平板电脑或有足够的计算资源来实现实施方式的任何计算设备上实现实施方式。

[0049] 简而言之，这些实施方式描述了用于沿地图上的路线显示短时预报的系统和方法。系统从用户接收包括出发位置和目的位置的地图请求，并获得包括目的位置与出发位置之间的路线的地图数据。使用短时预报器来输出针对沿着路线的多个关键点的短时预报。系统修改地图数据以包括用于与每个关键点相关联的短时预报的可视指示符，从而使得当在显示器上执行修改后的地图数据时，沿着出发位置和目的位置之间的路线显示短时预报。

[0050] 图 1 是用于沿着地图上的路线显示短时预报的系统 300 的框图。如图 1 所示，系统 300 包括短时预报器 200（又称为用于生成短时预报的系统）、地图生成模块 310、和用于在地图生成模块 310 和短时预报器 200 之间进行通信以输出地图的智能模块 312，所述地图针对沿着路线的多个关键点显示短时预报。

[0051] 短时预报器

[0052] 图 2 是适当的短时预报器 200 的框图，诸如 2013 年 4 月 4 日提交的共同拥有和共同发明的美国专利申请 No. 13/856923 中所述的短时预报器。

[0053] 如图 2 所示，短时预报器 200 从不同的源 201 接收气象观测，所述源诸如气象观测源和气象预报源，所述气象观测源包括但不限于：点观测 201-2（例如，由用户和自动站提供的反馈）、气象雷达 201-3、卫星 201-4 和其他类型的气象观测 201-1，所述气象预报源诸如数值气象预测 (NWP) 模型输出 201-5 和气象预报和公告 201-6。

[0054] 在实施方式中，短时预报器 200 包括 P 类型 (PType) 分布预报器 202 和 P 速率 (PRate) 分布预报器 204。P 类型预报器 202 针对给定的经纬度（和 / 或位置）从不同的源 201 接收气象观测并输出一段时间间隔上的降水类型的概率分布。在一个非限制性的示例中，概率分布可以为：

[0055] 1) 降雪：10％

[0056] 2) 降雨：30％

[0057] 3) 冻雨：60％

[0058] 4) 冰雹：0％

[0059] 5) 冰粒：0％

[0060] 对于本领域的普通技术人员显而易见的是，可以有和上面提供的示例不同的各种其他类型和许多种类。

[0061] 类似地，P 速率预报器 204 从不同的源接收对于给定经纬度的气象观测，并以表达不确定性的表示来输出降水速率 (PRate) 的概率分布预报。例如，P 速率可以被输出为对于给定的经纬度的一段时间间隔上的降水速率的概率分布或降水速率的范围。在一个非限制性的示例中，P 速率可以为：

[0062] 1) 无降水：30％

[0063] 2) 轻度降水：40％

[0064] 3) 中度降水：20％

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[0065] 4) 重度降水 :10%

[0066] 对于本领域的普通技术人员显而易见的是,可以有和上面提供的示例不同的各种其他类型和许多种类。

[0067] P 速率预报器 204 和 P 类型预报器 202 输出的 P 速率和 P 类型值被发送到预报组合器 206,以将这些值组合成单个值 P 类型速率 (PTypeRate),该 P 类型速率表示降水结果。例如,如果 P 类型的值为“降雪”,“P 速率”的值为重度,则 P 类型速率的合并值可以为“重度降雪”。

[0068] 对于给定的经纬度,系统输出针对时间间隔的预报的 P 类型速率,所述预定时间间隔为固定的 (例如 :1 分钟) 或可变的 (例如 :1 分钟、然后 5 分钟、然后 10 分钟等)。系统可以按照时间间隔序列预计算或存储预报的 P 类型速率分布,或在运行过程中 (on the fly) 计算预报的 P 类型速率分布。P 类型速率分布针对每个时间间隔表示 P 类型速率会发生的确定性或不确定性。

[0069] 参考图 2,预报组合器 206 从 P 类型预报器 202 接收最终的 P 速率分布,并且从 P 速率预报器 204 接收最终的 P 速率分布,并将它们组合成一组 P 类型速率分布值,每个所述 P 类型速率分布值表示以特定速率接收特定类型的降水的概率。下面提供了一个示例。

[0070] 假设 P 类型分布如下 :降雪 :50%,降雨 :0%,冻雨 :30%,冰雹 :0%,冰粒 :20%,以及 P 速率分布如下 :无降水 :30%,轻度降水 :10%,中度降水 :20%,重度降水 :30%,严重降水 40%,P 类型速率分布可以如下 :

[0071] 表 1 :P 类型速率分布表的示例

[0072]

P类型 / P速率	降雪 50%	降雨 0%	冻雨 30%	冰雹 0%	冰粒 20%
无降水 0%	无降水	无降水	无降水	无降水	无降水
轻度降水 10%	5%轻度降雪	无降水	3% 轻度冻雨	无降水	2%轻度冰粒
中度降水 20%	10% 中度降雪	无降水	6% 中度冻雨	无降水	4% 中度冰粒
重度降水 30%	15% 重度降雪	无降水	9% 重度冻雨	无降水	6% 重度冰粒
严重降水 40%	20% 严重降雪	无降水	12% 严重冻雨	无降水	8% 严重冰粒

[0073] 因此,预报组合器 206 将每种类型降水的概率与每个降水速率的概率相乘来获得以特定速率接收特定类型的降水的概率,例如 20% 几率的重度降雪,或 12% 几率的严重冻

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雨。在一个实施方式中，能够将概率范围与文本信息关联起来，以用于代替数字式的概率而向用户显示文本信息。例如，5％与 15％之间的概率可以与文本“小几率”关联，而 40％与 70％之间的概率可以与文本“大几率”或“很可能”相关联等等，由此，代替显示 60％几率的重度降雪，可以显示：“大几率重度降雪”。

[0074] 在另一个实施方式中，能够沿着一个或多个维度（所述维度包括：速度、类型或概率）将两个或多个不同的 P 类型速率组合起来。例如，所述组合的结果可以包括：可能有轻到中度降雨，可能有轻到中度降雨或重度降雪；可能有中度降雨或降雪；可能有降雨或降雪；偶有轻到中度降雨或重度降雪或轻雹；偶有中度降雨、降雪或冰雹；偶有降雨、降雪或冰雹等等。

[0075] 因此，短时预报器 200 接收需要短时预报的位置和需要短时预报的时间和 / 或时间间隔，并输出针对给定位置和针对特定时间的 P 类型速率分布。

[0076] 还可以有短时预报器 200 的另一个实施方式。在该实施方式中，短时预报器包括 P 类型选择器 / 接收器和 P 速率分布预报器。和图 2 中所示的实施方式类似，P 速率分布预报器从不同的源接收针对给定经纬度的气象观测并以表达不确定性的表示来输出降水速率（P 速率）的概率分布预测。例如，可以将 P 速率作为针对给定经纬度的在时间间隔上的降水速率或速率的范围的概率分布输出。在一个非限制性的示例中，P 速率可以包括：

[0077] 1）无降水：30％

[0078] 2）轻度降水：40％

[0079] 3）中度降水：20％

[0080] 4）重度降水：10％

[0081] 对于本领域的普通技术人员显而易见的是，可以有和上面提供的示例不同的各种其他类型和许多种类。

[0082] 然而，P 类型选择器 / 接收器不输出与不同类型的降水相关的概率分布。取而代之的是，P 类型选择器 / 接收器从不同的源接收针对给定经纬度的气象观测，以从不同降水类型的列表中选择一个降水类型。例如，基于从源接收的输入，P 类型选择器 / 接收器从以下降水类型的列表中选择最可能在给定经纬度（和 / 或位置）发生的单个降水类型：

[0083] 1）降雪

[0084] 2）降雨

[0085] 3）冻雨

[0086] 4）冰雹

[0087] 5）冰粒

[0088] 6）混合（例如，a+c、a+d、b+c、a+e、c+e、d+e 等等）

[0089] 从例如上面列表的降水类型的列表中，对于给定的位置仅选择一个降水类型。例如，可以将降雪和冻雨的混合选择作为对给定位置在给定时间最可能的降水类型。降水类型与概率值不相关。实际上，由于针对任意给定位置和时间仅选择一个与位置相对应的降水类型，所以选择的降水类型将具有 100％的有效概率值。

[0090] 可用于选择一个类型的降水类型的列表可以包括表示两个不同降水类型的混合（例如，降雪和冻雨、冰雹和冰粒等等）的混合类型。混合类型被认为是可用于选择的独特降水类型，如上面列表中（f）所示，并可以有许多不同的混合类型，表示不同对的各种降水

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类型的混合。

[0091] 在另一个实施方式中，降水类型不由 P 类型选择器 / 接收器选择而是从短时预报器外部的源中接收。换句话说，短时预报器 200 可以向远程源（例如，第三方气象服务）请求识别针对给定位置在给定时间最可能发生的降水类型，并从识别最可能的降水类型的源接收响应。在这种情况下，对降水类型的选择不由短时预报器执行。仅向短时预报器输入已经选择的降水类型，从而可以节省短时预报器的计算功率，否则就需要该计算功率来执行选择。

[0092] 将分别由 P 类型选择器 / 接收器和 P 速率分布预报器输出的选择的降水类型和 P 速率值组合起来。例如，如果选择的降水类型为降雪，以及 P 速率值如上所述，则组合的信息将指示：

[0093] 1) 无雪 :30％

[0094] 2) 轻度降雪 :40％

[0095] 3) 中度降雪 :20％

[0096] 4) 重度降雪 :10％

[0097] 因为只涉及一个降水类型，所以只需要极少量的计算功率来执行组合，以输出最终的气象预报数据。因为 P 类型选择器 / 接收器会输出一个（1 个）针对给定位置和时间的降水类型，如果 P 速率分布预报器输出 m 个概率分布，则最终的气象预报数据将仅包括 m 个（m*1 个）气象预报分布。

[0098] 在输出最终的气象预报数据时，能够将概率范围与文本信息关联起来，以用于代替数字式的概率向用户显示文本信息，和图 2 中所示的实施方式类似。例如，5％与 15％之间的概率可以与文本“小几率”关联，而 40％与 70％之间的概率可以与文本“大几率”或“很可能”相关联等等，由此，代替显示“60％几率的重度降雪”，可以显示 :“大几率重度降雪”。对于本领域的普通技术人员来说明显的是，可以有和这里提供的示例不同的许多其他变化。

[0099] 因此，短时预报器接收需要短时预报的位置和需要短时预报的时间和 / 或时间间隔，并输出针对给定位置和针对特定时间的选择的 P 类型和 P 速率分布。

[0100] 根据短时预报器的该另一个实施方式的短时预报器在需要效率的某些情况下相对于图 2 中所示的实施方式可能是有利的。可以使用比图 2 的实施方式小得多的处理功率来执行该另一个实施方式。然而，图 2 的实施方式在提供针对任意给定位置和时间的气象预报数据的更详细和精确的简介 (snapshot) 方面可能比上述该另一个实施方式更合适。

[0101] 地图生成模块

[0102] 地图生成模块 310 可以为用于生成路线和方向的基于网络的模块和 / 或基于 GPS 的模块。

[0103] 所述基于网络的模块的示例可以包括地图查询 (MapquestTM)、雅虎地图 (YahooTM Maps)、谷歌地图 (GoogleTM Maps) 等等。在这种类型的模块中，与生成或路线和 / 或地图相关的数据存储在远程服务器 250 上，可以经由电信网络 254（例如互联网）访问该远程服务器 250。使用这些模块，用户可以请求查看地图中的某个位置，例如城市、镇、乡村、街道等，和 / 或可以请求从第一位置 A 到第二位置 B 的方向，从而模块可以返回如图 3a 所示的从 A 到 B 的位移的方向的列表和 / 或返回如图 3b 所示的地图上绘制的路线。在一个实施方式

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中，地图生成模块 310 可以提供一个或多个供用户从中选择的路线选项，如图 3c 中所例示。

[0104] 在另一个实施方式中，可以从服务器 250 下载和 / 或推送数据到计算设备中，在所述计算设备上实现实施方式，从而可以在不访问远程服务器 250 的情况下显示线路和 / 或地图。

[0105] 在一个实施方式中，地图生成模块 310 还可以包括 GPS 导航设备 330，该 GPS 导航设备 330 使用与卫星 332 的连接来确定用户的当前位置。GPS 单元可以嵌入在便携式设备中，诸如 IPhone TM 等。在另一个示例中，GPS 导航设备 330 可以嵌入在手持 GPS 导航设备中，诸如通过 GarminTM 或 MagellanTM 等制造的一系列设备。图 4 中示出了 GPS 导航设备 330 的一个示例。

[0106] 智能模块

[0107] 在一个实施方式中，智能模块 312 可以链接到用于接收用户输入的用户界面上，所述用户输入诸如位置 A 和 B 的识别、出发时间和关于需要短时预报的位置的用户偏好。

[0108] 智能模块 312 将对位置 A 和 B 的识别传输到地图生成模块 310，以及智能模块 312 转而再接收地图，在所述地图上如图 3b 所示例的绘制了 A 与 B 之间的路线。

[0109] 基于用户的偏好，智能模块 312 可以识别 / 接收沿着路线的关键点。例如，用户可以选择查看对沿着路线的主要城市或者每隔例如 30 公里的增量等的短时预报。智能模块 312 将与每个关键点相关的位置信息和时间或时间间隔一起发送到短时预报器 200。作为响应，智能模块 312 从短时预报器 200 接收短时预报，并在从地图生成模块 310 接收到的地图上添加这些短时预报中的部分或所有（取决于显示器的分辨率和尺寸以及缩放级别），如图 5a 中所例示的。

[0110] 在一个实施方式中，智能模块 312 可以将每个关键点的位置信息与当前时间一起发送，由此用户可以看到沿着路线的不同位置处的当前气象条件。

[0111] 在另一个实施方式中，智能模块 312 可以针对每个关键点估计到达时间，所述到达时间表示用户预计到达给定关键点的估计时间。对到达时间的估计可以取决于多个因素，包括：出发时间（该出发时间除非由用户指定，否则取为当前时间）、出发点与各个关键点之间的距离、从地图生成模块 310（或其他源）接收的交通信息、气象信息、当前速度、以及与当前位置与各个关键点之间的每段路线相关的限速。

[0112] 如上所示，地图生成模块 310 可以提供不同的路线选择，由此用户可以沿着不同的关键点查看气象条件并选择一条路线来导航。

[0113] 在一个实施方式中，如果用户使用 GPS 和 / 或能用网络的计算设备查看地图，则可以基于用户在路线上的前进和气象条件的变化在地图上更新短时预报。

[0114] 在一个实施方式中，可以在地图上一起提供短时预报和与每个短时预报相关的时间 / 时间间隔，如图 5b 所例示。在一个实施方式中，地图上所示的时间是估计的到达时间，由智能模块 312 基于当前位置、速度、以及气象和交通条件来估计所述到达时间。

[0115] 图 6 是其中可以实现实施方式的网络环境的示例。短时预报器 200 可以在多个客户端计算机 252 通过电信网络 254 可访问的服务器 250 上实施。客户端计算机 252 可以包括但不限于：笔记本电脑、台式计算机、便携式计算设备、平板电脑等。使用客户端计算机 252，每个用户可以输入两个位置之间的方向和优选输入出发时间（否则使用当前时间作为出发时间）。将信息通过电信网络 254 发送到远程服务器 250。服务器 250 将方向的列

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表与包括从位置 A 到 B 的路线以及在路线上某些关键点处的短时预报的地图一起返回。如参考图 2 所述的，服务器通过电信网络 254 访问气象源 201。服务器 250 上可以存储有地图数据，并还可以访问由第三方提供的地图源 320。

[0116] 优选地，客户端计算机 252 能够启用 GPS。在这种情况下，计算设备可以提供对服务器 250 的更新，以用于更新如上所述的沿着路线的短时预报。

[0117] 图 7 是另一个网络环境的示例，在该网络环境中可以实现用于提供短时预报的方法的实施方式。在该实施方式中，用户在 GPS 导航设备上输入目的地并查看地图。GPS 导航设备将出发位置作为当前位置。当前位置和最终目的地以及由卫星 332 选择的预定路线可以经由卫星 332 被发送到服务器 250。服务器 250 中实施的智能模块 312 可以返回针对沿着路线的关键点的短时预报，并将短时预报和对关键点的识别发送给 GPS 导航设备 330，以用于添加到在 GPS 导航设备 330 的显示器上显示的地图上。

[0118] 图 8 示出了用于生成地图的计算机实现的方法 800。该方法包括接收地图请求 810，所述地图请求包括出发位置和目的位置。响应于接收地图请求 810，计算机实现的方法 800 包括获得地图数据 820，当在显示器设备上实现所述地图数据时，使得显示器设备显示地图显示 830，所述地图显示 830 包括在出发位置与所述目的位置之间绘制的路线。计算机实现的方法 800 还执行获得针对沿着路线的一个或多个关键点的短时预报 840，并为了表示 850 对地图上绘制的路线上的每个关键点的短时预报中的一个短时预报来修改地图数据 820（包括添加可视指示符）。计算机实现的方法 800 最终输出修改的地图数据以用于显示 860 给用户。

[0119] 硬件和操作环境

[0120] 图 9 示出了合适的计算操作环境的示例图，在所述计算操作环境中可以实现本发明的实施方式。下面的描述与图 9 有关，并旨在提供对合适的计算机硬件和合适的计算环境的简要概述，结合该简要概述可以实现实施方式。不必须使用所有的组件来实现实施方式，在不脱离实施方式的实质和范围的情况下可以对组件的布置和类型做出改变。

[0121] 虽然不是必须的，但是以计算机可执行指令（诸如程序模块）的一般情况描述了实施方式，所述计算机可执行指令被计算机执行，诸如个人计算机、手持式或掌上型计算机、智能手机、或者嵌入式系统，例如消费电子设备或专业工业控制器中的计算机。一般而言，程序模块包括执行特定任务或实现特定抽象数据类型的例程、程序、对象、组件、数据结构等等。

[0122] 而且，本领域的技术人员将会理解，可以用其他计算机系统配置来实现实施方式，所述其他计算机系统配置包括手持式设备、多处理器系统、基于微处理器或可编程的消费电子产品、网络 PCS、小型计算机、大型计算机、蜂窝电话、智能电话、显示寻呼机、射频 (RF) 设备、红外 (IR) 设备、个人数字助理 (PDA)、膝上型计算机、可穿戴计算机、平板电脑、由苹果电脑公司生产的 IPOD 或 IPAD 系列设备中的设备、将一个或多个前述设备组合起来的集成设备、或者能够执行这里所述的方法和系统的任何其他计算设备。还可以在其中任务由通过通信网络链接的远程处理设备执行的分布式计算环境中实现实施方式。在分布式计算环境中，程序模块可以位于本地和远程存储器存储设备两者之中。

[0123] 图 9 的示例性硬件和操作环境包括计算机 720 形式的通用计算设备，所述计算机 720 包括处理单元 721、系统存储器 722、和可操作地将各种系统组件（包括系统存储器）耦

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接到处理单元 721 的系统总线 723。可以只有一个处理单元 721，或者可以有多于一个处理单元 721，从而计算机 720 的处理器可以包括单个中央处理单元 (CPU) 或者多个处理单元（通常称为并行处理环境）。计算机 720 可以是常规计算机、分布式计算机、或者任何其它类型的计算机；该实施方式并不做限制。

[0124] 系统总线 723 可以为多种类型的总线结构中的任何类型的总线结构，所述总线结构包括存储器总线或存储器控制器、外围总线、以及使用各种总线体系结构中的任意总线体系结构的局部总线。系统存储器还可以被简称为存储器，并且包括只读存储器 (ROM) 724 和随机存取存储器 (RAM) 725。基本输入 / 输出系统 (BIOS) 726 存储在 ROM724 中，所述基本输入 / 输出系统 726 包含（例如在启动期间）帮助在计算机 720 内的元件之间传输信息的基本例程。在本发明的一个实施方式中，计算机 720 还包括用于读取和写入硬盘（未示出）的硬盘驱动器 727、用于读取和写入可移动磁盘 729 的磁盘驱动器 728、和用于读取和写入可移动光盘 731（诸如 CD ROM 或其他光介质）的光盘驱动器 730。在本发明的可替换的实施方式中，使用易失性或非易失性 RAM 来模仿由硬盘驱动器 727、磁盘 729 和光盘驱动器 730 所提供的功能，以便节省功率并减小系统的尺寸。在这些可替换的实施方式中，RAM 可以固定在计算机系统中，或者 RAM 可以是移动 RAM 设备，诸如紧凑型闪存卡。

[0125] 在本发明的实施方式中，硬盘驱动器 727、磁盘驱动器 728 和光盘驱动器 730 分别通过硬盘驱动器接口 732、磁盘驱动器接口 733 和光盘驱动器接口 734 连接到系统总线 723。驱动器及其关联的计算机可读介质提供对计算机可读指令、数据结构、程序模块和用于计算机 720 的其他数据的非易失性存储。本领域的技术人员应该理解，可以存储可由计算机访问的数据的任意类型的计算机可读介质可以用于示例性的操作环境中，所述计算机可读介质诸如磁带、闪存卡、数字影盘、伯努利盒式磁带、随机存取存储器 (RAM)、只读存储器 (ROM) 等等。

[0126] 多个程序模块可以存储在硬盘、磁盘 729、光盘 731、ROM 724、或 RAM 725 中，所述程序模块包括操作系统 735、一个或多个应用程序 736、其他程序模块 737 和程序数据 738。用户可以通过输入设备（诸如键盘 740 和定位设备 742）向个人电脑 720 输入命令和信息。其他输入设备（未示出）可以包括麦克风、操纵杆、游戏垫、圆盘式卫星天线、扫描仪、触摸感应垫等等。这些和其他输入设备通常通过耦接到系统总线的串行端口接口 746 连接到处理单元 721，但也可以通过其他接口（诸如并行端口、游戏端口或通用串行总线 (USB)）连接。另外，可以通过麦克风提供到系统的输入以用于接收音频输入。

[0127] 监视器 747 或其他类型的显示器设备也经由诸如视频适配器 748 的接口连接到系统总线 723。在本发明的一个实施方式中，监视器包括液晶显示器 (LCD)。除了监视器，计算机通常包括其他外围输出设备（未示出），诸如扬声器和打印机。监视器可以包括允许用户通过按压或触摸表面与计算机接口的触摸敏感表面。

[0128] 计算机 720 可以使用与一个或多个诸如远程计算机 749 的远程计算机的逻辑连接在网络环境中操作。通过耦接到计算机 720 或者是计算机 720 一部分的通信设备实现这些逻辑连接；实施方式不限于特定类型的通信设备。远程计算机 749 可以是其他计算机、服务器、路由器、网络 PC、客户端、对等设备或其他公共网络节点，并且通常包括许多或所有上面关于计算机 720 所述的元件，虽然图 6 中仅示出了存储器存储设备 750。图 6 中示出的逻辑连接包括局域网 (LAN) 751 和广域网 (WAN) 752。这样的联网环境常见于办公室、企业范围计

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算机网络、内联网和因特网。

[0129] 当用于 LAN 联网环境中时，计算机 720 通过作为一种通信设备的网络接口或适配器 753 连接到本地网络 751。当用于 WAN 联网环境中时，计算机 720 通常包括作为一种通信设备的调制解调器 754，或任何其他类型的用于通过广域网 752（诸如，因特网）建立通信的通信设备。可以是内部或外部的调制解调器 754 经由串行端口接口 746 连接到系统总线 723。在网络环境中，关于个人计算机 720 描述的或者是个人计算机 720 的一部分的程序模块可以存储在远程存储器存储设备中。可以理解，所示的网络连接是示例性的，可使用用于在计算机之间建立通信链接的其他方式和通信设备。

[0130] 描述了可用于实现本发明的实施方式的硬件和操作环境。可以被结合来实现本发明的实施方式的计算机可以为常规计算机、手持或掌上型计算机、嵌入式系统中的计算机、分布式计算机、或任何其他类型的计算机；对此本发明不作限制。所述计算机通常包括一个或多个处理单元作为其处理器，还包括诸如存储器的计算机可读介质。计算机还可以包括诸如网络适配器或调制解调器的通信设备，从而其能够通信耦接到其他计算机。

[0131] 虽然上面描述并在附图中示出了优选的实施方式，但是对本领域的技术人员来说明显的是，在不脱离本公开的情况下可以做出修改。所述修改被认为是包括在本公开的范围内的可能的变换方式。

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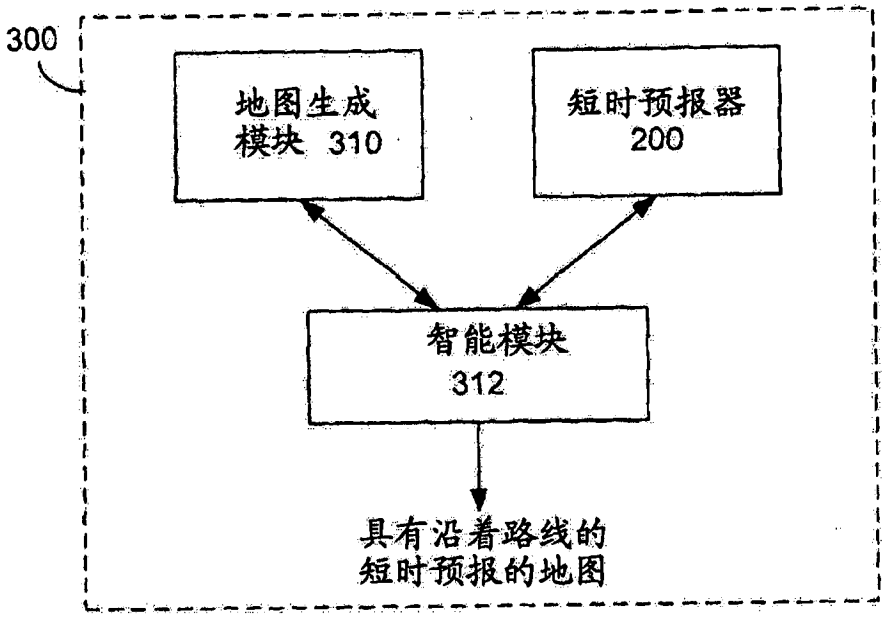


图 1

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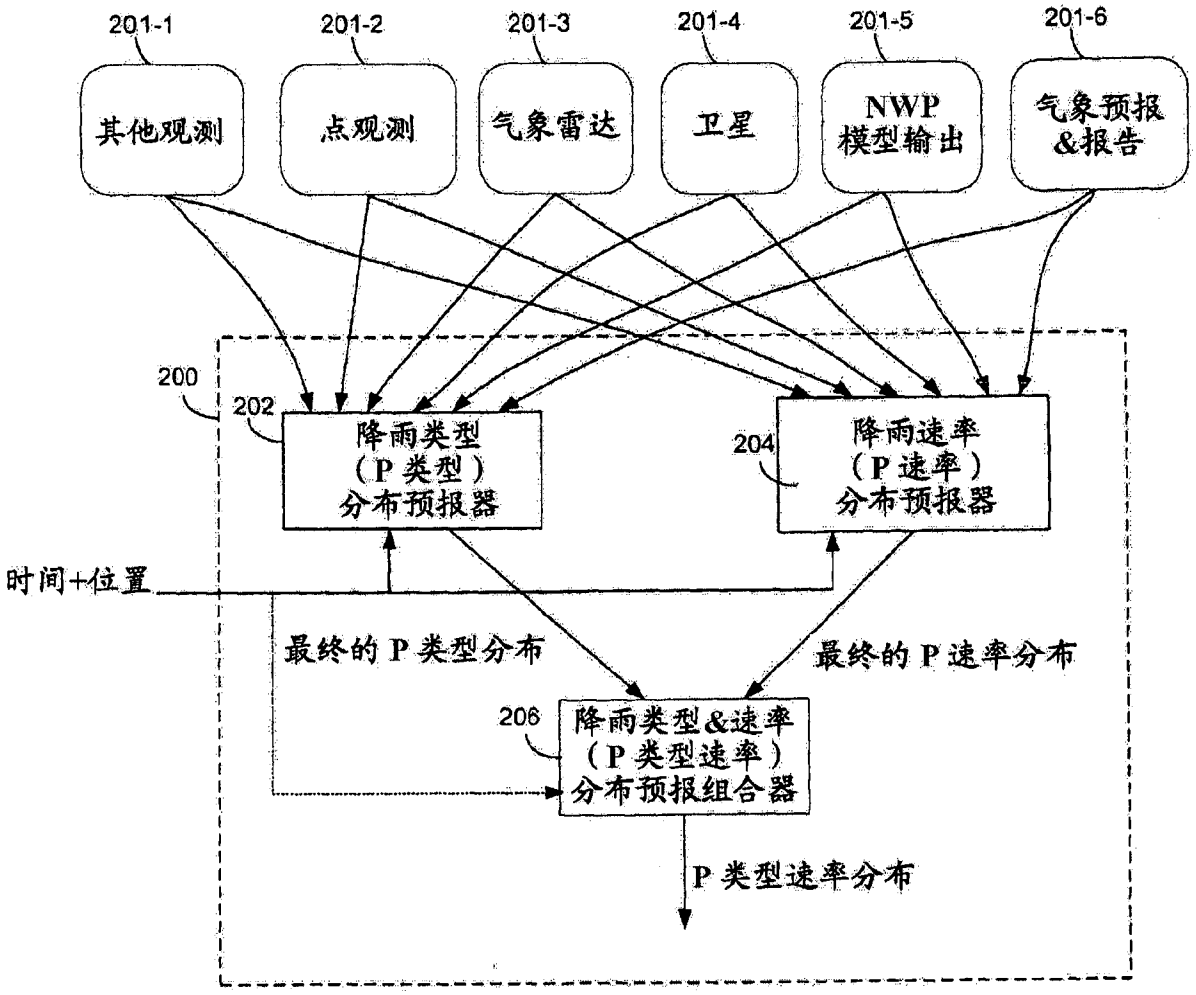


图 2

打印ID7561489 Pg 18



图 3a

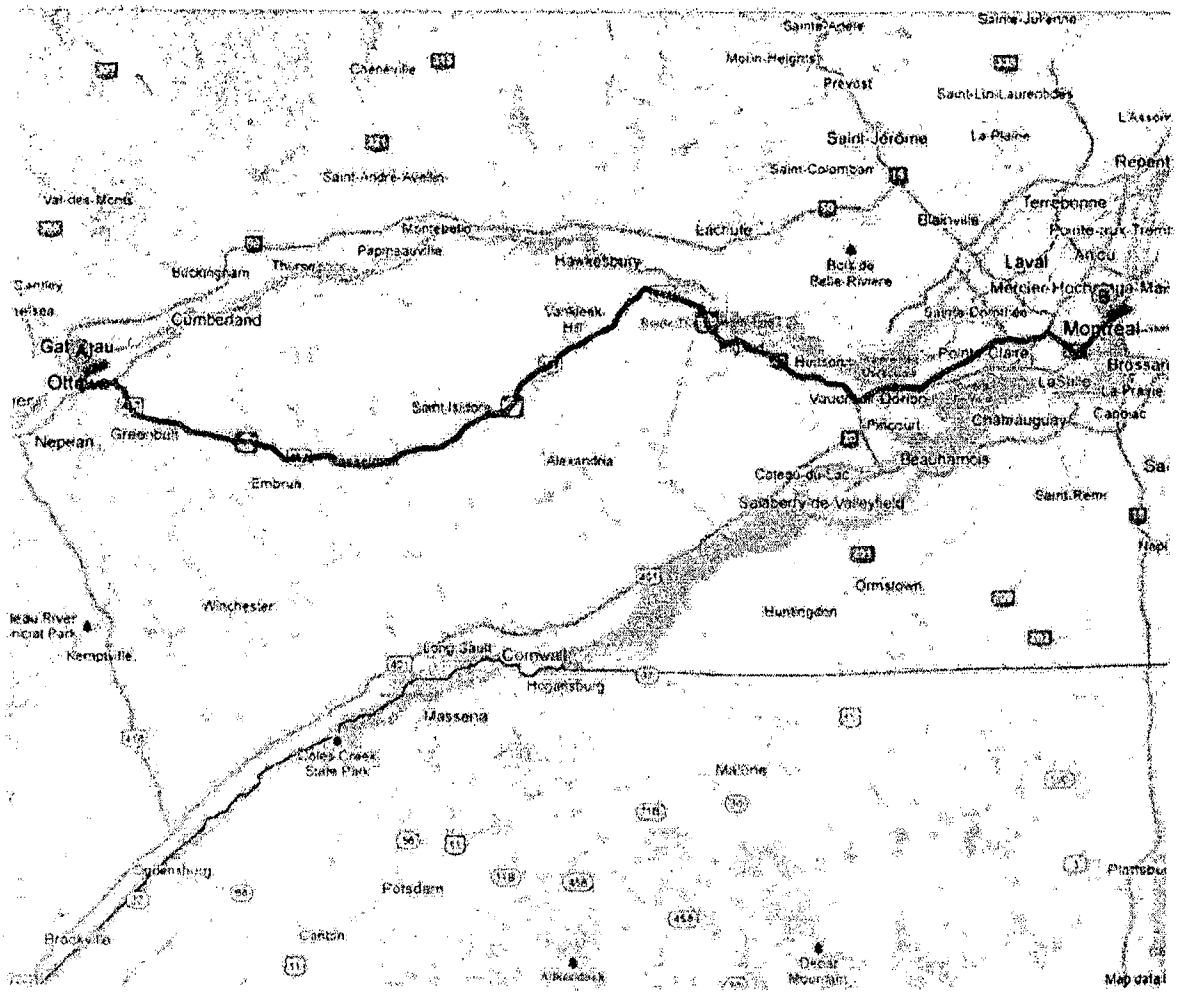


图 3b

建议的路线

Trans-Canada Hwy	**200 km, 2 hours 2 mins**
	• 当前交通：2 小时 2 分钟
County Rd 17 and Trans-Canada Hwy	193 km, 2 hours 12 mins
	• 无交通信息
Autoroute 50 E	210 km, 2 hours 14 mins
	• 无交通信息

图 3c

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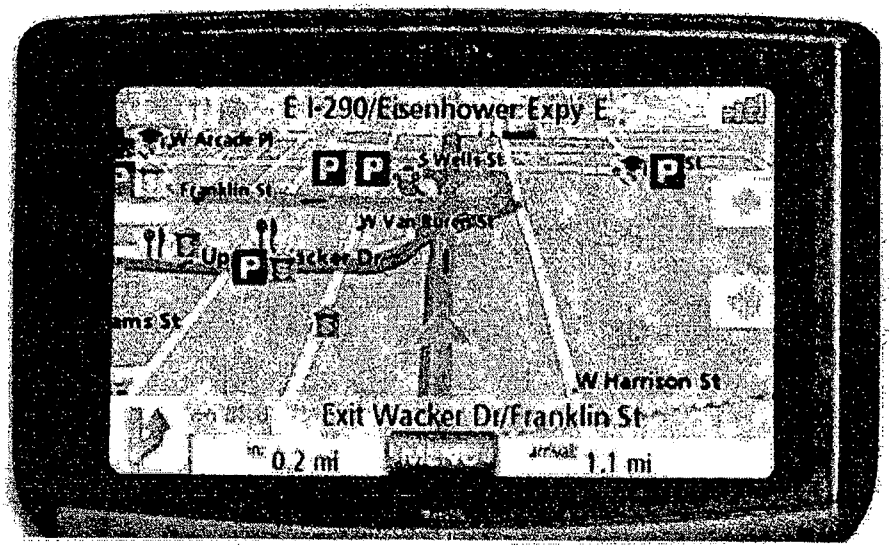


图 4

打印ID?561489 Pg 21

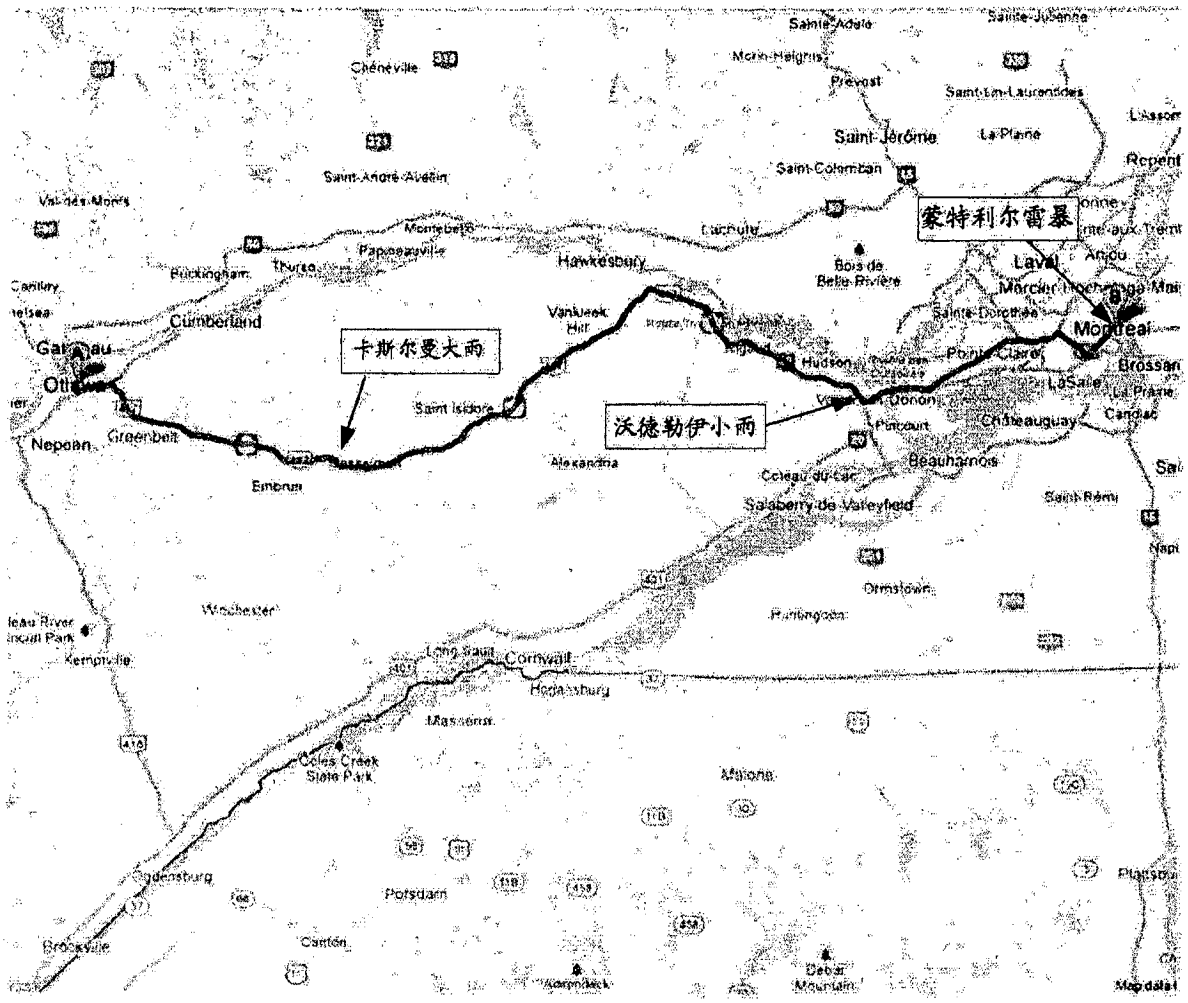


图 5a

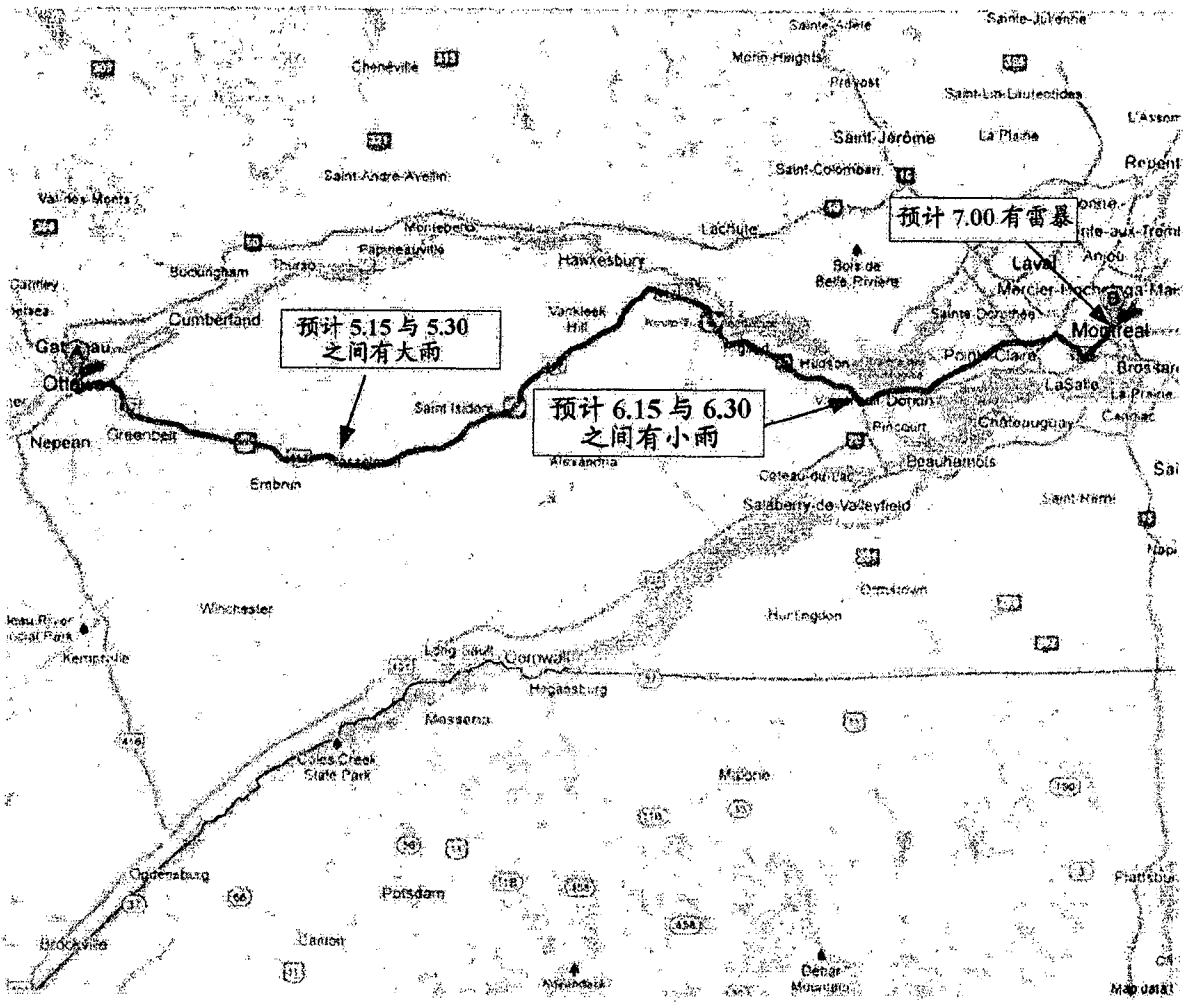

预计 7.00 有雷暴
预计 5.15 与 5.30 之间有大雨
预计 6.15 与 6.30 之间有小雨
Ottawa
Montreal
Gatineau
Cumberland
Hawkesbury
Lachute
Saint-Jérôme
Laval
Nepean
Greenbelt
Embrun
Alexandria
Salaberry-de-Valleyfield
Beauharnois
Winchester
Cornwall
Massena
Potsdam
Malone
Brockville
Gananoque
Kemptville
Hudson
Pincourt
Châteauguay
LaSalle
Saint-Hubert
Huntingdon
Coteau-du-Lac
Vankleek Hill
Saint-Isidore
Prévost
Mont-Tremblant
Saint-André-Avellin
Papineauville
Thurso
Buckingham
Montebello
Bois de Belle Rivière
Sainte-Dorothée
Pointe-Claire
Dorion
Saint-Nazaire
Sainte-Julienne
Saint-Colomban
La Plaine
Repentigny
Anjou
Mercier-Hochelaga-Maisonneuve
Brossard
Candiac
Saint-Remi
Ogdensburg
Coles Creek State Park
Hogansburg
Long Sault
Mooers
Dannemora
Plattsburgh
Massena

图 5b

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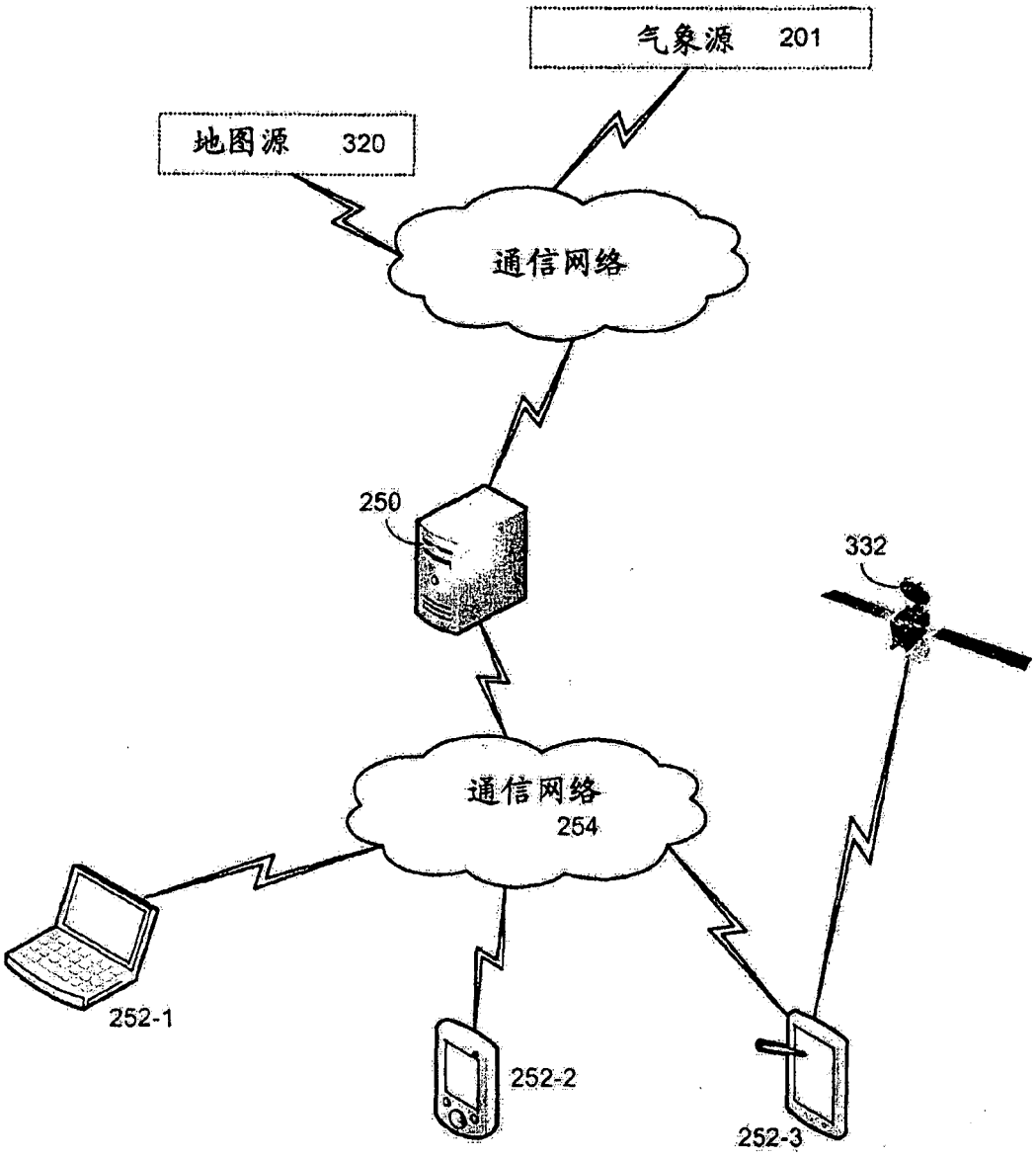


图 6

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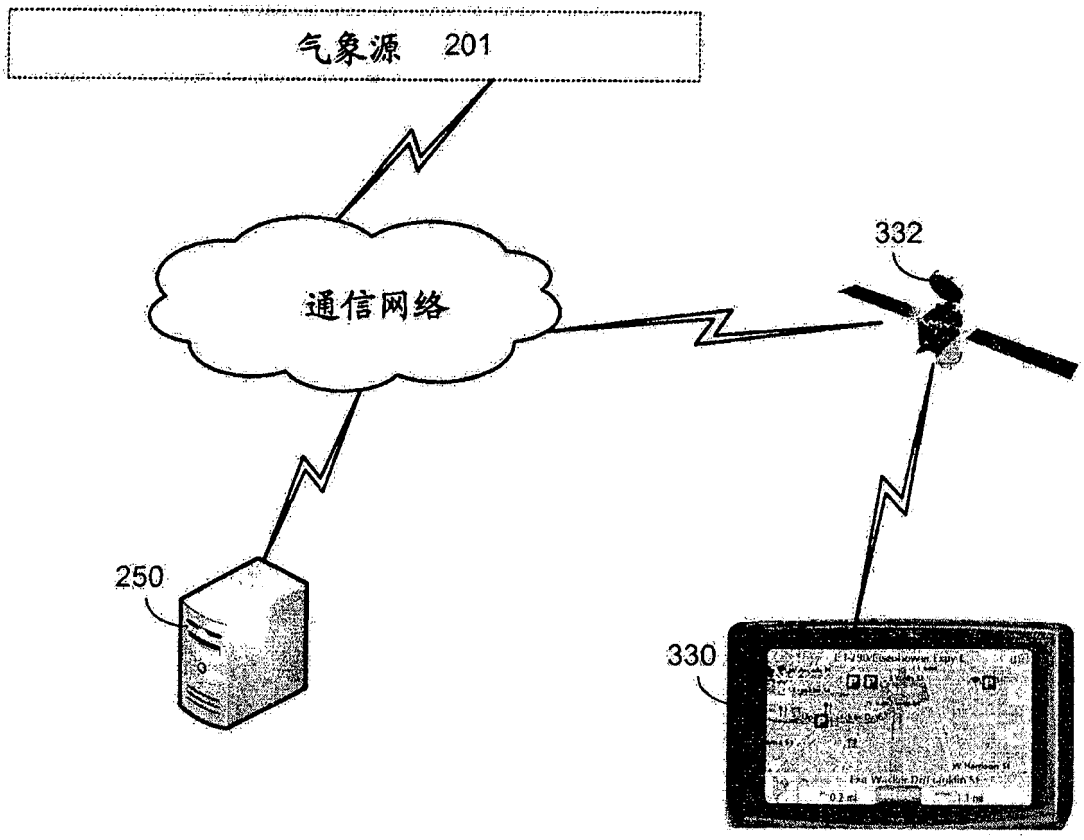


图 7

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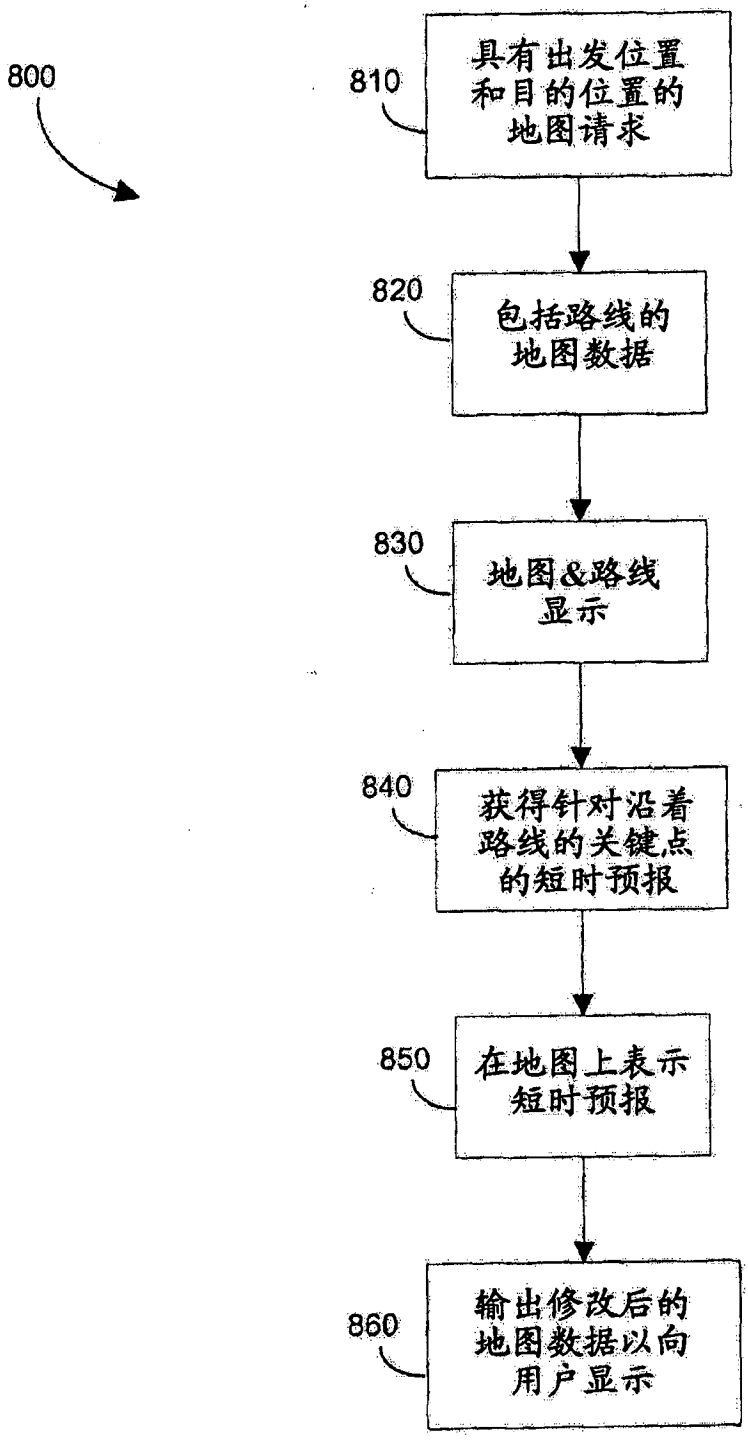


图 8

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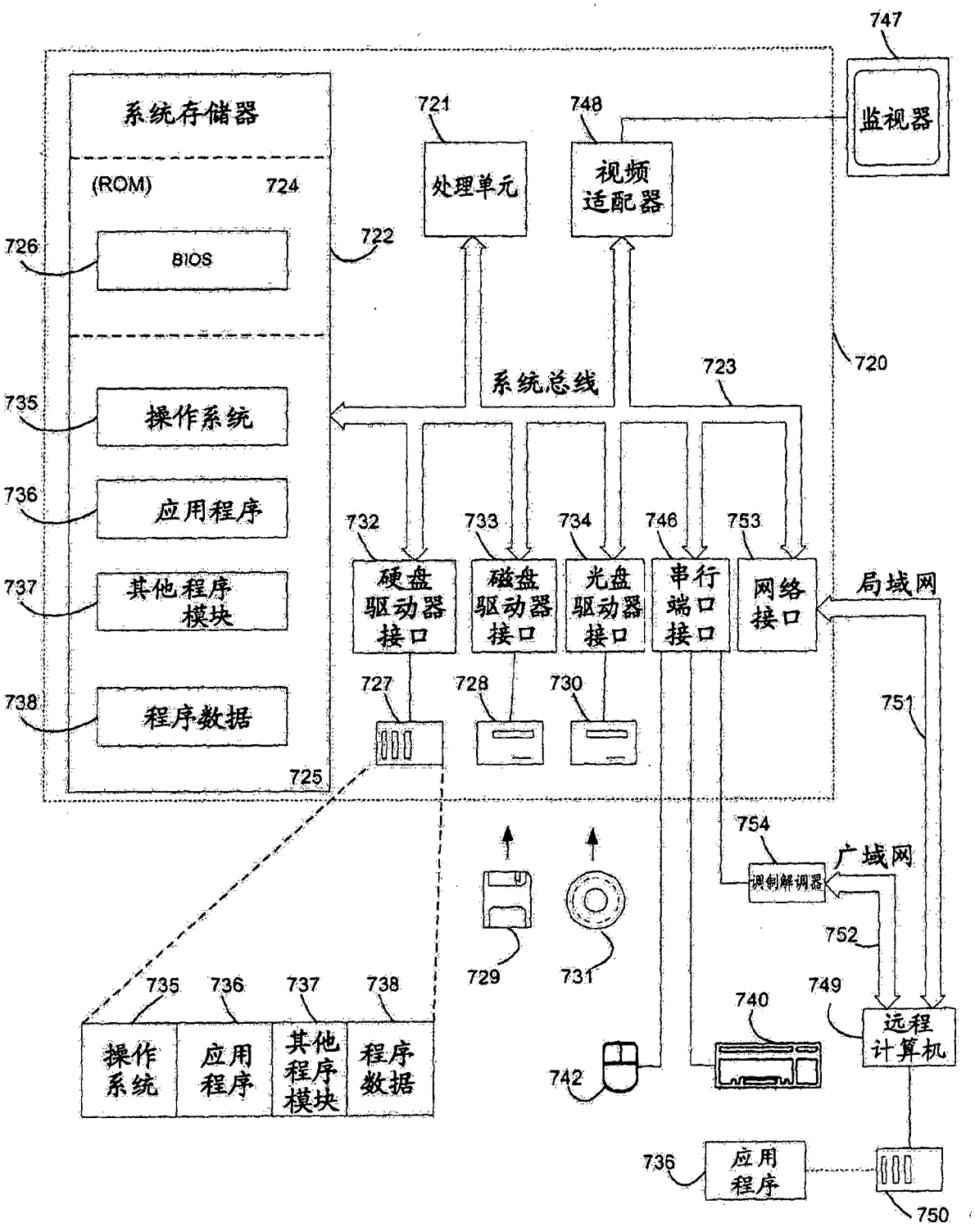


图 9