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(54) Title: ROAD TRAFFIC OPTIMIZATION SYSTEM

FIG. 1
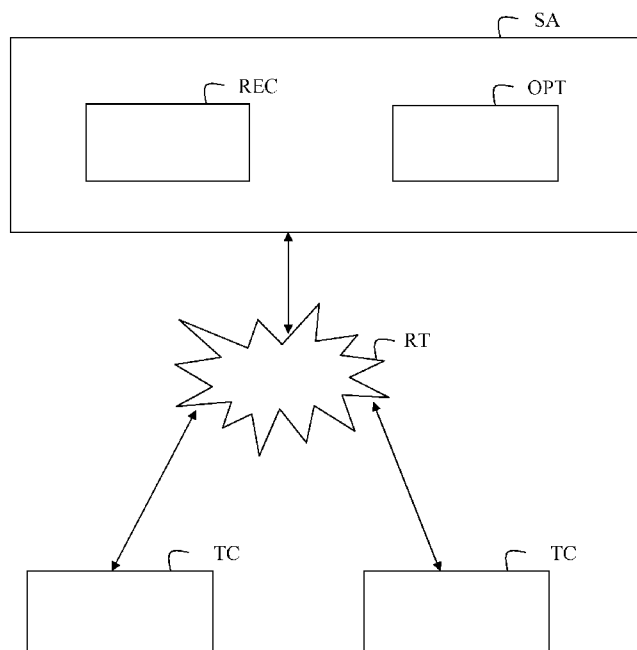
(57) Abstract: To optimize road traffic within an application server (SA) providing itineraries recommended to users connected to said application server from communication terminals (TC), each recommended itinerary being provided to a user based on a profile of the user containing the departure date or arrival date, the departure location and the arrival location, the application server compares the itineraries recommended to users whose indicated departure date belongs to a given interval time, produces a set of users whose corresponding recommended itineraries have at least one itinerary segment of given length in common, and modifies an itinerary recommended to at least one user who belongs to said set of users.

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

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ROAD TRAFFIC OPTIMIZATION SYSTEM

The present invention relates to a road traffic optimization system.

5   Currently, the road traffic in metropolitan areas is becoming increasingly congested. There is therefore a need to assist users in choosing the right itinerary and right moment to leave, taking into account their constraints and their preferences.

Current itinerary recommendation tools only look at the state of road 10   traffic, and recommend itineraries that avoid congested road portions.

To remedy the aforementioned drawbacks, a method for optimizing road traffic within an application server providing recommended itineraries to users connected to said application server from communication terminals, each 15   recommended itinerary being provided to a user based on a user profile containing the departure or arrival date, and the departure and arrival location, comprises the following steps within the application server:

comparing the itineraries recommended to users whose starting date belongs to a given interval of time,

20   producing a set of users whose compared recommended itineraries have at least one itinerary segment of given length in common, and

modifying an itinerary recommended to at least one user belonging to said set of users.

Advantageously, the invention makes it possible to make road traffic more 25   fluid by suggesting different itineraries or different departure dates to the users, while fulfilling their preferences and constraints. For example, in an exceptional situation in which heavy snow is falling, users who want to know whether they should go home or stay at work can be assisted regarding the right itinerary to take or the right moment to leave, in order to avoid bottlenecks that are often created 30   when many people are on the same roads at the same time.

According to another feature of the invention, said itinerary segment may additionally have the feature of comprising portions of roads that have a risk of being congested with road traffic. Furthermore, potential congestions of road segments may be identified after the users are grouped.

According to another feature of the invention, said itinerary segment may be determined based on information retrieved by the application server regarding the state of road traffic and the state of the roads.

According to another feature of the invention, said set of users may 5 contain a minimum number of users whose compared recommended itineraries have an itineraries segment with minimum length in common.

According to another feature of the invention, the recommended itinerary may be modified by changing the starting date or by changing at least one segment of the itinerary.

10 According to another feature of the invention, the recommended itinerary may be modified based on preferences and restrictions related to the user's profile.

According to another feature of the invention, the itineraries recommended to the users may be updated by the application server based on at least one actual departure date indicated by a user.

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The invention also pertains to an application server for optimizing road traffic providing recommended itineraries to users connected to said application server from communication terminals, each recommended itinerary being provided to a user based on a profile of the user containing the departure date or arrival 20 date, the departure location or arrival location, the application server comprising:

means for comparing the itineraries recommended to the users whose departure date belongs to a given interval of time,

means for producing a set of users whose compared recommended itineraries have at least one itinerary segment of given length in common, and

25 means for modifying an itinerary recommended to at least one user belonging to said set of users.

The invention additionally pertains to a computer program capable of being implemented within a server or within a network of servers within a cloud 30 computing environment, said program comprising instructions which, when the program is executed within said server, carry out the steps of the inventive method.

The present invention and the benefits thereof shall be better understood upon examining the description below, which makes reference to the attached figures, in which:

- Figure 1 is a schematic block diagram of a communication system

5   according to one embodiment of the invention,

- Figure 2 is an algorithm of a method for optimizing road traffic according to one embodiment of the invention.

With reference to figure 1, a communication system according to the invention

10   comprises an application server SA and at least one communication terminal TC, capable of communicating with one another through a telecommunication network RT.

The telecommunication network RT may be a wired or wireless network, or a combination of wired and wireless networks.

15   In one example, the telecommunications network RT is a high-speed IP ("Internet Protocol") packet network, such as the Internet or an intranet.

In another example, the telecommunications network RT is an ATM ("Asynchronous Transfer Mode") or TDM ("Time Division Multiplexing") network or a private network specific to a company supporting a proprietary protocol.

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A communication terminal TC of a user is connected to the application server SA over the telecommunications network RT.

In one example, a communication terminal is a personal computer directly linked by modem to an xDSL ("Digital Subscriber Line") or ISDN ("Integrated

25   Services Digital Network") link connected to the telecommunication network RT.

In another example, a communication terminal is a mobile cellular radiocommunication terminal, linked by a radiocommunication channel to the telecommunication network, for example of the GSM ("Global System for Mobile communications") or UMTS ("Universal Mobile Telecommunications System") type,

30   potentially using the protocol HSDPA ("High Speed Downlink Packet Access").

In another example, a communication terminal comprises an electronic telecommunication device or object that may be a personal digital assistant (PDA) or a smartphone, capable of being connected to an antenna on a public wireless local area network WLAN, a network using the 802.1x standard, or a wide area

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network using the WIMAX ("World wide Interoperability Microwave Access") protocol, connected to the telecommunication network.

The application server SA is a server providing a road itinerary
5   recommendation service to users connected to said application server from communication terminals TC.

The application server SA comprises a recommendation module REC and an optimization module OPT. In the remainder of the description, the term module may designate a device, a software program, or a combination of computer
10   hardware and software, configured to execute at least one particular task.

The recommendation module REC retrieves information about various users, and particularly a profile for each user.

In his or her profile, the user indicates, for example, the starting or arrival date, and the starting or arrival location. The user may further impose constraints
15   such as an itinerary without tolls, or without major highways, or the shortest or fastest itinerary. The user may further impose constraints on the type of vehicle used, which may, for example, be a motor vehicle or non-motor vehicle, with two, three, or four wheels. It is assumed that the departure or arrival date may be specified in days, hours, and minutes.

20   The recommendation module REC further retrieves information about the state of road traffic, such as the current road congestion situation and road congestion forecasts assisted by statistics and historical data.

The recommendation module REC may further retrieve information about the weather, such as the current weather and weather forecasts, and information
25   about the state of the roads, which may be dry, wet, or slippery, for example.

The recommendation module REC provides an itinerary recommended to the user based on the user's profile, particularly containing the departure or arrival date, the departure location or arrival location, and additionally, based on information retrieval regarding the state of road traffic or the state of the roads.

30   The optimization module OPT compares the itineraries recommended to users whose indicated departure date belongs to a given interval time. The optimization module OPT produces a set of users whose corresponding recommended itineraries have at least one itinerary segment of given length in common. Said itinerary segment is determined based on information retrieved by

the recommendation module REC, such as information about the state of road traffic and the state of the roads. It is a further feature of said segment to comprise road portions that have a risk of being congested with road traffic, particularly after the users are grouped together. The grouping of users makes it possible to tell how

5   many users might be included together on an itinerary segment, in order to verify whether the segment might be congested or not. The risk that an itinerary segment might be congested may therefore be defined based on the number of users plan on that segment and based on the road congestion forecasts assisted by statistics and historical data. It is assumed that said set of users contains a minimum number

10   of users whose compared recommended itineraries have an itinerary segment with a minimum length in common.

The optimization module OPT modifies, if warranted, an itinerary recommended to at least one user belonging to said set of users. The recommended itinerary may therefore be modified by changing the departure date

15   or by changing at least one segment of the itinerary, i.e. a road portion. The recommended itinerary may further be modified based on the user's preferences and constraints.

Optionally, users may indicate their actual departure date, for example by

20   sending a message to the application server SA from their communication terminal TC. According to one embodiment, an application may be installed in the communication terminal TC which is, for example, a "smartphone" mobile telephone that automatically communicates the departure date to the application server, using a means of geolocation and which further communicates the user's

25   current geographic position. The application server SA may then take this information into account in order to update the recommended itineraries and said sets of users. The optimization module OPT may also take into account a user who did not follow the recommended itinerary with the departure date.

The optimization module OPT can also identify any bottlenecks following

30   the grouping of the users on an itinerary segment and based on additional information on the state of road traffic.

The optimization module OPT thereby dynamically produces sets of users whose corresponding recommended itineraries have at least one itinerary segment

of given length in common, and that take into account in real time the information provided by users and retrieved about the users.

With reference to Figure 2, a method for optimizing road traffic according to one embodiment of the invention comprises steps E1 to E5 executed automatically within the communication system.

In step E1, a user connects to the application server SA from a communication terminal TC. The user is invited to fill out a profile, indicating the desired departure or arrival date, the departure location and arrival location, and additionally indicating constraints such as an itinerary without tolls, or without major highways, or the shortest or fastest itinerary.

In step E2, the recommendation module REC of the application server SA provides an itinerary recommended to the user based on the user's profile.

Steps E1 and E2 are thereby followed for each of the users who connect to the application server SA.

In step E3, the optimization module OPT of the application server SA compares itineraries recommended to various users whose indicated departure date belongs to a given interval of time.

In step E4, the optimization module OPT produces a set of users whose corresponding recommended itineraries have at least one itinerary segment of given length in common. Said itinerary segment has the feature of comprising road portions that have a risk of being congested with road traffic, and is additionally determined based on information retrieved by the application server regarding the state of road traffic and/or the state of the roads.

The optimization module OPT thereby seeks to find at least one road portion that has a minimum length which is subject to bottlenecks and thereby determines said set of uses so that it contains a minimum number of users who planned to take that road portion.

In step E5, the optimization module OPT modifies an itinerary recommended to at least one user who belongs to said set of users, the recommended itinerary being modified by changing the departure date or by changing at least one itinerary segment. Thus, by modifying several recommended itineraries, the application server SA reduces the risks of road traffic congestion for

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the itineraries recommended to users. The user may be selected for an itinerary modified based on his or her preferences and constraints.

5   The invention described here pertains to a method and server for optimizing road traffic. According to one embodiment of the invention, the steps of the inventive method are determined by the instructions of a computer program incorporated into a server, such as the application server SA. The program comprises program instructions that, when said program is loaded and executed within the server, carry out the steps of the inventive method. According to another

10   implementation of the invention, the steps of the inventive method are determined by the instructions of a computer program partially incorporated into a server of a server network. The program comprises program instructions, which when said program is loaded and executed at least partially in at least one server of the server network, carry out the steps of the inventive method. In this embodiment,

15   each server of the server network has features similar to those of the application server SA.

Consequently, the invention also applies to a computer program, particularly a computer program on or within an information medium, suitable to implement the invention. This program may use any programming language, and

20   be in the form of source code, object code, or intermediate code between source code and object code, such as in a partially compiled form, or in any other form desirable for implementing the inventive method.

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CLAIMS

1.   A method for optimizing road traffic within an application server (SA) providing recommended itineraries to users connected to said application server from communication terminals (TC), each recommended itinerary being provided to a user based on a user profile containing the departure or arrival date, and the departure and arrival location, comprises the following steps within the application server (SA):

comparing (E3) the itineraries recommended to users whose starting date belongs to a given interval of time,

producing (E4) a set of users whose compared recommended itineraries have at least one itinerary segment of given length in common, and

modifying (E5) an itinerary recommended to at least one user belonging to said set of users.

2.   A method according to claim 1, whereby said itinerary segment also has the feature of comprising road portions that have a risk of being congested with road traffic.

3.   A method according to claim 1 or 2, whereby said itinerary segment is determined based on information retrieved by the application server regarding the state of road traffic and the state of the roads.

4.   A method according to one of the claims 1 to 3, whereby said set of users contains a minimum number of users whose compared recommended itineraries have an itinerary segment with a minimum length in common.

5.   A method according to one of the claims 1 to 4, whereby the recommended itinerary is modified by changing the departure date or by changing at least one segment of the itinerary.

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6.   A method according to one of the claims 1 to 5, whereby the recommended itinerary is modified based on preferences and constraints related to the user's profile.

7.   A method according to one of the claims 1 to 6, whereby the itineraries recommended to users are updated by the application server (SA) based on at least one actual departure date indicated by a user.

8.   An application server (SA) to optimize road traffic providing recommended itineraries to users connected to said application server from communication terminals (TC), each recommended itinerary being provided to a user based on a profile of the user containing the departure date or arrival date, the departure location or arrival location, the application server (SA) comprising:

        means (OPT) for comparing the itineraries recommended to the users whose departure date belongs to a given interval of time,

        means (OPT) for producing a set of users whose compared recommended itineraries have at least one itinerary segment of given length in common, and

        means (OPT) for modifying an itinerary recommended to at least one user belonging to said set of users.

9.   A computer program capable of being implemented within an application server (SA) to optimize road traffic, said application server (SA) providing itineraries recommended to users connected to said application server from communication terminals (TC), each recommended itinerary being provided to a user based on a profile of the user containing the departure date or arrival date, the departure location and the arrival location, said program comprising instructions which, when the program is loaded and executed within said application server (SA), carry out the following steps:
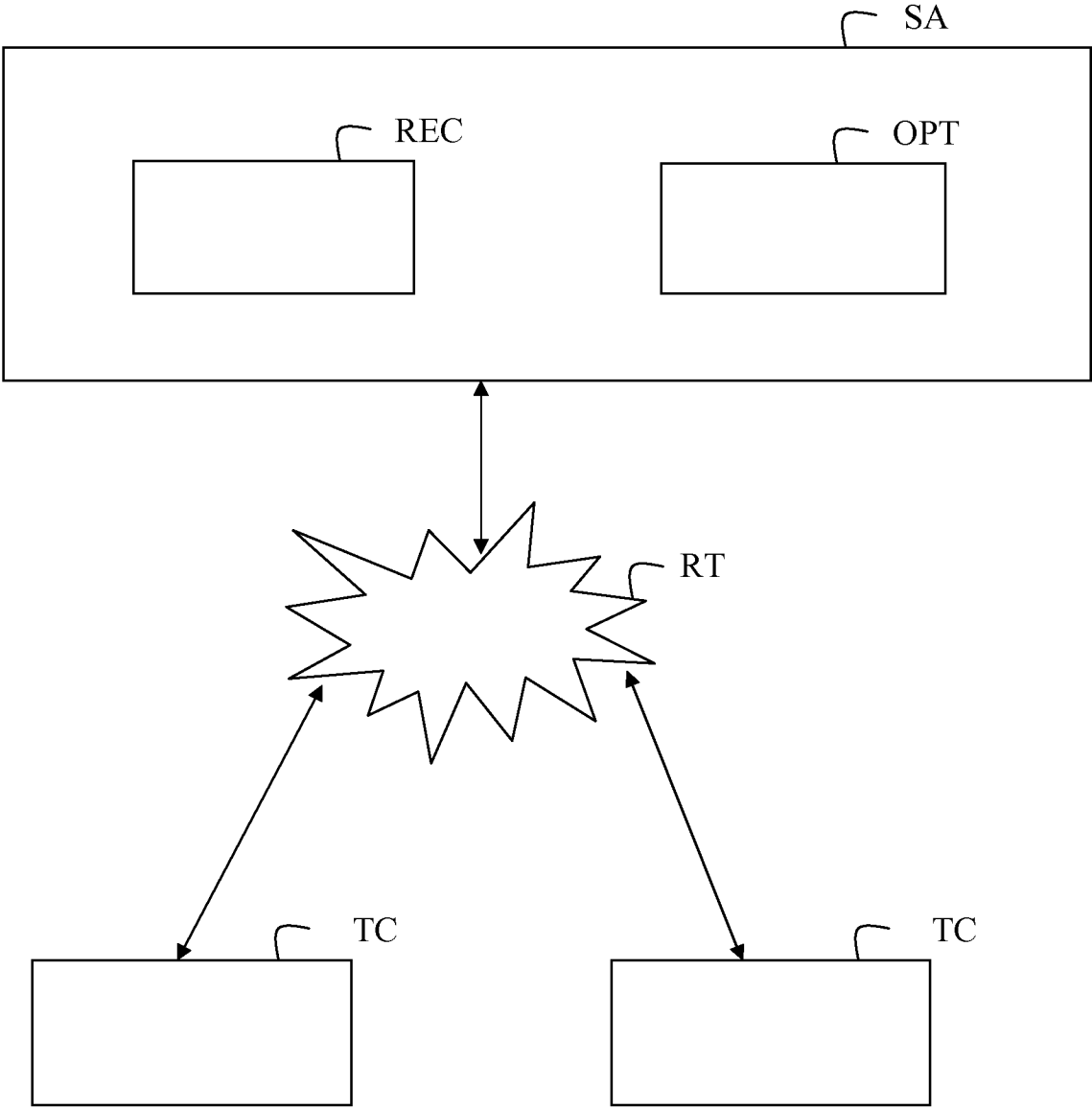
        comparing (E3) the itineraries recommended to users whose starting date belongs to a given interval of time,

        producing (E4) a set of users whose compared recommended itineraries have at least one itinerary segment of given length in common, and
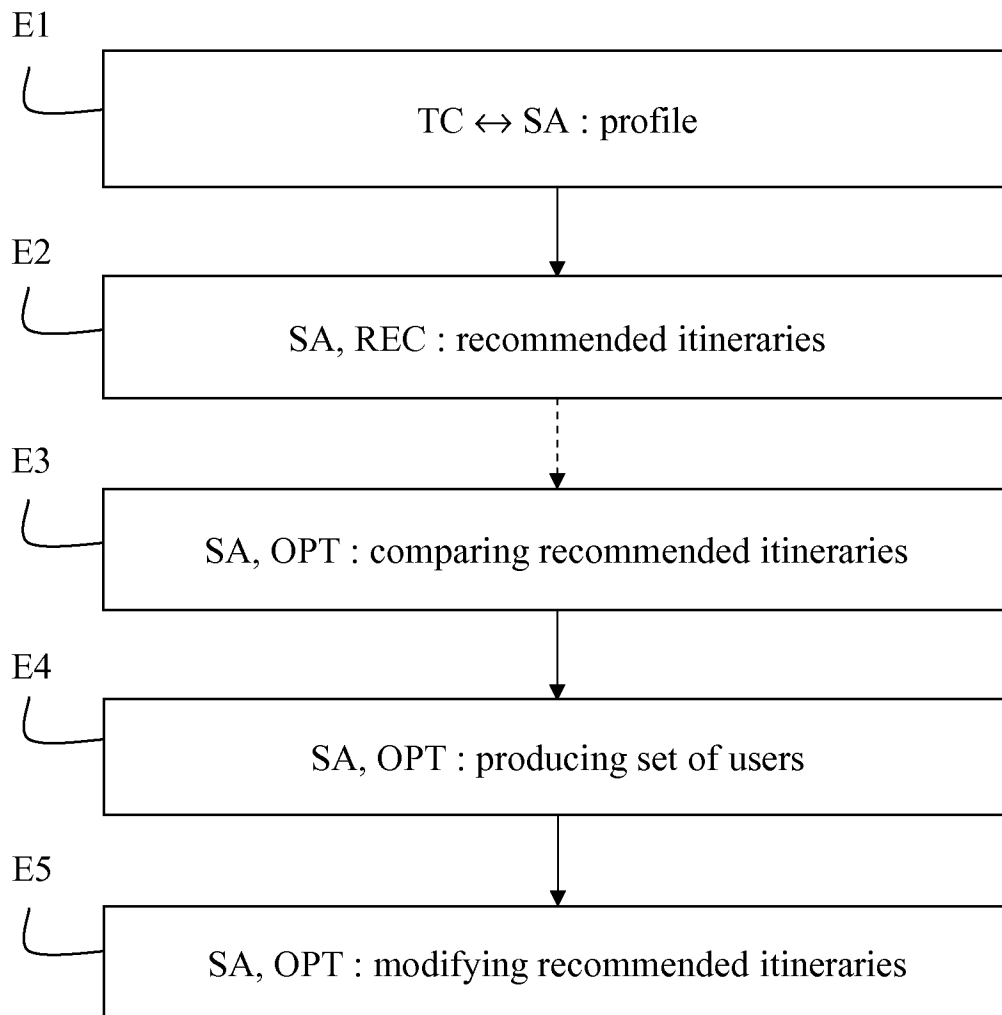
        modifying (E5) an itinerary recommended to at least one user belonging to said set of users.

10.   A computer program for optimizing road traffic via a server network
providing itineraries recommended to users connected at least to a server of the
server network from communication terminals (TC), each recommended itinerary
being provided to a user based on a profile of the user containing the departure or
arrival date, the departure location and arrival location, said program comprising
instructions that, when the program is loaded and executed at least partially in at
least one server of the server network, carry out the following steps:

comparing (E3) the itineraries recommended to users whose starting date
belongs to a given interval of time,

producing (E4) a set of users whose compared recommended itineraries
have at least one itinerary segment of given length in common, and

modifying (E5) an itinerary recommended to at least one user belonging to
said set of users.

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FIG. 1

2/2
FIG. 2

E1

TC ↔ SA : profile

E2

SA, REC : recommended itineraries

E3

SA, OPT : comparing recommended itineraries

E4

SA, OPT : producing set of users

E5

SA, OPT : modifying recommended itineraries

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. G08G1/0968
ADD.

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)

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	WO 01/88480 A1 (YEOMAN GROUP PLC [GB]; HANCOCK SIMON GEOFFREY [GB]; AGNEW HUGH JOHN [G) 22 November 2001 (2001-11-22) page 2, line 11 - line 28 page 5, line 21 - page 6, line 13 page 8, line 7 - page 9, line 16 page 10, line 3 - page 11, line 5 page 15, line 21 - page 16, line 12 page 17, line 4 - page 18, line 1 ----- -/--	1-9

[X] Further documents are listed in the continuation of Box C.　　　[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"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

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 November 2012	06/12/2012

| Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016 | Authorized officer Bourdier, Renaud |

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
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INTERNATIONAL SEARCH REPORT

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