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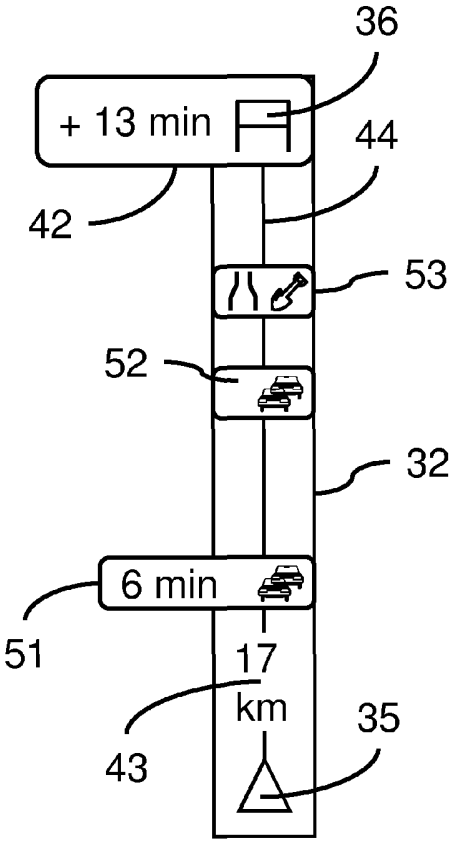
(54) Title: METHOD OF INDICATING TRAFFIC DELAYS, COMPUTER PROGRAM AND NAVIGATION SYSTEM THEREFOR



(57) Abstract: A method of indicating traffic delays in a navigation system for planning a route of a vehicle is provided. The method comprises a step of receiving traffic information with position information of each one of a number of delay incidents, a step of determining a position of the vehicle on a planned route, a step of determining a relevance of each one of the delay incidents on the planned route based on the position information of the respective delay incident and on the position of the vehicle, a step of selecting at least one delay incident on the planned route, based on the determined relevance of the respective delay incident, and a step of communicating information concerning the selected delay incident to a user. The method provides an intuitive and user-friendly way of informing the user about delays to be expected.

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METHOD OF INDICATING TRAFFIC DELAYS, COMPUTER PROGRAM AND NAVIGATION SYSTEM

Field of the invention

This invention relates to a method of indicating traffic delays in a navigation system for planning a route of a vehicle, the method comprising receiving traffic information comprising position information of each one of a number of delay incidents, determining a position of the vehicle on a planned route and communicating information concerning the delay incidents to a user.

This invention further relates to a computer program product and a navigation system for performing the method of indicating traffic delays.

Background of the invention

Nowadays, many motorists use in-car navigation systems for planning routes. Using digital maps and location information of the user, e.g. based on GPS signals received by a GPS receiver, navigation systems calculate the shortest, fastest or otherwise optimal route to a destination. One of the problems with routes planned by navigation systems is that traffic jams, road work and other delay incidents may drastically increase the time needed for reaching the destination. Some navigation systems, e.g. provided by TomTom (www.tomtom.com), are able to receive traffic information concerning the planned route and adapt the planned route in such a way that large delays are avoided. E.g., icons indicating delay incidents are shown on a map. A user may use the user interface of the navigation system to obtain further information about the delay incidents, such as the positions of the beginning or end of the delay incident, an expected delay time caused by the delay incident or a cause of the delay incident. Adaptations to the planned route may be applied automatically, after approval by the user or upon a specific user request.

It is a problem of the known traffic information services that icons on a map are only visible when the location of the corresponding delay incident is on-screen. Typically, this is only the case when the user approaches the delay incident. Relevant delay incidents that are further away may be invisible for the user. When the icon becomes visible, it may be too late to change the route and avoid the delay.

Object of the invention

It is an object of the invention to provide a more intuitive and user-

friendly way of informing the user about delays to be expected.

Summary of the invention

According to a first aspect of the invention, this object is achieved by providing a method of indicating traffic delays in a navigation system for planning a route of a vehicle, the method comprising receiving traffic information comprising position information of each one of a number of delay incidents, determining a position of the vehicle on a planned route, determining a relevance of each one of the delay incidents on the planned route, based on the position information of the respective delay incident and on the position of the vehicle, selecting at least one delay incident on the planned route, based on the determined relevance of the respective delay incident, and communicating information concerning the selected delay incident to a user.

By communicating only the most relevant delay incident(s) to the user, it becomes much easier to communicate the obtained information to the user in such a way that it is easily understandable for the user, without interfering too much with the providing of the usual route information. For example, the selected delay incident(s) may be read out loud by a text-to-speech converter or may be displayed as text, graphics or a combination of both on a relatively small sub-section of the display. The inventors have realized that the relevance of the delay incidents is mainly dependent on the position information of the incidents. A traffic jam situated 100 km from a current position is less relevant than another traffic jam that is only 10 km away.

In an embodiment of the method according to the invention, the traffic information further comprises an expected delay caused by each one of the number of delay incidents and the determining of the relevance of each one of the delay incidents on the planned route is further based on the expected delay caused by the respective delay incident. A one hour delay starting at 20 kilometers from the current position may be much more relevant than a 2 minutes delay that is only 2 kilometers away.

Preferably, the traffic information, the position of the vehicle and the relevance of each one of the number of delay incidents are updated periodically. After each update, new relevant delay incidents and changes to previously communicated delay incidents are communicated to the user. Furthermore, the system may remove information concerning delay incidents with a decreased relevance from the display screen.

In an embodiment of the method according to the invention, the method

further comprises determining a total expected delay of all delay incidents on the planned route together and communicating the total expected delay to the user. An indication of the total amount of delay to be expected gives the user a good estimate of the duration of the delay incidents that are not selected for communication and the expected time of arrival at the destination.

Preferably, the communicating of the total expected delay comprises providing an audible warning message when the delay situation significantly changes. Traffic information may be updated very often or even almost continuously. The user should however keep an eye on the road and should not have to look at the screen of the navigation all the time to check whether something has changed in the traffic situation. If the user receives an audible message each time an interesting change or update of the traffic situation is observed, continuously watching the display is not required.

According to a second aspect of the invention, a computer program product is provided which program is operative to cause a processor to perform the method according to the invention.

According to a third aspect of the invention, a navigator system is provided for planning a route of a vehicle, the system comprising a receiver for receiving traffic information comprising position information of each one of a number of delay incidents, a memory for storing the received traffic information, a processor. The processor is arranged for determining a position of the vehicle on a planned route, determining a relevance of each one of the delay incidents on the planned route, based on the position information of the respective delay incident and on the position of the vehicle, and selecting at least one delay incident on the planned route, based on the determined relevance of the respective delay incident. The system further comprises an output for communicating information concerning the selected delay incident to a user.

These and other aspects of the invention are apparent from and will be elucidated with reference to the embodiments described hereinafter.

Brief description of the drawings

In the drawings:

Figure 1 shows a navigation device according to the invention,

Figure 2 schematically shows components of the navigation device of figure 1,

Figure 3 shows a flow diagram of the method according to the invention,

Figure 4 shows an exemplary view of a display of the navigation device,

Figures 5, 6 and 7 show examples of traffic bars for indicating traffic delays.

Detailed description of the invention

Figure 1 shows a navigation device 10 according to the invention. The navigation device 10 comprises a display 11 for showing, e.g., route information and traffic information. The navigation device 10 further comprises a set of interface elements 12 for enabling the user to interact with the navigation device 10. Preferably, the display 11 is a touch-screen display and the user interface of the navigation device 10 is, at least in part, embodied by menus shown and operated on the touch-screen. The navigation device 10 may use voice recognition for receiving control commands from the user. Preferably, the navigation device uses text-to-speech conversion to inform the user about, the planned route, traffic information or other information via audible messages.

Figure 2 schematically shows components of the navigation device 10 of figure 1. The navigation device comprises a processor 13 for controlling the functioning of the navigation device 10. The processor 13 is arranged to process input data from, e.g., the user, GPS satellites and traffic delay information services to calculate an optimal route for the user to travel to a destination. The processor 13 is coupled to the user interface 11, 12 for receiving instructions from the user and coupled to the display 11 for showing, e.g., planned routes, traffic information and user interface options. The processor 13 is also coupled to a memory 14 for storing software and data. The software is used by the processor to perform all functions of the navigation device 10. The data comprises, e.g., destinations, map data, user information, graphics and sound data. A speaker 15 is coupled to the processor 13 for providing audible messages. The navigation device 10 may comprise several communication units 16, all coupled to the processor 13. Generally, a navigation device 10 comprises a GPS sensor for determining a current position of the navigation device 10. Other suitable techniques may be used as an alternative or additionally, e.g., using information derived from cell based wireless communication systems, such as GSM, UMTS, GPRS, WiFi or WiMAX. Traffic information may, be obtained from a traffic information source via, e.g., AM or FM radio communication, dedicated satellite systems, mobile telephone communication networks (e.g. GSM, UMTS, GPRS) or via a nearby telephone or computer via local communication means, such as Bluetooth or USB. With the components described

above, the navigation device 10 is suitable for performing the method according to the invention. It is however to be noted, that amendments or additions may be made without decreasing the suitability for performing the method according to the invention.

Figure 3, shows a flow diagram of the method according to the invention. The method according to the invention may be performed while the vehicle is traversing a planned route. The method starts wit a receiving step 21 for receiving traffic information. The traffic information comprises position information of a number of delay incidents, the traffic information may also comprise additional information about the delay incidents, such as delay type (e.g., road block, accident, road work, slow moving traffic, rush hour), expected delay, trend (e.g. growing or shrinking) or other additional information, such as a moment of last update of the information. Generally, the navigation device 10 will receive all traffic information available for a large area, e.g. for the whole country or state or even for multiple nearby countries or states. However, on request, the area covered by the traffic information may be reduced in dependence of the planned route or the position of the vehicle.

In a position determining step 22, the position of the vehicle on the planned route is determined. Generally, a navigation device 10 comprises a GPS sensor for determining a current position of the navigation device 10. Other suitable techniques may be used as an alternative or additionally, e.g., using information derived from cell based wireless communication systems, such as GSM, UMTS, GPRS, WiFi or WiMAX.

Then in relevance determining step 23, the relevance of each one of the delay incidents on the planned route. All traffic information received in the receiving step 21 is filtered in order to select the delay incidents that are on the planned routes. For all delay incidents on the planned route, a relevance value is calculated. Amongst others, the relevance value is based on the current vehicle position and position information of the delay incident. If, e.g., the delay incident is only a few kilometers away from the current vehicle position, the incident is very relevant and will obtain a high relevance value. If the delay incident is 200 kilometers away, it may already have been disappeared once the vehicle reaches the position of the delay incident. Such an incident thus is much less relevant and will get a lower relevance value. The relevance value may further based on an expected delay caused by the delay incident. A one hour delay is more relevant than a 3 minutes delay. Preferably, the relevance value is based on a combination of its position and its associated expected delay. For example, a 3 minutes delay that is a few kilometers away may be more relevant than a 10

minutes delay in about 200 kilometers, and a one hour delay that is 20 kilometers away may be more important than a 3 minutes delay around the next corner.

Examples of other criteria that may influence the relevance value are delay type (e.g., road block, accident, road work, slow moving traffic, rush hour), expected delay, trend (e.g. growing or shrinking) or other additional information, such as a moment of last update of the information. Preferably, all criteria work together. For example, a one hour delay caused by a rush hour traffic jam that is 300 km away, may not be very relevant. However, a tunnel that has been closed for a few days and is 500 km away is a relevant delay incident.

After determining the relevance values of all delay incidents on the route, one or more delay incidents are selected for communicating to the user in selection step 24. Only the selected incidents are communicated to the user in communication step 25. When only informing the user about the most relevant delay incidents, the user will not be annoyed by less relevant information. Communicating delay incidents may be performed by showing graphics or text on the display 11 and/or by providing the information as spoken text via a speaker 15. When only displaying the most relevant incidents, a larger part of the display remains available for displaying maps, route information and other information.

In an embodiment of the method according to the invention, selection of delay incidents depends on a combination of the distance to and delay caused by the delay incident. The most relevant delay incidents are nearby and cause a long delay. The least relevant delay incidents are far away and cause a short delay. For each possible incident distance, there is may be minimum delay that makes the incident relevant. On the other hand, for each possible delay, there may be a maximum distance making the delay incident relevant. A selection algorithm may, e.g., select delay incidents for communicating to the user in the following manner:

If there is only one incident on the route, it is never hidden (an incident is hidden when its relevance value is below a predetermined limit).

If the distance to an incident is shorter than 15km it is never hidden.

Delay 0-30 sec. => incident is hidden if distance > 7km

Delay 31-90 sec. => incident is hidden if distance > 15km

Delay 1-2 min. => incident is hidden if distance > 30km

Delay 2-3 min. => incident is hidden if distance > 45km

Delay 3-4 min. => incident is hidden if distance > 60km

Delay 4-5 min. => incident is hidden if distance > 75km

Delay 5-10 min. => incident is hidden if distance > 150km
Delay 10-15 min. => incident is hidden if distance > 200km
Delay 15-20 min. => incident is hidden if distance > 250km
Delay 20-30 min. => incident is hidden if distance > 300km
Delay > 30 min. => incident is never hidden

Figure 4 shows an exemplary view of a display 11 of the navigation device 10. The display 11 shows a map 31 with one or more roads 37. An indicator 34 represents the current position of the vehicle on the map 11. Part of the roads 37 on the map 11 are highlighted for indicating the route 38 that is advised to the user. An information panel 33 may provide the route information in another form, e.g. using text and arrows. The information panel 33 may also show additional information, such as e.g. battery power and display options. In this embodiment, a traffic bar 32 is used for indicating traffic information. A skilled person will be able to use other ways of displaying traffic information on screen. The traffic bar 32 comprises a vehicle icon 35, representing the current position of the vehicle. Preferably the same icon is used as for the indicator 34 on the map 31, making it easier for the user to understand the vehicle icon 35. When a new route is planned and the vehicle has not yet started traveling, the vehicle icon may be replaced by a Go flag that represents the start location of the route. A finish icon 36 represents the destination. The same icon may be used for representing the destination on the map 31. A line extending from the vehicle icon 35, to the finish icon 36 represents the planned route. Representations of the delay incidents on the route are placed on the line. In the situation of figure 3 however, no delay incidents are reported. In the following figures, traffic bars 32 are shown, comprising one or more delay incidents. It is to be noted that when no delay incident is expected, the traffic bar 32 may be hidden completely.

Figures, 5, 6 and 7 show examples of traffic bars 32 for indicating traffic delays. In figure 5, only the most relevant delay incident 41 is shown. The shown delay incident is traffic jam, causing a 6 minutes delay and starting 17 km from the current position of the vehicle. A distance indicator 43, indicates the distance from the vehicle to the first relevant delay incident 41. The position of the selected delay incident 41 on the traffic bar 32 is proportional to the distance from the vehicle and the destination. The route indicator 44 represents the distance between the vehicle and the destination. When a delay incident is, e.g., half way between the vehicle and the destination, the delay incident 41 is shown halfway the route indicator 44. As the vehicle approaches the delay incident, the route represented by the route indicator 44 becomes shorter and

the delay incidents slides down towards the vehicle icon. When the vehicle has passed the selected delay incident 41, the next most relevant delay incident may be shown. In this example, the scale of the route indicator is linear, however other options are also available. The scale may, e.g., also be logarithmic. As an option, the scale of the traffic bar 32 may be indicated by numbers displayed along the traffic bar and indicating the distance from the vehicle.

Optionally, the length of the traffic bar may be limited to only represent the area for which traffic information is available and parts of the route for which traffic information is not available may not be shown. In the event that the traffic information is not up to date anymore, e.g., because of connection problems, the traffic bar may be 'greyed out', i.e. shown in a different color.

A total expected delay indicator 42 at the top of the traffic bar 32 indicates the total delay to be expected. The fact that the total expected delay indicator 42 is put next to the finish icon 36, will make it more obvious to the user that it deals with a total delay, since they are likely to put a connection between the end of the route and the total delay they encountered along this route. This will increase usability. An advantage of the plus sign shown in the total expected delay icon 42 is put in front of the number to indicate that this number indicates the total delay, and not a delay of one of the incidents on the route. It is to be noted that the total expected delay icon 42 may, of course, also be embodied in alternative ways. The total delay is the sum of the expected delays of all delay incidents on the route. In figure 5, the total delay is 13 minutes. The only incident 41 selected for display causes a 6 minutes delay. Other delay incidents that are further away and/or cause less delay are not selected for display. The delay incidents that are not shown together cause a delay of 7 minutes

The traffic information is updated periodically, which may cause the displayed information to be changed. Preferably, a warning message is provided if the total expected delay is changed more than a predetermined amount of time. For example, an increase of the total expected delay to 14 minutes will not cause a warning message, but when the total expected delay becomes more than 18 minutes, a warning message is provided. Preferably, the warning message is provided as an audible signal, making it unnecessary for the user to repeatedly check the display. The user may then keep his eyes on the road which improves safety. Most preferably, the warning message is provided using text-to-speech conversion and comprises the updated total expected delay. This message may also contain a question for the user, if

he wishes to optimize the route. If the device supports voice recognition, the user may answer the question without needing to let go the steering wheel.

In figure 6, not only the most relevant, but also some other relevant delay incidents are shown. The first relevant delay incident 51 is similar to the most relevant delay incident 41 in figure 5. Again, the incident distance indicator 43 shows the distance between the vehicle and the first relevant incident 51. Two other relevant delay incident 52, 53 are also selected for display on the traffic bar 32. The second relevant delay incident 52 is also a traffic jam. The third delay incident 53 is a road narrowing because of road work. In this example, the specific delays expected for these further incidents 52, 53 is not shown, because it is determined to be less relevant. However, in an alternative embodiment, the expected delays for these incidents may also be shown.

Figures 7a, 7b and 7c show three different ways to solve the problem that the distance indicator 43, may be too large to fit between the first relevant delay incident 41 and the vehicle icon 35. In figure 7a this problem is solved by making the distance indicator 43 smaller. In Figure 7b, the distance indicator 43 slides over the vehicle icon 35 and the vehicle icon 35 is not visible anymore. In figure 7c, the route indicator 44 has been made smaller and the distance indicator 43 is displayed below the vehicle icon 35.

It will be appreciated that the invention also extends to computer programs, particularly computer programs on or in a carrier, adapted for putting the invention into practice. The program may be in the form of source code, object code, a code intermediate source and object code such as partially compiled form, or in any other form suitable for use in the implementation of the method according to the invention. It will also be appreciated that such a program may have many different architectural designs. For example, a program code implementing the functionality of the method or system according to the invention may be subdivided into one or more subroutines. Many different ways to distribute the functionality among these subroutines will be apparent to the skilled person. The subroutines may be stored together in one executable file to form a self-contained program. Such an executable file may comprise computer executable instructions, for example processor instructions and/or interpreter instructions (e.g. Java interpreter instructions). Alternatively, one or more or all of the subroutines may be stored in at least one external library file and linked with a main program either statically or dynamically, e.g. at run-time. The main program contains at least one call to at least one of the subroutines. Also, the

subroutines may comprise function calls to each other. An embodiment relating to a computer program product comprises computer executable instructions corresponding to each of the processing steps of at least one of the methods set forth. These instructions may be subdivided into subroutines and/or be stored in one or more files that may be linked statically or dynamically. Another embodiment relating to a computer program product comprises computer executable instructions corresponding to each of the means of at least one of the systems and/or products set forth. These instructions may be subdivided into subroutines and/or be stored in one or more files that may be linked statically or dynamically.

The carrier of a computer program may be any entity or device capable of carrying the program. For example, the carrier may include a storage medium, such as a ROM, for example a CD ROM or a semiconductor ROM, or a magnetic recording medium, for example a floppy disc or hard disk. Further the carrier may be a transmissible carrier such as an electrical or optical signal, which may be conveyed via electrical or optical cable or by radio or other means. When the program is embodied in such a signal, the carrier may be constituted by such cable or other device or means. Alternatively, the carrier may be an integrated circuit in which the program is embedded, the integrated circuit being adapted for performing, or for use in the performance of, the relevant method.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention may be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer. In the device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

CLAIMS

1. A method of indicating traffic delays in a navigation system for planning a route of a vehicle, the method comprising:

- receiving traffic information comprising position information of each one of a number of delay incidents,
- determining a position of the vehicle on a planned route,
- determining a relevance of each one of the delay incidents on the planned route, based on the position information of the respective delay incident and on the position of the vehicle,
- selecting at least one delay incident on the planned route, based on the determined relevance of the respective delay incident, and
- communicating information concerning the selected delay incident to a user.

2. A method of indicating traffic delays as claimed in claim 1, wherein the traffic information further comprises an expected delay caused by each one of the number of delay incidents and wherein the determining of the relevance of each one of the delay incidents on the planned route is further based on the expected delay caused by the respective delay incident.

3. A method of indicating traffic delays as claimed in claim 1 or 2, wherein the traffic information further comprises a delay type of each one of the number of delay incidents and wherein the determining of the relevance of each one of the delay incidents on the planned route is further based on the delay type of the respective delay incident.

4. A method of indicating traffic delays as claimed in claim 2, wherein the determining of the relevance of each one of the delay incidents on the planned route comprises assigning a high relevance value to the respective delay incident if an incident distance between the position of the vehicle and a position of the respective delay incident is below a predetermined distance limit and/or the expected delay of the respective delay incident is above a predetermined delay limit.

5. A method of indicating traffic delays as claimed in claim 4, wherein the predetermined delay limit is dependent on the incident distance.

6. A method of indicating traffic delays as claimed in any one of the claims 1 to 5, wherein the communicating comprises showing a representation of the selected delay incident on a display of the navigation system, the representation of the selected delay incident including a representation of the position of the selected delay incident.

7. A method of indicating traffic delays as claimed in claim 6, wherein the representation of the position of the selected delay incident is a representation of an incident distance between the position of the vehicle and the position of the selected delay incident.

8. A method of indicating traffic delays as claimed in claim 7, wherein the communicating comprises displaying a traffic bar along an edge of the display screen, one end of the traffic bar comprising the representation of the position of the vehicle on the planned route in the form of a vehicle icon, the other end of the traffic bar comprising a finish icon for representing a destination of the planned route, the representation of the position of the selected delay incident comprising displaying the representation of the delay incident in between the vehicle icon and the finish icon, at distances from the vehicle icon and the finish icon corresponding to the incident distance and a distance between the selected delay incident and the destination respectively.

9. A method of indicating traffic delays as claimed in claim 2, wherein the communicating comprises communicating the expected delay caused by the selected delay incident to the user.

10. A method of indicating traffic delays as claimed in claim 2, further comprising determining a total expected delay of all delay incidents on the planned route together and communicating the total expected delay to the user.

11. A method of indicating traffic delays as claimed in claim 10, further comprising

periodically updating the traffic information and the total expected delay and communicating the updated total expected delay,

providing an audible warning message if a predetermined criterion is met.

12. A method of indicating traffic delays as claimed in claim 11, wherein the predetermined criterion is met when, since a previous warning message, the updating of the total expected delay has resulted in an increase of the total expected delay with more than a first predetermined amount of time.

13. A method of indicating traffic delays as claimed in claim 11, wherein the predetermined criterion is met when the previous warning message has been provided more than a second predetermined amount of time ago.

14. A method of indicating traffic delays as claimed in claim 11, 12 or 13 wherein the audible warning message is generated using text to speech conversion.

15. A computer program product for indicating traffic delays which program is operative to cause a processor to perform the method as claimed in any of the claims 1 to 14.

16. A computer program stored on a computer readable medium, the computer program comprising:

a program portion arranged to receive traffic information comprising position information of each one of a number of delay incidents,

a program portion arranged to determine a position of the vehicle on a planned route,

a program portion arranged to determine a relevance of each one of the delay incidents on the planned route, based on the position information of the respective delay incident and on the position of the vehicle,

a program portion arranged to select at least one delay incident on the planned route, based on the determined relevance of the respective delay incident, and

a program portion arranged to communicate information concerning the selected delay incident to a user.

17. A navigation system for planning a route of a vehicle, the system comprising:

- a receiver for receiving traffic information comprising position information of each one of a number of delay incidents,
- a memory for storing the received traffic information,
- a processor being arranged for:
  - determining a position of the vehicle on a planned route,
  - determining a relevance of each one of the delay incidents on the planned route, based on the position information of the respective delay incident and on the position of the vehicle, and
  - selecting at least one delay incident on the planned route, based on the determined relevance of the respective delay incident, and
  - an output for communicating information concerning the selected delay incident to a user.

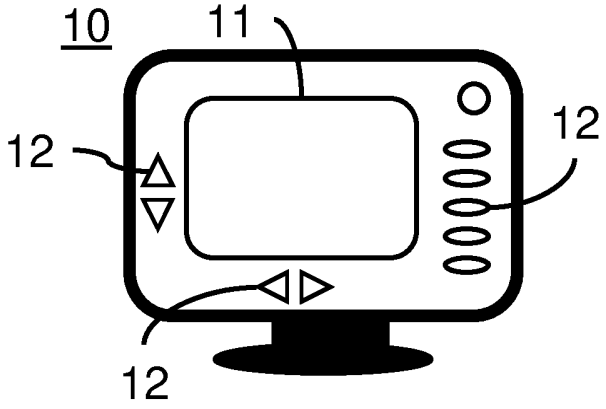

Fig. 1

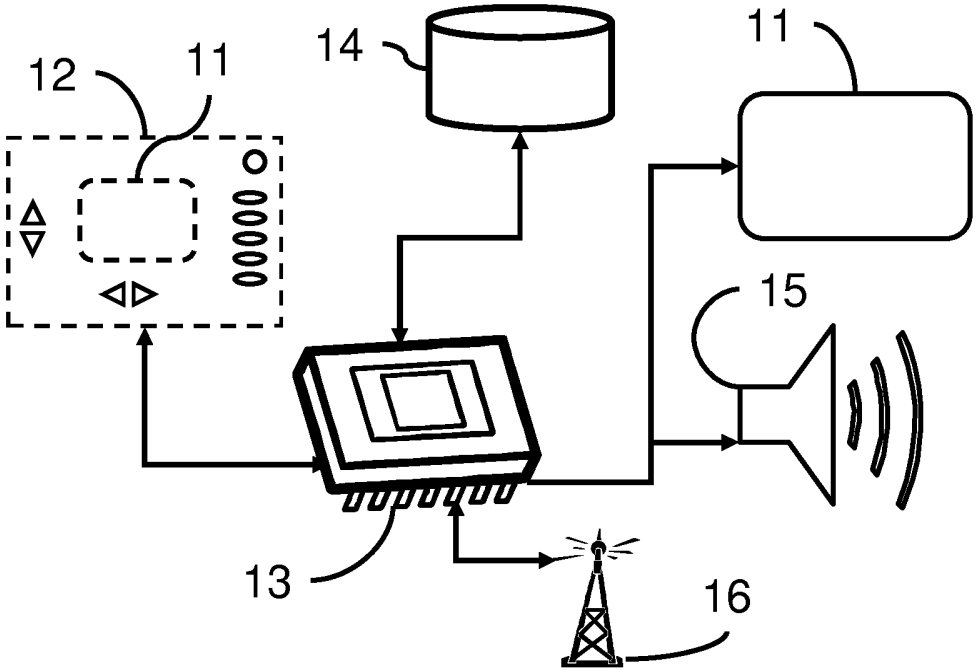

Fig. 2

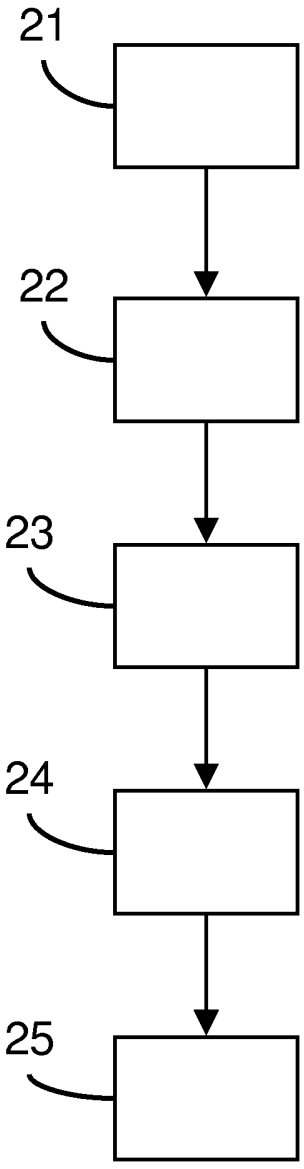

Fig. 3

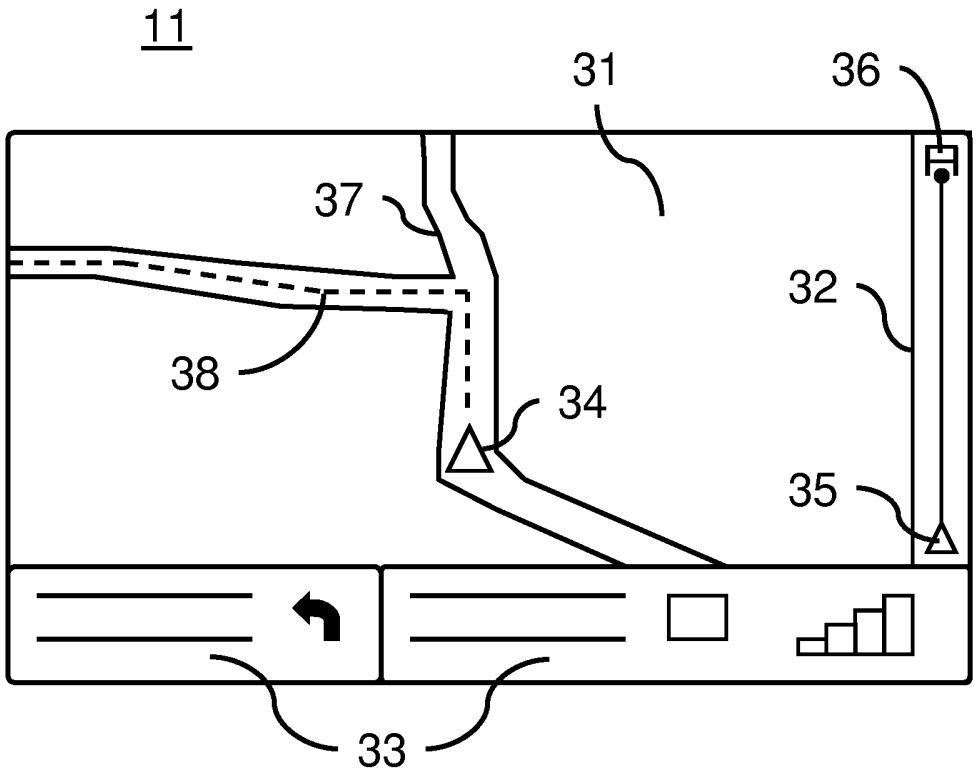

Fig. 4

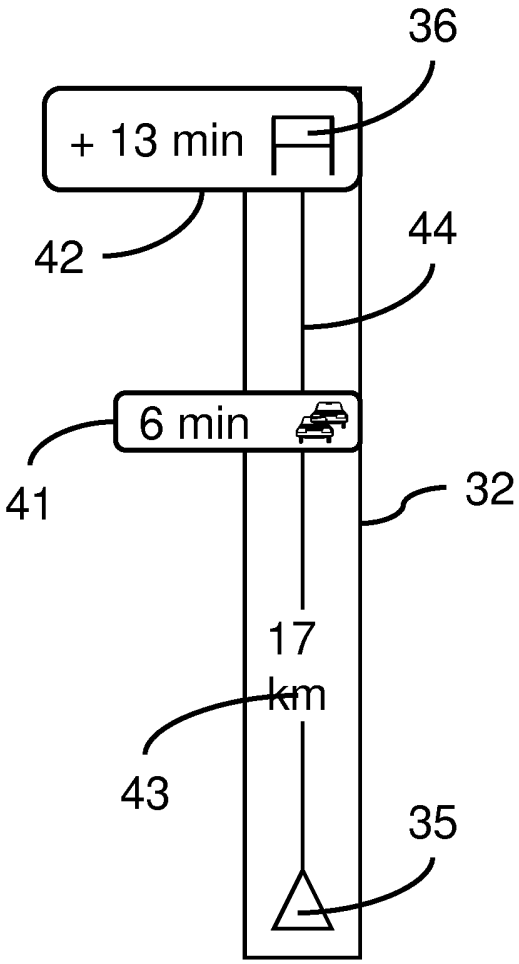

Fig. 5

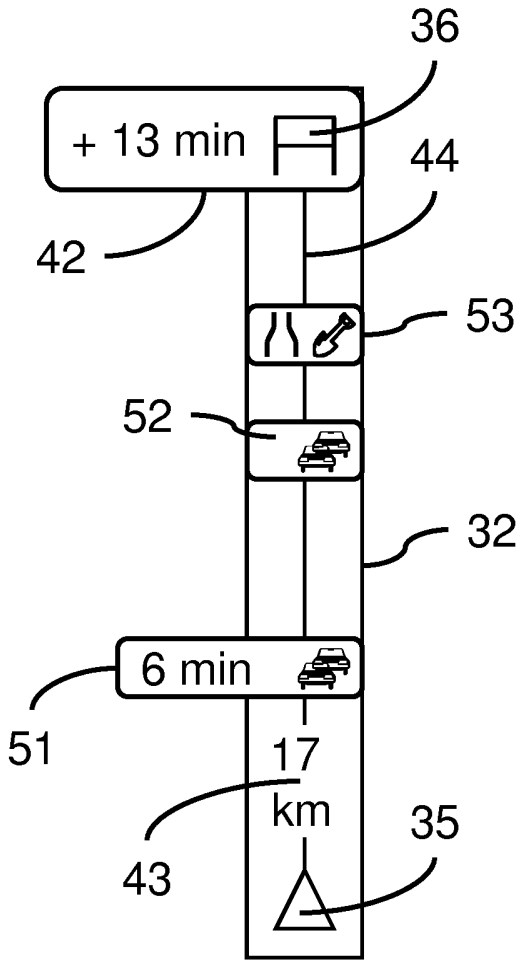

Fig. 6

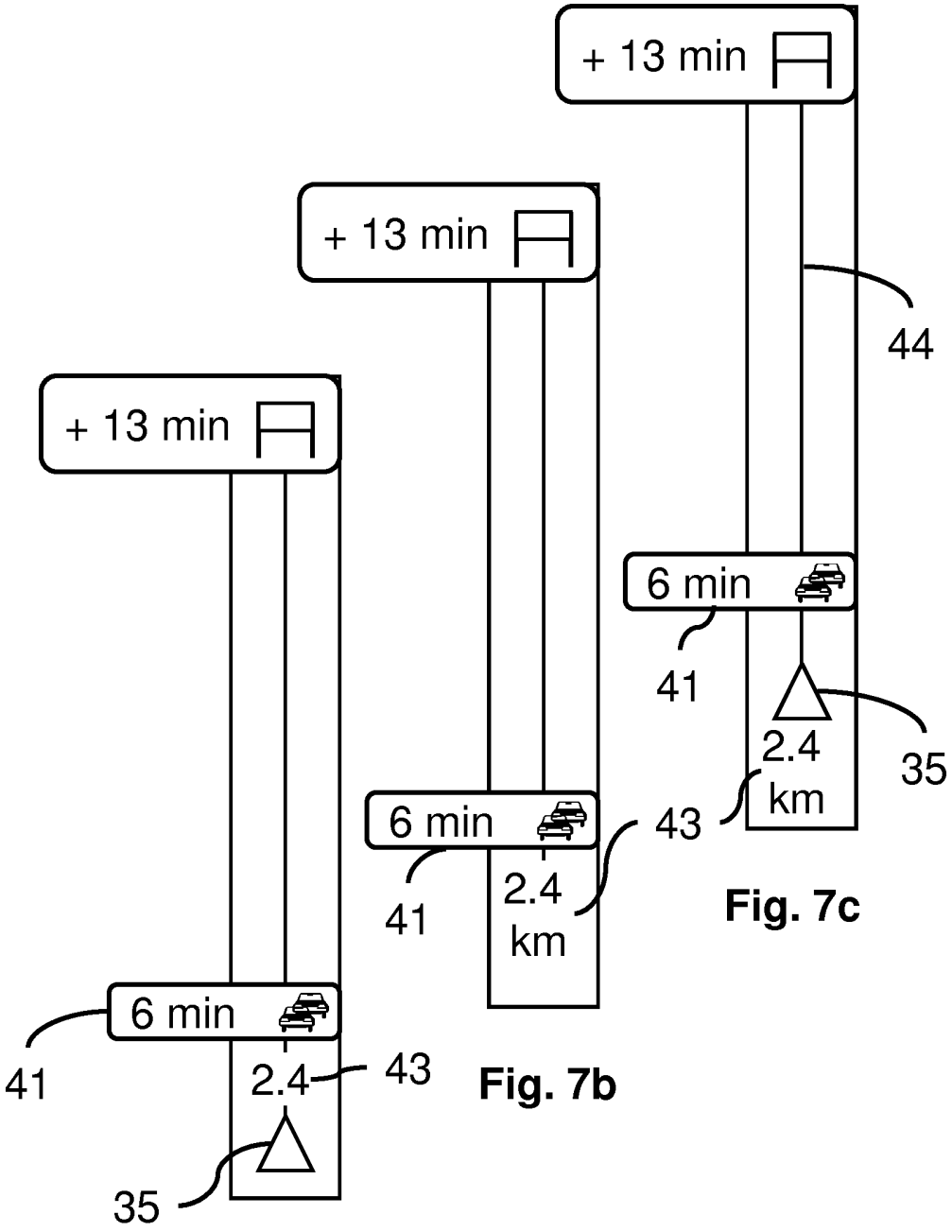

Fig. 7a

Fig. 7b

Fig. 7c

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/060303

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01C21/26 G01C21/34 G08G1/0962 G08G1/0969

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01C G08G

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

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/204845 A1 (WONG WINNIE [US]) 14 October 2004 (2004-10-14) page 1, paragraph 7 - page 2, paragraph 19 page 3, paragraph 36 - page 8, paragraph 100; figures 4,7-15	1-17
X Y	DE 102 33 376 A1 (FENDT GUENTER [DE]) 12 February 2004 (2004-02-12) page 5, paragraph 36 - page 9, paragraph 68; figures 1-4	1,2,6,7, 15-17 4,5
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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 January 2008	29/01/2008

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Springer, Oliver

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2007/060303

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	US 6 680 674 B1 (PARK MICHAEL C [US]) 20 January 2004 (2004-01-20) column 2, line 15 - column 8, line 27; figures 2,3,5	1,15-17
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2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2007/060303

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EP 1533592 A	25-05-2005	DE 10354218 A1	30-06-2005
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G01C 21/26 (2006.01)
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G08G 1/0969 (2006.01)

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[21] 申请号 200780049436.8
[30] 优先权
[32] 2007. 1.10 [33] US [31] 60/879,523
[32] 2007. 1.10 [33] US [31] 60/879,549
[32] 2007. 1.10 [33] US [31] 60/879,553
[32] 2007. 1.10 [33] US [31] 60/879,577
[32] 2007. 1.10 [33] US [31] 60/879,599
[86] 国际申请 PCT/EP2007/060303 2007.9.28
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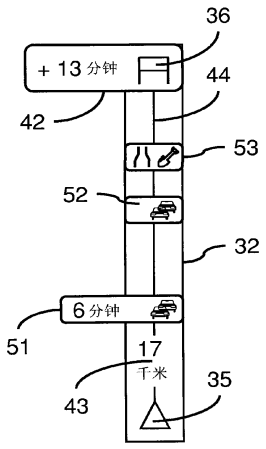
代理人 刘国伟
权利要求书 3 页 说明书 8 页 附图 6 页

[54] 发明名称

指示交通延迟的方法、其计算机程序以及导航系统

[57] 摘要

本发明提供一种在用于规划交通工具的路线的导航系统中指示交通延迟的方法。 所述方法包括：接收具有若干延迟事件中的每一者的位置信息的交通信息的步骤，确定所述交通工具在所规划路线上的位置的步骤，基于所述相应延迟事件的所述位置信息且基于所述交通工具的所述位置而确定所述所规划路线上的所述延迟事件中的每一者的相关性的步骤，基于所述相应延迟事件的所述确定的相关性而选择所述所规划路线上的至少一个延迟事件的步骤，以及将关于所述选定延迟事件的信息传送到用户的步骤。 所述方法提供向所述用户通知预期的延迟的直观且用户友好的方式。



1. 一种在用于规划交通工具的路线的导航系统中指示交通延迟的方法，所述方法包括：

接收包括若干延迟事件中的每一者的位置信息的交通信息，

确定所述交通工具在所规划路线上的位置，

基于所述相应延迟事件的所述位置信息且基于所述交通工具的所述位置而确定所述所规划路线上的所述延迟事件中的每一者的相关性，

基于所述相应延迟事件的所述确定的相关性而选择所述所规划路线上的至少一个延迟事件，以及

将关于所述选定延迟事件的信息传送到用户。

2. 根据权利要求 1 所述的指示交通延迟的方法，其中所述交通信息进一步包括由所述若干延迟事件中的每一者引起的预期延迟，且其中所述确定所述所规划路线上的所述延迟事件中的每一者的所述相关性进一步基于由所述相应延迟事件引起的所述预期延迟。

3. 根据权利要求 1 或 2 所述的指示交通延迟的方法，其中所述交通信息进一步包括所述若干延迟事件中的每一者的延迟类型，且其中所述确定所述所规划路线上的所述延迟事件中的每一者的所述相关性进一步基于所述相应延迟事件的所述延迟类型。

4. 根据权利要求 2 所述的指示交通延迟的方法，其中所述确定所述所规划路线上的所述延迟事件中的每一者的所述相关性包括：如果所述交通工具的所述位置与所述相应延迟事件的位置之间的事件距离低于预定距离限值和/或所述相应延迟事件的所述预期延迟高于预定延迟限值，那么将高相关性值指派给所述相应延迟事件。

5. 根据权利要求 4 所述的指示交通延迟的方法，其中所述预定延迟限值取决于所述事件距离。

6. 根据权利要求 1 到 5 中任一权利要求所述的指示交通延迟的方法，其中所述传送包括在所述导航系统的显示器上展示所述选定延迟事件的表示，所述选定延迟事件的所述表示包含所述选定延迟事件的所述位置的表示。

7. 根据权利要求 6 所述的指示交通延迟的方法，其中所述选定延迟事件的所述位置的所述表示是所述交通工具的所述位置与所述选定延迟事件的所述位置之间的事件距离的表示。

8. 根据权利要求 7 所述的指示交通延迟的方法，其中所述传送包括沿着显示器屏幕的边缘显示交通栏，所述交通栏的一端包括所述交通工具在所述所规划路线上的所述位置的呈交通工具图标形式的所述表示，所述交通栏的另一端包括用于表示所述所规划路线的目的地的结束图标，所述选定延迟事件的所述位置的所述表示包括在所述交通工具图标与所述结束图标之间，在距所述交通工具图标和所述结束图标的分别对应于所述事件距离和所述选定延迟事件与所述目的地之间的距离的距离处显示所述延迟事件的所述表示。

9. 根据权利要求 2 所述的指示交通延迟的方法，其中所述传送包括将由所述选定延迟事件引起的所述预期延迟传送到所述用户。

10. 根据权利要求 2 所述的指示交通延迟的方法，其进一步包括一同确定所述所规划路线上所有延迟事件的总预期延迟，且将所述总预期延迟传送到所述用户。

11. 根据权利要求 10 所述的指示交通延迟的方法，其进一步包括

周期性地更新所述交通信息和所述总预期延迟，且传送所述经更新的总预期延迟，

如果满足预定标准，那么提供可听的警告消息。

12. 根据权利要求 11 所述的指示交通延迟的方法，其中当自从先前警告消息以来所述总预期延迟的所述更新已导致所述总预期延迟增加超过第一预定时间量时，满足所述预定标准。

13. 根据权利要求 11 所述的指示交通延迟的方法，其中当超过第二预定时间量以前已提供所述先前警告消息时，满足所述预定标准。

14. 根据权利要求 11、12 或 13 所述的指示交通延迟的方法，其中使用文本到话音转换

来产生所述可听的警告消息。

15. 一种用于指示交通延迟的计算机程序产品，所述程序操作以致使处理器执行根据权利要求 1 到 14 中任一权利要求所述的方法。

16. 一种存储在计算机可读媒体上的计算机程序，所述计算机程序包括：

经布置以接收包括若干延迟事件中的每一者的位置信息的交通信息的程序部分，

经布置以确定所述交通工具在所规划路线上的位置的程序部分，

经布置以基于所述相应延迟事件的所述位置信息且基于所述交通工具的所述位置而确定所述所规划路线上的所述延迟事件中的每一者的相关性的程序部分，

经布置以基于所述相应延迟事件的所述确定的相关性而选择所述所规划路线上的至少一个延迟事件的程序部分，以及

经布置以将关于所述选定延迟事件的信息传送到用户的程序部分。

17. 一种用于规划交通工具的路线的导航系统，所述系统包括：

接收器，其用于接收包括若干延迟事件中的每一者的位置信息的交通信息，

存储器，其用于存储所述接收的交通信息，

处理器，其经布置以：

确定所述交通工具在所规划路线上的位置，

基于所述相应延迟事件的所述位置信息且基于所述交通工具的所述位置而确定所述所规划路线上的所述延迟事件中的每一者的相关性，以及

基于所述相应延迟事件的所述确定的相关性而选择所述所规划路线上的至少一个延迟事件，以及

输出端，其用于将关于所述选定延迟事件的信息传送到用户。

指示交通延迟的方法、其计算机程序以及导航系统

技术领域

本发明涉及一种在用于规划交通工具的路线的导航系统中指示交通延迟的方法，所述方法包括接收包括若干延迟事件中的每一者的位置信息的交通信息、确定交通工具在所规划路线上的位置，以及将关于延迟事件的信息传送到用户。

本发明进一步涉及用于执行所述指示交通延迟的方法的计算机程序产品和导航系统。

背景技术

当今，许多开车人使用车内导航系统来规划路线。通过使用数字地图和用户的位置信息，例如基于 GPS 接收器所接收的 GPS 信号，导航系统计算到达目的地的最短、最快或另外最优的路线。由导航系统规划路线所存在的问题之一在于，交通阻塞、道路工程和其它延迟事件可能急剧增加到达目的地所需的时间。例如由汤姆汤姆（TomTom）（www.tomtom.com）提供的某些导航系统能够接收关于所规划路线的交通信息，且以避免较大延迟的方式调适所规划路线。例如，在地图上展示指示延迟事件的图标。用户可使用导航系统的用户界面来获得关于延迟事件的进一步信息，例如延迟事件的开始或结束的位置、由延迟事件引起的预期延迟时间或延迟事件的起因。在用户核准之后或在特定用户请求时，可自动应用对所规划路线的调适。

已知交通信息服务的问题在于，地图上的图标仅在对应延迟事件的位置在屏幕上时可见。通常，这仅是当用户接近延迟事件时的情况。用户可能不可见更远的相关延迟事件。当图标变为可见时，改变路线和避免延迟可能已太晚。

发明内容

本发明的目的是提供向用户通知预期的延迟的更直观且用户友好的方式。

根据本发明的第一方面，通过提供一种在用于规划交通工具的路线的导航系统中指示交通延迟的方法而实现此目的，所述方法包括：接收包括若干延迟事件中的每一者的位置信息的交通信息，确定所述交通工具在所规划路线上的位置，基于相应延迟事件的

所述位置信息且基于所述交通工具的所述位置而确定所述所规划路线上的所述延迟事件中的每一者的相关性，基于相应延迟事件的所述确定的相关性而选择所述所规划路线上的至少一个延迟事件，以及将关于所述选定延迟事件的信息传送到用户。

通过仅将最相关延迟事件传送到用户，以用户容易理解的方式将获得的信息传送到用户而不过多干扰提供通常路线信息就变得容易得多。举例来说，可通过文本到话音转换器大声读出选定延迟事件，或可在显示器的相对小的子部分上将选定延迟事件显示为文本、图形或两者的组合。发明人认识到延迟事件的相关性主要取决于事件的位置信息。位于距当前位置 100 km 远的交通阻塞不如仅 10 km 远的另一交通阻塞相关。

在根据本发明的方法的实施例中，交通信息进一步包括由所述若干延迟事件中的每一者引起的预期延迟，且确定所规划路线上的所述延迟事件中的每一者的相关性是进一步基于由相应延迟事件引起的所述预期延迟。在距当前位置 20 千米处开始的一小时延迟可能比仅 2 千米远的 2 分钟延迟相关得多。

优选地，周期性地更新交通信息、交通工具的位置以及所述若干延迟事件中的每一者的相关性。在每一更新之后，将新的相关延迟事件和对先前传送的延迟事件的改变传送到用户。此外，系统可从显示器屏幕移除关于具有减小的相关性的延迟事件的信息。

在根据本发明的方法的实施例中，所述方法进一步包括确定所述所规划路线上所有延迟事件共同的总预期延迟，且将所述总预期延迟传送到用户。预期的总延迟量的指示为用户给出对未选择进行传送的延迟事件的持续时间以及到达目的地的预期时间的良好估计。

优选地，总预期延迟的传送包括当延迟情况显著改变时提供可听的警告消息。可非常经常或甚至几乎连续地更新交通信息。然而用户应关注于道路且不应必须一直观看导航的屏幕以核准交通情况中是否已有改变。如果用户每当观察到交通情况的受关注的改变或更新时接收到可听的消息，那么不需要连续观看显示器。

根据本发明的第二方面，提供一种计算机程序产品，所述程序操作以致使处理器执行根据本发明的方法。

根据本发明的第三方面，提供一种用于规划交通工具的路线的导航系统，所述系统包括：接收器，其用于接收包括若干延迟事件中的每一者的位置信息的交通信息；存储器，其用于存储所述接收的交通信息；处理器。所述处理器经布置以：确定所述交通工具在所规划路线上的位置，基于相应延迟事件的所述位置信息且基于所述交通工具的位置而确定所述所规划路线上的所述延迟事件中的每一者的相关性，以及基于相应延迟事件的所述确定的相关性而选择所述所规划路线上的至少一个延迟事件。所述系统进一步

包括输出端，其用于将关于所述选定延迟事件的信息传送到用户。

从下文描述的实施例中将明白且将参考下文描述的实施例来说明本发明的这些和其它方面。

附图说明

在图式中：

图 1 展示根据本发明的导航装置，

图 2 示意性地展示图 1 的导航装置的组件，

图 3 展示根据本发明的方法的流程图，

图 4 展示导航装置的显示器的示范性视图，

图 5、图 6 和图 7 展示用于指示交通延迟的交通栏的实例。

具体实施方式

图 1 展示根据本发明的导航装置 10。导航装置 10 包括显示器 11，其用于展示例如路线信息和交通信息。导航装置 10 进一步包括一组界面元件 12，其用于使用户能够与导航装置 10 交互。优选地，显示器 11 是触摸屏显示器，且导航装置 10 的用户界面至少部分由在所述触摸屏上展示和操作的菜单来实施。导航装置 10 可使用语音识别来从用户接收控制命令。优选地，导航装置使用文本到话音转换以经由可听的消息向用户通知所规划路线、交通信息或其它信息。

图 2 示意性地展示图 1 的导航装置 10 的组件。导航装置包括处理器 13，其用于控制导航装置 10 的机能。处理器 13 经布置以处理来自（例如）用户、GPS 卫星和交通延迟信息服务的输入数据，以为用户计算行进到目的地的最优路线。处理器 13 耦合到用户界面 11、12 以用于从用户接收指令，且耦合到显示器 11 以用于展示（例如）所规划路线、交通信息和用户界面选项。处理器 13 还耦合到用于存储软件和数据的存储器 14。软件由处理器使用以执行导航装置 10 的所有功能。数据包括（例如）目的地、地图数据、用户信息、图形和声音数据。扬声器 15 耦合到处理器 13 以用于提供可听的消息。导航装置 10 可包括若干通信单元 16，其全部耦合到处理器 13。一般来说，导航装置 10 包括 GPS 传感器，其用于确定导航装置 10 的当前位置。可作为替代方案或另外使用其它合适的技术，例如使用从基于小区的无线通信系统（例如，GSM、UMTS、GPRS、WiFi 或 WiMAX）导出的信息。可经由（例如）AM 或 FM 无线电通信、专用卫星系统、移动电话通信网络（例如，GSM、UMTS、GPRS），或者经由局部通信构件（例如，蓝

牙或 USB）而经由附近的电话或计算机，从交通信息源获得交通信息。通过上述组件，导航装置 10 适合于执行根据本发明的方法。然而应注意，在不减少执行根据本发明的方法的适用性的情况下可做出修正或添加。

图 3 展示根据本发明的方法的流程图。可在交通工具正在穿越所规划路线时执行根据本发明的方法。所述方法以用于接收交通信息的接收步骤 21 开始。交通信息包括若干延迟事件的位置信息，交通信息也可包括关于延迟事件的额外信息，例如延迟类型（例如，路障、事故、道路工程、缓慢移动的交通、高峰期）、预期延迟、趋势（例如，增长或缩减）或其它额外信息，例如信息的上一次更新的时刻。一般来说，导航装置 10 将接收可用于较大区域（例如，用于整个国家或州，或甚至用于多个附近的国家或州）的所有交通信息。然而，根据请求，由所述交通信息覆盖的区域可依据所规划路线或交通工具的位置而减小。

在位置确定步骤 22 中，确定交通工具在所规划路线上的位置。一般来说，导航装置 10 包括用于确定导航装置 10 的当前位置的 GPS 传感器。可作为替代方案或另外使用其它合适的技术，例如使用从基于小区的无线通信系统（例如 GSM、UMTS、GPRS、WiFi 或 WiMAX）导出的信息。

随后在相关性确定步骤 23 中，所规划路线上的延迟事件中的每一者的相关性。对接收步骤 21 中所接收的所有交通信息进行过滤，以便选择位于所规划路线上的延迟事件。对于所规划路线上的所有延迟事件，计算相关性值。其中，相关性值是基于当前交通工具位置和延迟事件的位置信息。如果例如延迟事件距当前交通工具位置仅几千米远，那么事件极为相关，且将获得高相关性值。如果延迟事件是 200 千米远，那么在交通工具到达所述延迟事件的位置时其可能已经消失。此事件因此较不相关，且将获得较低的相关性值。相关性值可进一步基于由延迟事件引起的预期延迟。一小时延迟比 3 分钟延迟更相关。优选地，相关性值是基于其位置及其相关联的预期延迟的组合。举例来说，几千米远的 3 分钟延迟可能比约 200 千米的 10 分钟延迟更相关，且 20 千米远的一小时延迟可能比下一拐角附近的 3 分钟延迟更重要。

可影响相关性值的其它标准的实例是延迟类型（例如，路障、事故、道路工程、缓慢移动的交通、高峰期）、预期延迟、趋势（例如，增长或缩减）或其它额外信息，例如信息的上一次更新的时刻。优选地，所有标准一起起作用。举例来说，由 300 km 远的高峰期交通阻塞引起的一小时延迟可能不是非常相关。然而，已关闭数天且 500 km 远的隧道是相关延迟事件。

在确定路线上所有延迟事件的相关性值之后，在选择步骤 24 中选择用于传送到用

户的一个或一个以上延迟事件。在通信步骤 25 中仅将选定的事件传送到用户。当仅向用户通知最相关的延迟事件时，用户将不会因较不相关的信息而烦恼。可通过在显示器 11 上展示图形或文本和/或通过经由扬声器 15 将信息提供为口头文本来执行传送延迟事件。当仅显示最相关的事件时，显示器的较大部分仍可用于显示地图、路线信息和其它信息。

在根据本发明的方法的实施例中，延迟事件的选择取决于到延迟事件的距离与由延迟事件引起的延迟的组合。最相关的延迟事件是在附近且引起较长延迟。最不相关的延迟事件是远离的且引起短延迟。对于每一可能的事件距离，可存在使得事件相关的最小延迟。另一方面，对于每一可能的延迟，可存在使得延迟事件相关的最大距离。选择算法可（例如）以如下方式选择用于传送到用户的延迟事件：

如果在路线上仅有一个事件，那么从不隐藏事件（当事件的相关性值低于预定限值时隐藏事件）。

如果到事件的距离短于 15 km，那么从不隐藏事件。

延迟 0-30 秒。=>如果距离>7 km，那么隐藏事件。

延迟 31-90 秒。=>如果距离>15 km，那么隐藏事件。

延迟 1-2 分钟。=>如果距离>30 km，那么隐藏事件。

延迟 2-3 分钟。=>如果距离>45 km，那么隐藏事件。

延迟 3-4 分钟。=>如果距离>60 km，那么隐藏事件。

延迟 4-5 分钟。=>如果距离>75 km，那么隐藏事件。

延迟 5-10 分钟。=>如果距离>150 km，那么隐藏事件。

延迟 10-15 分钟。=>如果距离>200 km，那么隐藏事件。

延迟 15-20 分钟。=>如果距离>250 km，那么隐藏事件。

延迟 20-30 分钟。=>如果距离>300 km，那么隐藏事件。

延迟>30 分钟。=>从不隐藏事件。

图 4 展示导航装置 10 的显示器 11 的示范性视图。显示器 11 展示具有一条或一条以上道路 37 的地图 31。指示符 34 表示交通工具在地图 11 上的当前位置。道路 37 在地图 11 上的部分高亮显示以指示向用户建议的路线 38。信息面板 33 可以另一形式（例如，使用文本和箭头）提供路线信息。信息面板 33 也可展示额外信息，例如电池电力和显示选项。在此实施例中，交通栏 32 用于指示交通信息。所属领域的技术人员将能够使用其它在屏幕上显示交通信息的方式。交通栏 32 包括交通工具图标 35，其表示交通工具的当前位置。优选地，使用相同图标作为地图 31 上的指示符 34，使得用户较容易理

解交通工具图标 35。当规划新的路线且交通工具尚未开始行进时，交通工具图标可由表示路线的开始位置的“前进（Go）”旗标代替。结束图标 36 表示目的地。相同图标可用于表示地图 31 上的目的地。从交通工具图标 35 延伸到结束图标 36 的线表示规划的路线。将路线上的对延迟事件的表示放置于线上。然而在图 3 的情形中，没有报告延迟事件。在以下图中，展示交通栏 32，其包括一个或一个以上延迟事件。应注意，当预期没有延迟事件时，交通栏 32 可完全隐藏。

图 5、6 和 7 展示用于指示交通延迟的交通栏 32 的实例。在图 5 中，仅展示最相关的延迟事件 41。所展示的延迟事件是交通阻塞，其导致 6 分钟延迟且在距交通工具的当前位置 17 km 处开始。距离指示符 43 指示从交通工具到第一相关延迟事件 41 的距离。选定延迟事件 41 在交通栏 32 上的位置与从交通工具到目的地的距离成比例。路线指示符 44 表示交通工具与目的地之间的距离。当延迟事件（例如）在交通工具与目的地之间的中点时，延迟事件 41 展示为在路线指示符 44 的中点。随着交通工具接近延迟事件，由路线指示符 44 表示的路线变得较短，且延迟事件朝向交通工具图标向下滑动。当交通工具已经过选定的延迟事件 41 时，可展示下一最相关的延迟事件。在此实例中，路线指示符的缩放比例是线性的，然而其它选项也是可用的。所述缩放比例也可（例如）为对数。作为选项，可由沿着交通栏显示且指示距交通工具的距离的数字来指示交通栏 32 的缩放比例。

任选地，交通栏的长度可限于仅表示交通信息可用的区域，且可能不展示路线中的交通信息不可用的部分。在交通信息例如由于连接问题而不再是最新的情况下，交通栏可“灰化（greyed out）”，即以不同颜色展示。

在交通栏 32 顶部的总预期延迟指示符 42 指示预期的总延迟。总预期延迟指示符 42 放在结束图标 36 旁边的事实将使得用户更清楚其涉及到的总延迟，因为其很可能在路线的末端与其沿着此路线遇到的总延迟之间做出连接。这将增加可用性。总预期延迟图标 42 中所展示的加号的优点是放在数字的前方以指示此数字指示总延迟，而不是路线上的事件中的一者的延迟。应注意，当然也可以替代方式实施总预期延迟图标 42。总延迟是路线上所有延迟事件的预期延迟的总和。在图 5 中，总延迟是 13 分钟。经选择以进行显示的仅有事件 41 引起 6 分钟延迟。未选择更远和/或引起较少延迟的其它延迟事件进行显示。未展示的延迟事件共同引起 7 分钟的延迟。

交通信息被周期性地更新，其可致使所显示的信息被改变。优选地，如果总预期延迟改变超过预定时间量，那么提供警告消息。举例来说，总预期延迟增加到 14 分钟将不引起警告消息，但当总预期延迟变为高于 18 分钟时，提供警告消息。优选地，将警

告消息提供为可听的信号，使得用户不必重复核查显示器。用户可随后关注于道路，这改善了安全性。最优选地，使用文本到话音转换来提供警告消息，且其包括经更新的总预期延迟。此消息也可含有对用户的关于他是否希望对路线进行优化的询问。如果装置支持语音识别，那么用户可回答所述问题而无需放开方向盘。

在图 6 中，不仅展示最相关延迟事件，而且展示某些其它相关延迟事件。第一相关延迟事件 51 类似于图 5 中的最相关延迟事件 41。同样，事件距离指示符 43 展示交通工具与第一相关事件 51 之间的距离。还选择两个其它相关延迟事件 52、53 用于在交通栏 32 上显示。第二相关延迟事件 52 也是交通阻塞。第三延迟事件 53 是由于道路工程而带来的道路变窄。在此实例中，未展示对这些其它事件 52、53 预期的特定延迟，因为将其确定为较不相关的。然而，在替代实施例中，也可展示这些事件的预期延迟。

图 7a、7b 和 7c 展示解决距离指示符 43 可能太大而无法配合在第一相关延迟事件 41 与交通工具图标 35 之间的问题的三种不同方式。在图 7a 中，通过使距离指示符 43 变小来解决此问题。在图 7b 中，距离指示符 43 在交通工具图标 35 上滑动且交通工具图标 35 不再可见。在图 7c 中，已使路线指示符 44 变小，且距离指示符 43 被显示于交通工具图标 35 下方。

将了解，本发明还延伸到适于将本发明付诸实践的计算机程序，尤其是位于载体上或载体中的计算机程序。所述程序可呈源代码、目标代码、代码中间源与目标代码（例如经部分编译的形式）的形式，或呈适合用于实施根据本发明的方法的任何其它形式。还将了解，此程序可具有许多不同的结构设计。举例来说，可将实施根据本发明的方法或系统的功能性的程序代码细分为一个或一个以上子例程。所属领域的技术人员将明白将功能性分布在这些子例程之间的许多不同方式。子例程可一起存储在一个可执行文件中以形成自含程序。此可执行文件可包括计算机可执行指令，例如处理器指令和/或解释程序指令（例如，Java 解释程序指令）。或者，子例程中的一者或一者以上或全部可存储在至少一个外部库文件中且与主程序静态或动态地（例如，在运行时间）链接。主程序含有对子例程中的至少一者的至少一个调用。而且，子例程可包括相互的函数调用。与计算机程序产品有关的实施例包括对应于所陈述的方法中的至少一者的处理步骤中的每一者的计算机可执行指令。可将这些指令细分为子例程和/或存储在可静态或动态地链接的一个或一个以上文件中。与计算机程序产品有关的另一实施例包括对应于所陈述的系统和/或产品中的至少一者的构件中的每一者的计算机可执行指令。可将这些指令细分为子例程和/或存储在可静态或动态地链接的一个或一个以上文件中。

计算机程序的载体可为能够携载程序的任何实体或装置。举例来说，载体可包含存

储媒体，例如 ROM（例如，CD ROM 或半导体 ROM）或磁性记录媒体（例如，软盘或硬盘）。此外，载体可为可传输载体，例如电或光信号，其可经由电缆或光缆或通过无线电或其它构件进行传递。当程序包含于此信号中时，载体可由此电缆或其它装置或构件构成。或者，载体可为其中嵌入有程序的集成电路，所述集成电路适于执行或用于执行相关方法。

应注意，上述实施例说明而不是限制本发明，且在不脱离所附权利要求书的范围的情况下，所属领域的技术人员将能够设计许多替代实施例。在权利要求书中，置于圆括号之间的任何参考符号都不应被解释为对权利要求的限制。动词“包括”及其词性变化的使用不排除除权利要求书中所陈述的元件或步骤以外的元件或步骤的存在。元件之前的冠词“一”不排除多个此类元件的存在。可借助于包括若干不同元件的硬件并借助于经适当编程的计算机来实施本发明。在列举若干构件的装置项中，这些构件中的若干者可由硬件的同一个项目来实施。某些措施是在相互不同的从属权利要求中陈述的事实并不指示这些措施的组合无法用于带来优点。

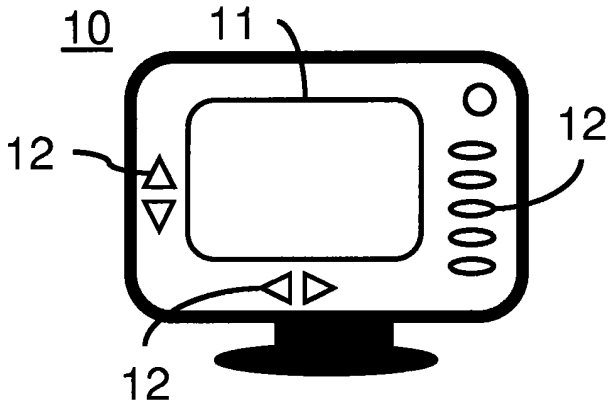


图1

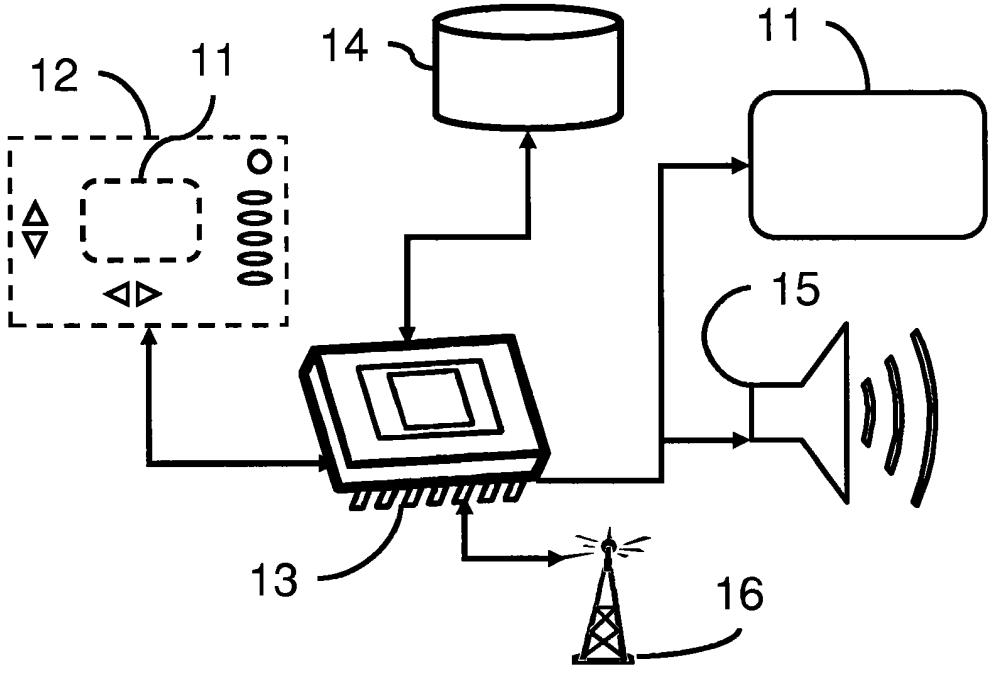


图2

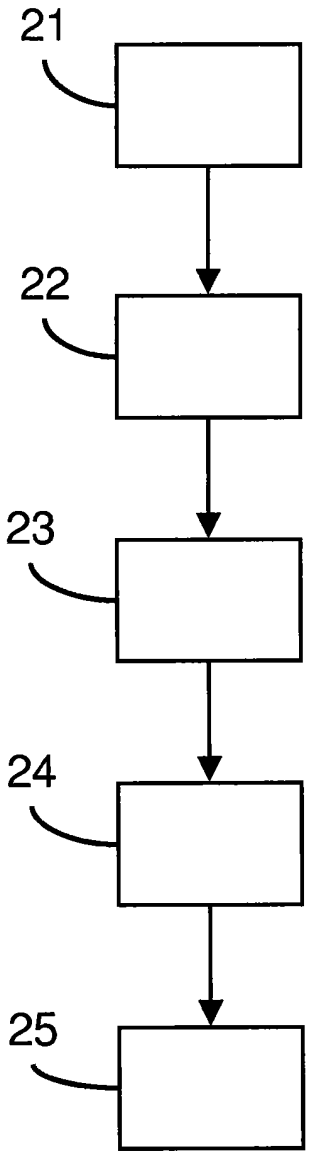


图3

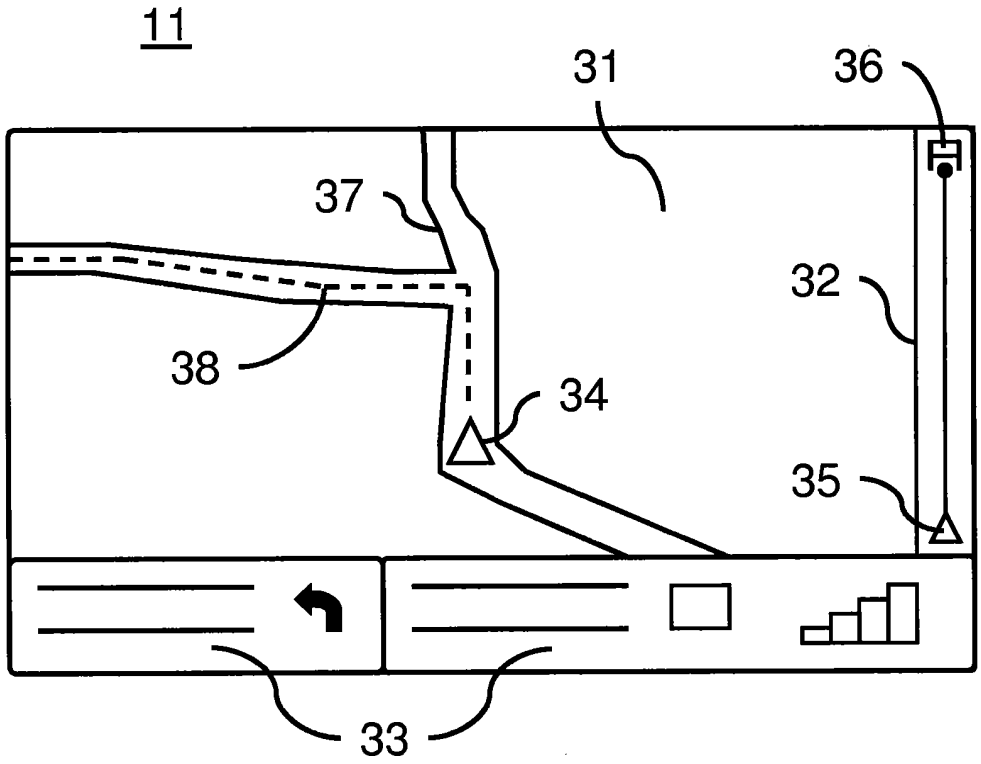


图4

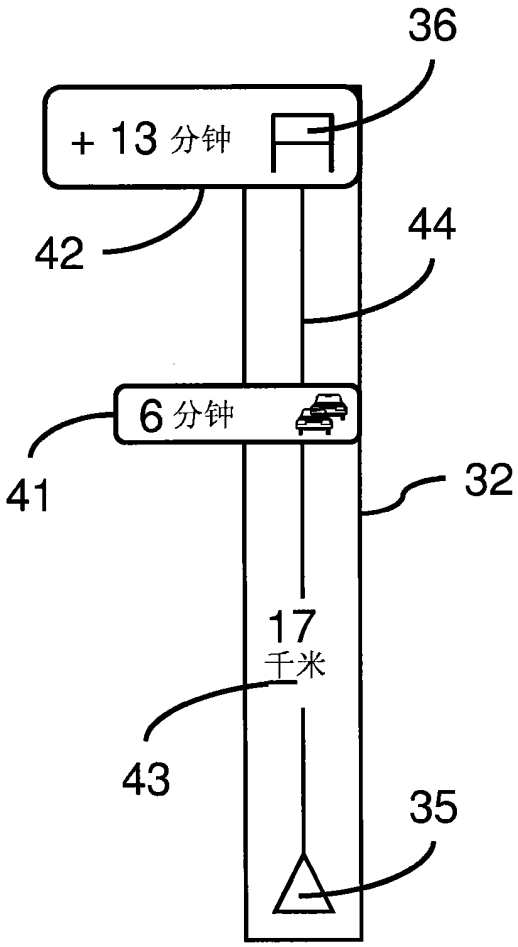


图5

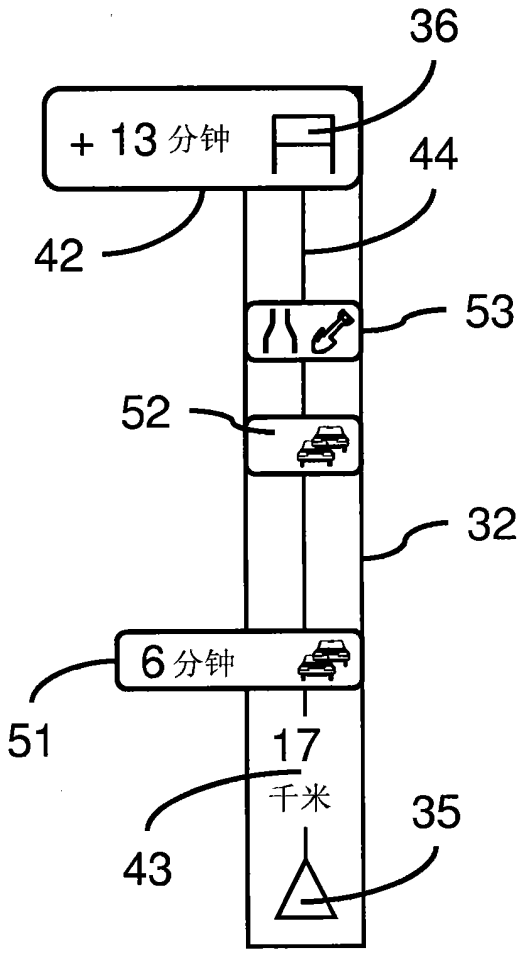


图6

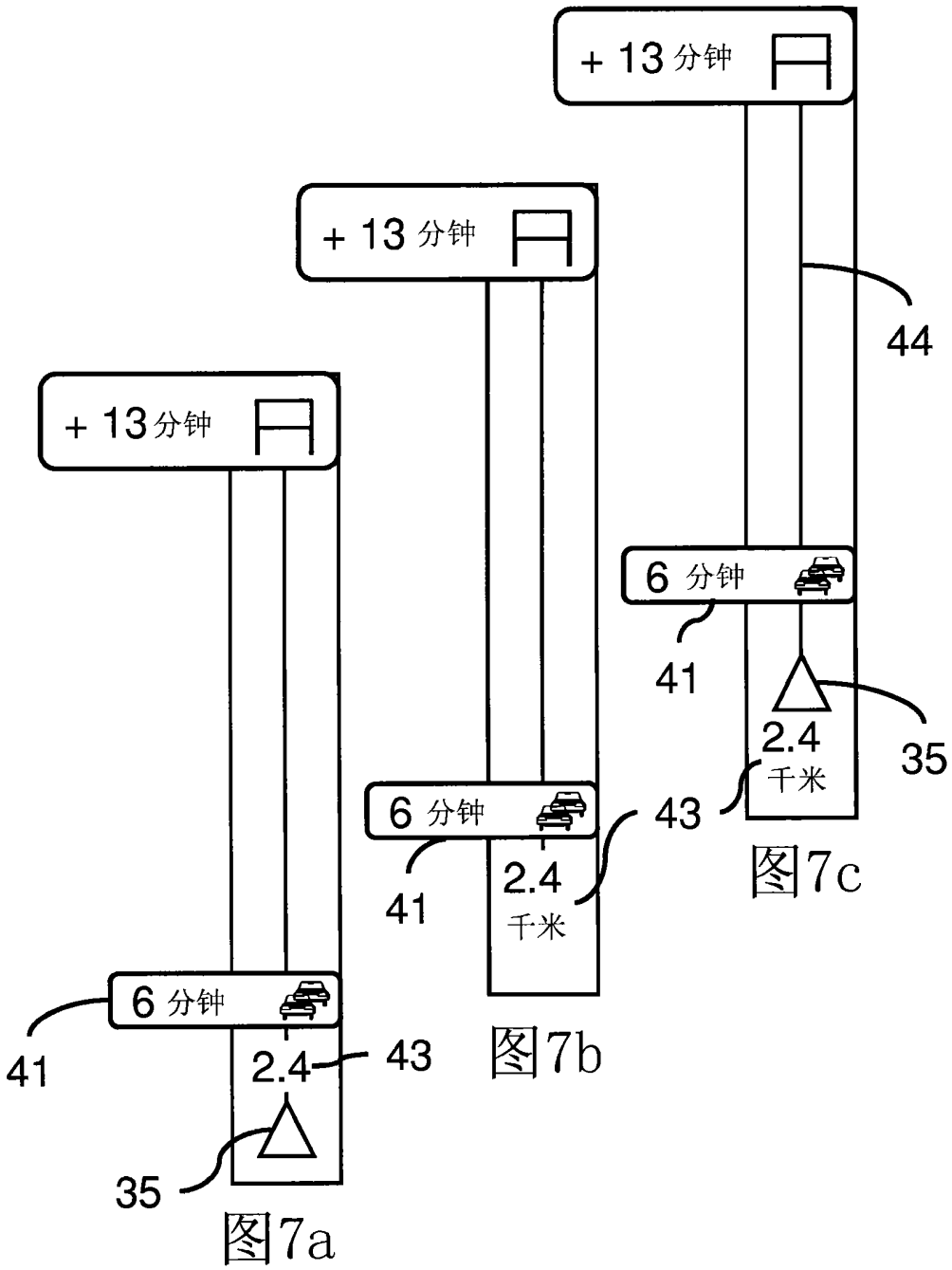


图7a 图7b 图7c