(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 608 184 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
26.06.2013 Bulletin 2013/26

(51) Int Cl.:
G08G 1/14 *(2006.01)* ***G06Q 10/02*** *(2012.01)*

(21) Application number: **11290607.8**

(22) Date of filing: **23.12.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **France Télécom**
75015 Paris (FR)

(72) Inventor: **Grau Heredia, Jesus**
08025 Barcelone (ES)

(74) Representative: **Regimbeau**
20, rue de Chazelles
75847 Paris Cedex 17 (FR)

(54) Method and device for allocating a parking place

(57) A method and a device for allocating, to a user, a parking place for a vehicle. , the user being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the method comprising: allocating a first parking place to a user in a response to a first parking request received from a user terminal device of the user, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user; modifying the parking score of the user in response to a predetermined parking event; and allocating a second parking place to the user based on the modified parking score.

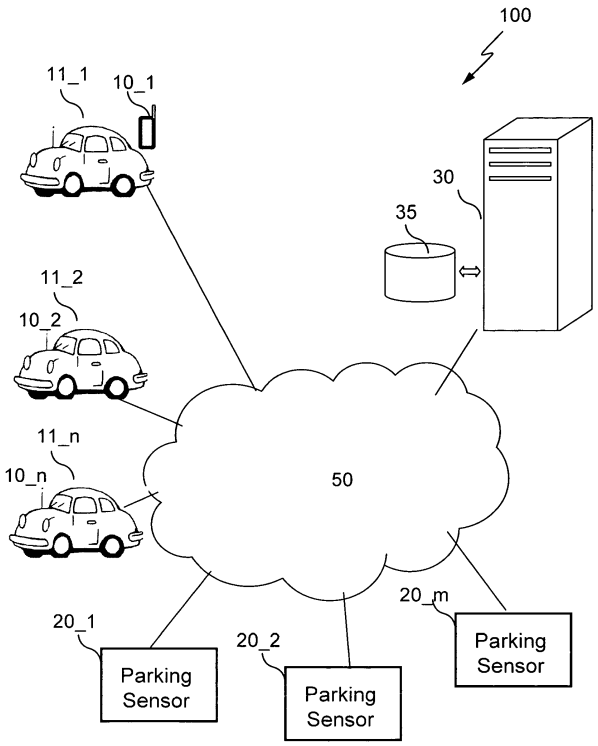

Fig. 1

EP 2 608 184 A1

Description

[0001] The present invention concerns a method and a device for allocating, to a user, a parking place for a vehicle.

[0002] As urban areas become more and more congested, finding parking places for vehicles in metropolitan regions is becoming an increasing challenge for motorists. Even when parking places are available it becomes difficult for a driver of a vehicle to know where the available parking places are located. Much time is often wasted driving around looking for available parking places, leading to frustration and stress. In areas unfamiliar with a driver finding the locations of geographical location of potential parking places becomes more troublesome. Moreover, some parking places are more favourable to a motorist than others, for example they are located closer to the driver's ultimate destination, they have less or no restrictions in terms of allowed length of stay and/or parking charges.

[0003] Some solutions have been envisaged for providing motorists information on available parking places. For example US 2005/0280555 describes a parking management system for aiding drivers in finding parking places. However, such systems suffer the drawbacks that the some allocated parking places may be less favourable than others in terms of availability. For example, a motorist may turn up at an allocated location and realise that the allocated parking place is no longer available.

[0004] The present invention has been devised to address one or more of the foregoing concerns.

[0005] According to a first aspect of the invention there is provided a method of allocating, to a user, a parking place for a vehicle , the user being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the method comprising: allocating a first parking place to a user in a response to a first parking request received from a user terminal device of the user, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user; modifying the parking score of the user in response to a predetermined parking event; and allocating a second parking place to the user based on the modified parking score.

[0006] In an embodiment, the predetermined parking event comprises the allocated first parking place not being available, and the method includes receiving, from the user terminal, notification data indicating that the allocated first parking place is not available for the vehicle of the user; wherein the parking score is modified to a parking score indicative of a more favourable ranking; and the second parking place is allocated to replace the first allocated parking place based on the first parking request.

[0007] In an embodiment, the predetermined parking event comprises the allocated first parking place not corresponding to one or more indicated requirements of the user, and the method includes receiving, from the user terminal, notification data indicating that the allocated first parking place is not suitable; wherein the parking score is modified to a parking score indicative of a more favourable ranking; and the second parking place is allocated to replace the first allocated parking place based on the first parking request.

[0008] In an embodiment, the predetermined parking event comprises the vehicle of said user being detected as remaining in the allocated first parking place for a time duration exceeding a predetermined time duration, the parking score is modified to a parking score indicative of a less favourable ranking; and the second parking place is allocated in response to a second parking request.

[0009] According to a second aspect of the invention there is provided a method of requesting allocation of a parking place for a vehicle, the user of the vehicle being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the method comprising: transmitting, from a user terminal to a server device, data representative of a request for allocation of a parking place; receiving from the server device, data identifying a first parking place allocated to said user in response to the request, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user; and in response to a predetermined parking event transmitting a notification to the server device, for modification of the parking score of the user based on the predetermined parking event; receiving, data identifying a second parking place allocated to said user, the allocation of the second parking place being based on the modified parking score.

[0010] In an embodiment, the predetermined parking event comprises the allocated first parking place not being available for the vehicle of the user, and the method includes transmitting, from the user terminal to the server device, notification data indicating that the allocated first parking place is not available; wherein the modified parking score corresponds to a parking score indicative of a more favourable ranking; and the second parking place allocated replaces the first allocated parking place based on the first parking request.

[0011] In an embodiment, the predetermined parking event comprises the allocated first parking place not corresponding to one or more indicated requirements of the user, and the method includes transmitting, from the user terminal to the server device, notification data indicating that the allocated first parking place is not suitable; wherein the modified parking score corresponds to a parking score indicative of a more favourable ranking; and the second parking place allocated replaces the first allocated parking place based on the first parking re-

quest.

[0012] In an embodiment, the predetermined parking event comprises the vehicle of said user being detected as remaining in the allocated first parking place for a time duration exceeding a predetermined time duration, and wherein the modified parking score corresponds to a parking score indicative of a less favourable ranking; and the second parking place is allocated in response to a transmitted second parking request.

[0013] According to a third aspect of the invention there is provided a parking place allocation device for allocating, to a user, a parking place for a vehicle, the user being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the method comprising: a receiver for receiving a first parking request from a user terminal device of the user; a parking place allocator configured to allocate a first parking place to a user in a response to the received first parking request, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user; a parking score modifier configured to modify the parking score of the user in response to a predetermined parking event; wherein the parking place allocator is further configured to allocate a second parking place to the user based on the modified parking score.

[0014] In an embodiment, the predetermined parking event comprises the allocated first parking place not being available for the vehicle of the user, and wherein the receiver is operable to receive, from the user terminal, notification data indicating that the allocated first parking place is not available; wherein the parking score modifier is configured to modify the parking score associated with the user to a parking score indicative of a more favourable ranking; and the parking place allocator is operable to allocate the second parking place to replace the first allocated parking place based on the first parking request.

[0015] In an embodiment, the predetermined parking event comprises the allocated first parking place not corresponding to one or more indicated requirements of the user, wherein the receiver is operable to receive, from the user terminal, notification data indicating that the allocated first parking place is not suitable; the parking score modifier is configured to modify the parking score associated with the user to a parking score indicative of a more favourable ranking; and the parking place allocator is operable to allocate the second parking place to replace the first allocated parking place based on the first parking request.

[0016] In an embodiment, the predetermined parking event comprises the vehicle of said user being detected as remaining in the allocated first parking place for a time duration exceeding a predetermined time duration, the parking score modifier is configured to modify the parking score associated with the user to a parking score indicative of a less favourable ranking; and the parking place allocator is operable to allocate the second parking place in response to a received second parking request.

[0017] According to a fourth aspect of the invention there is provided a user terminal device for requesting allocation of a parking place for a vehicle, the user of the vehicle being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the device comprising: a transceiver configured to transmit, to a server device, data representative of a request for allocation of a parking place, and to receive, data identifying a first parking place allocated to said user in response to the request, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user; and notification means for transmitting a notification to the server device in response to a predetermined parking event, for modification of the parking score of the user based on the predetermined parking event; receiving, data identifying a second parking place allocated to said user, the allocation of the first parking place being based on the modified parking score.

[0018] The user terminal may be configured in accordance with any of the above mentioned embodiments.

[0019] At least parts of the methods according to the invention may be computer implemented. Accordingly, the present invention may take the form of an entirely hardware embodiment, an entirely software embodiment (including firmware, resident software, micro-code, etc.) or an embodiment combining software and hardware aspects that may all generally be referred to herein as a "circuit", "module" or "system". Furthermore, the present invention may take the form of a computer program product embodied in any tangible medium of expression having computer usable program code embodied in the medium.

[0020] Since the present invention can be implemented in software, the present invention can be embodied as computer readable code for provision to a programmable apparatus on any suitable carrier medium. A tangible carrier medium may comprise a storage medium such as a floppy disk, a CD-ROM, a hard disk drive, a magnetic tape device or a solid state memory device and the like. A transient carrier medium may include a signal such as an electrical signal, an electronic signal, an optical signal, an acoustic signal, a magnetic signal or an electromagnetic signal, e.g. a microwave or RF signal.

[0021] Embodiments of the invention will now be described, by way of example only, and with reference to the following drawings in which:-

Figure 1 is a schematic diagram of a parking management system in accordance with one or more embodiments of the invention;

Figure 2 is a functional block diagram of a user terminal in accordance with at least one embodiment of the invention;

Figure 3 is a functional block diagram of a parking management server in accordance with at least one embodiment of the invention;

Figure 4 is a flow chart illustrating steps of a method for allocating parking places to a user according to at least one embodiment of the invention;

Figure 5 is a flow chart illustrating steps of a method for requesting allocation of a parking place according to at least one embodiment of the invention; and

Figure 6 is a flow chart illustrating steps of a method for allocation of parking places in accordance with a particular embodiment of the invention.

[0022] Figure 1 illustrates a parking management system 100 according to one or more embodiments of the invention may be implemented. The parking management system 100 comprises a plurality of user terminal devices 10_1, 10_2, ...10_n associated with users of vehicles 11_1,11_2, ...11_n, respectively, and a plurality of parking sensor devices 20_1, 20_2, ...20_m each associated with one or more parking places. The parking management system also includes a parking management server 30 and a parking management database 35 storing data representative of parking place information and user profile data. The parking place information may include data such as geographical location of parking places, availability of parking places, importance ranking of parking places, associated parking restrictions, associated parking costs, size of parking place, parking places accessibility, whether or not a parking place is a disabled parking place.

[0023] The user profile data characterises the different users of the system and includes a parking score associated with a respective user, user preferences in terms of parking places, for example, the maximum distance a user wishes to be from his ultimate destination, the maximum parking costs the user is willing to pay, and user requirements such as size of his or her vehicle, the need for access to disabled parking places.

[0024] The devices of the parking management system 100 communicate by means of a data communication network 50. The data communication network may be a wireless network, a fixed network or a combination of fixed and wireless networks. For example a user terminal device 10_1 may communicate with parking management server 30 by means of a 3G communication link.

[0025] The user terminal devices 10_1, 10_2, 10_3 .... 10_n may be part of the equipment of the vehicles 11_1, 11_2, 11_3....11_n, or may be a mobile user device such as a smart phone, portable computer, personal assistant or the like.

[0026] A user terminal device 10_1 according to an embodiment of the invention is schematically illustrated in the functional block diagram of Figure 2.

[0027] While separate functions are represented in Figure 2 as separate modules, it will be appreciated that several functions may be combined in one or more modules.

[0028] The user terminal device according to the embodiment of the invention comprises a central processing unit (CPU) 106 configured to execute instructions from a program ROM (not shown) on powering up of the device 10_1, and to execute instructions relating to software applications of the device 10_1. Such software applications may include a software application for implementing methods according to embodiments of the invention such as a parking request application 105 for requesting allocation of a parking place and for indicating unavailability of an allocating parking place. The instructions of the various software applications may be read by the CPU 106 from a main memory 108 after powering up of the device 100. The main memory 108 may be a Random Access Memory (RAM) operating as a working area of the CPU 106. Instructions of a software application may be loaded into the main memory 108 from a hard-disc (not shown) or the program ROM for example. A software application in accordance with embodiments of the invention, when executed by the CPU 106, causes the steps of one or more methods of embodiments of the invention to be performed on the device. The memory 108 may be configured to store data representative of parking scores and parking place information as will be described in what follows.

[0029] The device 10_1 further includes a user interface 102 for receiving instructions input by a user for controlling execution of software instructions by the CPU 106 and various application modules and a display 104 for displaying data.

[0030] The user terminal device 10_1 further includes a network interface 107 enabling connection of the device 10_1 to the data communication network 50 by a wireless connection such as a 3G type connection. The software application when executed by the CPU is adapted to receive data streams through the network interface 107 from other devices connected to the communication network such as the parking management server 30 and to transmit data streams throug h the network interface 107.

[0031] The user terminal device 10_1 is also provided with a geographical locating module 108 such as a GPS (global positioning system) module to provide data representative of the geographical location of the vehicle 11_1 to the parking management server 30. In some embodiments the device 10_1 may be configured to communicate with a geographical locating module of the vehicle in order to provide the geographical location data.

[0032] Parking sensor devices 20_1, 20_2, 20_3....20_m are each configured to detect the availability of more or more parking places and to provide data indicative of whether or not a parking place is occupied

by a vehicle. Parking sensor devices 20_1, 20_2, 20_3....20_m may include magnetic sensors or weight sensors implanted on the ground or floor of the parking place and configured to determine by weight detection whether or not a vehicle is present in the parking place. Alternatively optical detection devices such as infra red emitters, LEDs etc and receivers may be used to determine whether or not a vehicle is present by the detection or lack of detection of light. Other parking sensor devices 20_1, 20_2, ...20_m may include camera devices configured to take images of parking places. Image processing software may be used to analyse the captured images in order to determine whether or not a vehicle is occupying the space. Moreover, in some embodiments of the invention the image processing software may be configured to detect license plate information of a vehicle occupying a parking place.

[0033] It will be appreciated that other sensor mechanisms capable of determining the occupation of a parking place may be used within the scope of the invention.

[0034] Data is transmitted from the parking sensor devices 20_1, 20_2, ...20_m to the parking management server 30 by means of data communication network 50; The parking sensor devices 20_1, 20_2, ...20_m may be provided with wireless communication interface for wireless communication or may be connected to a fixed wired communication link.

[0035] Parking availability data provided by the parking sensor devices 20_1, 20_2, ...20_m is stored in parking management database 35 as part of the parking information data. Each parking place has an identifier and a weighting score indicative of the reliability of the parking place still being available when a user arrives at the parking place after being allocated that parking place. The weighting allocated to a parking place may be based on the reliability of the data provided to indicate its occupancy. For example an instantaneous magnetic sensor detecting presence of a vehicle in a parking place may be more reliable than data retrieved from images captured periodically by a camera of a parking place, indicating occupation of the parking place. The weighting may also be related to the occupancy rate of the parking place. Some parking places are likely to be occupied at a higher rate or for a longer overall duration that other parking places.

[0036] A parking management server 30 according to an embodiment of the invention is schematically illustrated in the functional block diagram of Figure 3. While separate functions are represented in Figure 3 as separate modules, it will be appreciated that several functions may be combined in one or more modules.

[0037] The parking management server 30 is configured to receive parking availability data from the parking sensor devices 20_1, 20_2, 20_3....20_m and to process the received parking availability data to update stored parking availability data representing the availability of parking places to process parking place requests received from user terminals 10_1, 10_2, ...10_n. The geographical region covered by the parking management server may be segmented into geographical sections with associated parking place information. The parking management server 30 comprises a parking place allocator 31 configured to allocate parking places to a user based on parking availability data, the geographical location of the vehicle 11_1 and the parking score attributed to the user requesting allocation of a parking place. The parking management server 30 may, in some embodiments, also include a route processor module 32 configured to provide a route to the allocated parking place from the current location of the vehicle 11_1 of the user requesting the parking place. The parking management server 30 is further provided with a parking score adjustment module 36 for modifying the parking score of a user in response to a predetermined parking event where appropriate. For example, when a user who has been allocated a parking place informs the parking management server that the allocated parking place is occupied or does not satisfy his indicated requirement his parking score may be modified to a more favourable parking score, for example increased, in order to compensate for the inconvenience. In contrast if a registered user is found to be occupying a parking place that he was not allocated and recognised by an image taken of the license plate of his vehicle, or if a user exceeds his allocated parking duration his associated parking score may be modified to a less favourable score, for example decreased, as a penalty for the infraction. In some embodiments the users parking score may depend on user's subscription.

[0038] The parking management server 30 further comprises a general CPU 33, a memory 34, which operate in a similar manner to the CPU and memory of the user terminal device of Figure 2, as well as a network interface 35 enabling the parking management server to connect to data communication network 50 by a wireless or wired connection.

[0039] A method of allocating a parking place for a vehicle to a user according to a general embodiment of the invention will now be described with reference to Figures 4 and 5.

[0040] In step S21 a user terminal 10_1 transmits data representative of a request for allocation of a parking place by means of data communication network 50 to the parking management server 30. The transmitted data includes data representative of the geographical location of the vehicle 11_1 of the user, the geographical location of the user terminal 10_1, or data representative of the target destination geographical location of the user. In step S11 the parking management server receives the data representative of the request including the geographical location data. The parking place allocator module 31 of parking management server 30 processes the request in step S12 in order to allocate a first parking place to the user. The parking place allocator module 31 will determine a first parking place based on the geographical location data, the parking score associated with the identified user transmitting the parking allocation re-

quest, and the parking place availability data associated with a geographical section identified by the geographical location data. The parking place allocator module 31 checks to see if there are available parking places in the geographical section corresponding to the geographical location of the vehicle 11_1 and, where appropriate, corresponding to the requirements and preferences of the user as defined in the user profile stored in database 30 or in the transmitted request. The user's parking score is taken into account by the parking place allocator module 31 to determine a first allocated parking place. If the user has a favourable ranking parking score then preferred parking places for priority users may be allocated to the user. These preferred parking places may correspond to parking places which are more likely to remain available until the user reaches them, be located closer to the user's destination or better correspond to the user's needs and requirements.

[0041] In step S13 data identifying the allocated first parking place is transmitted from the parking management server 30 to the user terminal device 10_1. In step S22 the user terminal device 10_1 receives the data identifying the first allocate parking place. The user than can direct his vehicle 11_1 to the geographical location of the first parking place. In some embodiments of the invention the route processor 32 of the parking management server 30 can determine a route from the current geographical location of the user's vehicle 11_1 to the geographical location of the parking place and the route data identifying the determined route may be transmitted from the parking management server 30 to the user terminal 10_1 in step S13. In alternative embodiments the parking management server may directly transmit geographical location data such as a GPS data to the geographical location module 109 of the user terminal 10_1 or a route planner device of the vehicle 11_1 so that the geographical location module 109 may automatically determine the route from the current location of the vehicle 11_1 or user terminal 10_1 to the geographical location of the parking place. In other embodiments the user may manually insert the address into the geographical location module 109 of the user terminal or route planner module of the vehicle 11_1 to determine the route to the geographical location of the parking place.

[0042] On arrival at the first allocated parking place the user may find that the parking place is available and park his vehicle in the first allocated parking place. In particular embodiments of the invention the parking management server 30 allocates a parking duration time for the user to park in the first allocated parking place. The parking duration may depend on parking restrictions, parking costs or the users parking score. If the parking allocated parking duration is exceeded the parking score adjustor module 36 of the user terminal 30 may modify the parking score of the user to generate a parking score representative of a less favourable parking score to penalise the user for having exceeded the parking duration time.

[0043] If on arrival at the first allocated parking place the user finds that the parking place is already occupied by another vehicle in step S23 data representative of a notification indicating that there is a problem with the allocated parking place is transmitted from the user terminal 10_1 to the parking management server 30. In step S14 the parking management server 30 receives the notification transmitted from the user terminal 10_1 indicating that there is a problem with the first allocated parking place. In step S15 the parking score adjustor module 36 modifies the parking score associated with the user who has notified of a problem in order to compensate for the inconvenience. Then in step S16 the parking place allocator 31 allocates, to the user, a second parking place different to the first allocated parking place taking account of the parameters used to allocated the first parking place, and the fact that the first allocated parking place is no longer suitable. The more favourable parking score will be taken into account for allocation of the second parking place which may lead to a more favourable parking place being allocated to the user. In step S17 data identifying the second allocated parking place is transmitted to the user terminal device 10_1. In step S24 the user terminal 10_1 receives data identifying the second allocated parking place.

[0044] A method of allocating a parking place for a vehicle to a user according to a particular embodiment of the invention will now be described with reference to Figure 6.

[0045] In step S101 a request for allocation of a parking place is sent from user terminal device 10_1 to the parking management server 30. The request includes data representative of the geographical location of the vehicle 11_1 of the user or to a target destination geographical location. In step S102, based on the parking place availability data, the parking management server checks to see if there are available parking places in the geographical section corresponding to the geographical location of the vehicle 11_1 and corresponding to the requirements and preferences of the user.

[0046] It will be appreciated that the user's preferences or requirements may be already stored in the user profile data stored in database 35 or it may be transmitted to the management server 30 by the user terminal in the parking place allocation request.

[0047] If available parking places corresponding to the users request are found in the geographical section corresponding to the geographical location of the vehicle 11_1 a plurality of options are sent to the user terminal 10_1 in step S103 or step S104. The user's parking score is taken into account to determine a list of the best options or best similar of parking places corresponding to the user's requirements and preferences. If the user has a high parking score then preferred parking places for priority users may be allocated to the user. These preferred parking places may correspond to parking places which are more likely to remain available until the user reaches them, be located closer to the user's destination or better correspond to the user's needs and requirements. How-

ever if the user has a lower parking score or available parking places are found which do not satisfy all the requirements of the users request a plurality of the best similar options are transmitted to the user in step S104. The best similar options correspond to less preferred parking places or less reliable parking places in terms of occupancy. For example, the management server 30 may find a number of available parking places in the geographical section of the vehicle 11_1 but those options may correspond to paying parking places in the case where the user has indicated a preference for free parking places, or a number of available parking places may be found at a greater distance from the users ultimate destination than the maximum preferred distance indicated by the user.

[0048] In step S105, the user determines whether or not the proposed available parking places are suitable or not. If it is determined that the proposed available parking places allocated by the parking management server 30 are not suitable the parking place allocation process terminates in step S106. Otherwise, if it is determined that the proposed available parking places include a suitable parking place, the user selects the preferred parking place and sends a confirmation of acceptance of the selected allocated parking place to the parking management server in step S107. In step S108 the parking management server confirms allocation of the parking place to the user. In this step, in some embodiments of the invention, a route to the allocated parking place may be sent to the user, if it has not already been associated with the allocated parking place in the list of options sent in step S103 or S104. Moreover, in some embodiments of the invention information of available parking time duration based on restricting or parking costs may be indicated to the user. The parking management server will then update the parking availability data to indicate that the allocated parking place is no longer available for attribution to another vehicle. It is then determined in step S109 as to whether or not the user has cancelled the booking of the allocated parking place before the start of the parking duration has started. For example, the user may find a more suitable parking place on the way to the allocated parking place. If the booking of the allocated parking place has been cancelled before the starting time in step S110, the reserved time for the allocated parking place is released by the parking management server 30 in order to render the parking place available for another user. In step S111 it is determined as to whether or not the user should be penalised for cancelling the booking. This decision will depend on various factors such as the users parking score, the demand for the allocated parking place etc.

[0049] In step S112 on arrival at the first allocated parking place, the user determines whether or not the allocated parking place is available and/or whether or not it corresponds to the user's indicated preferences and requirements. If is determined in step S112 that the allocated parking place is occupied by another vehicle or that the allocated parking place is not suitable to the requirements indicated by the user then the user notifies the parking management server 30 by transmitting a notification indicating the problem to the server in step S113.

[0050] The parking management server 30 processes the notification and verifies the problem in step S114. For example if the user has indicated that the allocated parking place has been occupied by another vehicle, the parking management server may control a parking sensor device in the form of a camera to take an image of the occupying vehicle in order to identify the vehicle by means of a license plate of the vehicle; If the identified vehicle is registered to a user whose profile is stored in the database the score indicative of the rating of the user may be modified to a score indicative of a less favourable rating.

[0051] In step S115 the parking score associated with the user to which the allocated parking place has been indicated as being problematic is adjusted to a more favourable rating to compensate for the problem encountered with the allocated parking place. In step S116 an automatic parking place reallocation process is initiated to reallocate to the user in step S103 a parking place corresponding to a preferred parking place option. In this way the user may be compensated by being allocated a better parking place if available based on his more favourable parking score.

[0052] If, however, it is determined in step S112 that no problem has been detected on arrival at the allocated parking place, the user sends a notification from the user terminal 10_1 to the parking management server 30 in step S117 to confirm that he is parking in the allocated parking place. In some embodiments of the invention this step may be omitted and a lack of notification from the user may be determined as being indicative that the allocated parking place is being used by the requesting user. Occupation of the allocated parking place by the requesting user is monitored by the parking management server in step S118. In step S119 the user of the vehicle leaves the allocated parking place. This may be automatically detected by the corresponding parking sensor device 20_i. In some embodiments of the invention the user may notify the parking management server 30 that it has released the allocated parking place. This notification could be verified, in some embodiments for example by capturing an image of the parking place and checking that the vehicle 11_1 of the user is not longer occupying the parking place. In step S121 it is determined as to whether or not the user has exceeded a parking time duration allocated by the management server. The allocated parking time duration in some embodiments of the invention may be determined based on the parking score of the user. A user with a more favourable parking score may be allocated a longer time duration for parking in the allocated parking place. If it is determined however that the user has exceeded the allocated parking duration then the user is penalised by having is parking score adjusted to be representative of a less favourable parking

score for parking place allocation. In step S106 the parking place allocation process ends.

[0053] Embodiments of the invention provide a device and a method to enable a parking place for a vehicle to be allocated to a user based on a score or weighting associated with the user. Parking places which are more reliable in terms of determined occupancy may be allocated to users with more favourable scores. Users can be penalised or compensated by adjusting their user scores according to whether problems in allocated parking places occur or whether a user respects parking allocation conditions attributed to him.

[0054] Although the present invention has been described hereinabove with reference to specific embodiments, the present invention is not limited to the specific embodiments, and modifications will be apparent to a skilled person in the art which lie within the scope of the present invention.

[0055] Many further modifications and variations will suggest themselves to those versed in the art upon making reference to the foregoing illustrative embodiments, which are given by way of example only and which are not intended to limit the scope of the invention, that being determined solely by the appended claims. In particular the different features from different embodiments may be interchanged, where appropriate.

[0056] In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. The mere fact that different features are recited in mutually different dependent claims does not indicate that a combination of these features cannot be advantageously used.

Claims

1. A method of allocating, to a user, a parking place for a vehicle , the user being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the method comprising:

allocating a first parking place to a user in a response to a first parking request received from a user terminal device of the user, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user;
modifying the parking score of the user in response to a predetermined parking event; and
allocating a second parking place to the user based on the modified parking score.

2. A method according to claim 1, wherein the predetermined parking event comprises the allocated first parking place not being available, the method comprising:

receiving, from the user terminal, notification data indicating that the allocated first parking place is not available for the vehicle of the user; wherein
the parking score is modified to a parking score indicative of a more favourable ranking; and
the second parking place is allocated to replace the first allocated parking place based on the first parking request.

3. A method according to claim 1, wherein the predetermined parking event comprises the allocated first parking place not corresponding to one or more indicated requirements of the user, the method comprising
receiving, from the user terminal, notification data indicating that the allocated first parking place is not suitable; wherein
the parking score is modified to a parking score indicative of a more favourable ranking; and
the second parking place is allocated to replace the first allocated parking place based on the first parking request.

4. A method according to claim 1, wherein
the predetermined parking event comprises the vehicle of said user being detected as remaining in the allocated first parking place for a time duration exceeding a predetermined time duration,
the parking score is modified to a parking score indicative of a less favourable ranking; and
the second parking place is allocated in response to a second parking request.

5. A method of requesting allocation of a parking place for a vehicle, the user of the vehicle being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the method comprising:

transmitting, from a user terminal to a server device, data representative of a request for allocation of a parking place;
receiving from the server device, data identifying a first parking place allocated to said user in response to the request,
the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user; and
in response to a predetermined parking event
transmitting a notification to the server device,

for modification of the parking score of the user based on the predetermined parking event;
receiving, data identifying a second parking place allocated to said user, the allocation of the second parking place being based on the modified parking score.

6. A method according to claim 5, wherein the predetermined parking event comprises the allocated first parking place not being available for the vehicle of the user, the method comprising:

transmitting, from the user terminal to the server device, notification data indicating that the allocated first parking place is not available; wherein
the modified parking score corresponds to a parking score indicative of a more favourable ranking; and
the second parking place allocated replaces the first allocated parking place based on the first parking request.

7. A method according to claim 5, wherein the predetermined parking event comprises the allocated first parking place not corresponding to one or more indicated requirements of the user, the method comprising
transmitting, from the user terminal to the server device, notification data indicating that the allocated first parking place is not suitable; wherein
the modified parking score corresponds to a parking score indicative of a more favourable ranking; and
the second parking place allocated replaces the first allocated parking place based on the first parking request.

8. A method according to claim 5,
wherein the predetermined parking event comprises the vehicle of said user being detected as remaining in the allocated first parking place for a time duration exceeding a predetermined time duration, and wherein
the modified parking score corresponds to a parking score indicative of a less favourable ranking; and
the second parking place is allocated in response to a transmitted second parking request.

9. A parking place allocation device for allocating, to a user, a parking place for a vehicle, the user being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the method comprising:

a receiver for receiving a first parking request from a user terminal device of the user;
a parking place allocator configured to allocate a first parking place to a user in a response to the received first parking request, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user;
a parking score modifier configured to modify the parking score of the user in response to a predetermined parking event;

wherein the parking place allocator is further configured to allocate a second parking place to the user based on the modified parking score.

12. A device according to claim 9, wherein the predetermined parking event comprises the allocated first parking place not being available for the vehicle of the user, and wherein
the receiver is operable to receive, from the user terminal, notification data indicating that the allocated first parking place is not available; wherein
the parking score modifier is configured to modify the parking score associated with the user to a parking score indicative of a more favourable ranking; and
the parking place allocator is operable to allocate the second parking place to replace the first allocated parking place based on the first parking request.

11. A device according to claim 9, wherein the predetermined parking event comprises the allocated first parking place not corresponding to one or more indicated requirements of the user, wherein
the receiver is operable to receive, from the user terminal, notification data indicating that the allocated first parking place is not suitable;
the parking score modifier is configured to modify the parking score associated with the user to a parking score indicative of a more favourable ranking; and
the parking place allocator is operable to allocate the second parking place to replace the first allocated parking place based on the first parking request.

12. A device according to claim 9, wherein
the predetermined parking event comprises the vehicle of said user being detected as remaining in the allocated first parking place for a time duration exceeding a predetermined time duration, and
the parking score modifier is configured to modify the parking score associated with the user to a parking score indicative of a less favourable ranking; and
the parking place allocator is operable to allocate the second parking place in response to a received second parking request.

13. A user terminal device for requesting allocation

of a parking place for a vehicle, the user of the vehicle being associated with a parking score, the parking score being representative of the user's ranking among a plurality of rankings for a plurality of users, the device comprising:

a transceiver configured to transmit, to a server device, data representative of a request for allocation of a parking place, and to receive, data identifying a first parking place allocated to said user in response to the request, the allocation of the first parking place being based on the parking score associated with said user and parking place data representative of available parking places in a geographical region corresponding to a current location or target destination of said user; and

notification means for transmitting a notification to the server device in response to a predetermined parking event, for modification of the parking score of the user based on the predetermined parking event;

receiving, data identifying a second parking place allocated to said user, the allocation of the first parking place being based on the modified parking score.

14. A computer program product for a programmable apparatus, the computer program product comprising a sequence of instructions for implementing a method according to any one of claims 1 to 8, when loaded into and executed by the programmable apparatus.

15. A computer-readable storage medium storing instructions of a computer program for implementing a method, according to any one of claims 1 to 8.

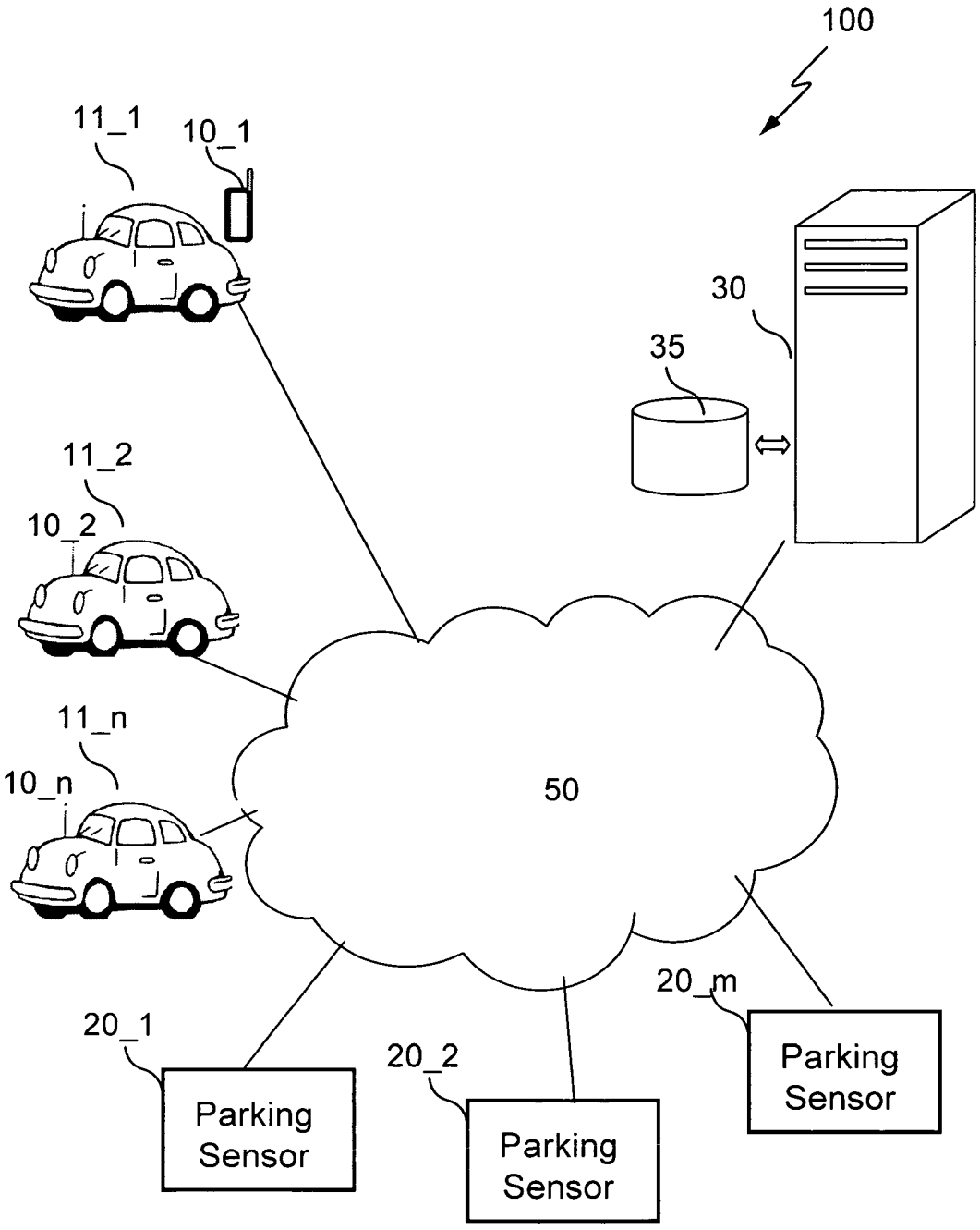
100
11_1
10_1
30
35
11_2
10_2
11_n
10_n
50
20_1
20_2
20_m
Parking Sensor
Parking Sensor
Parking Sensor

Fig. 1

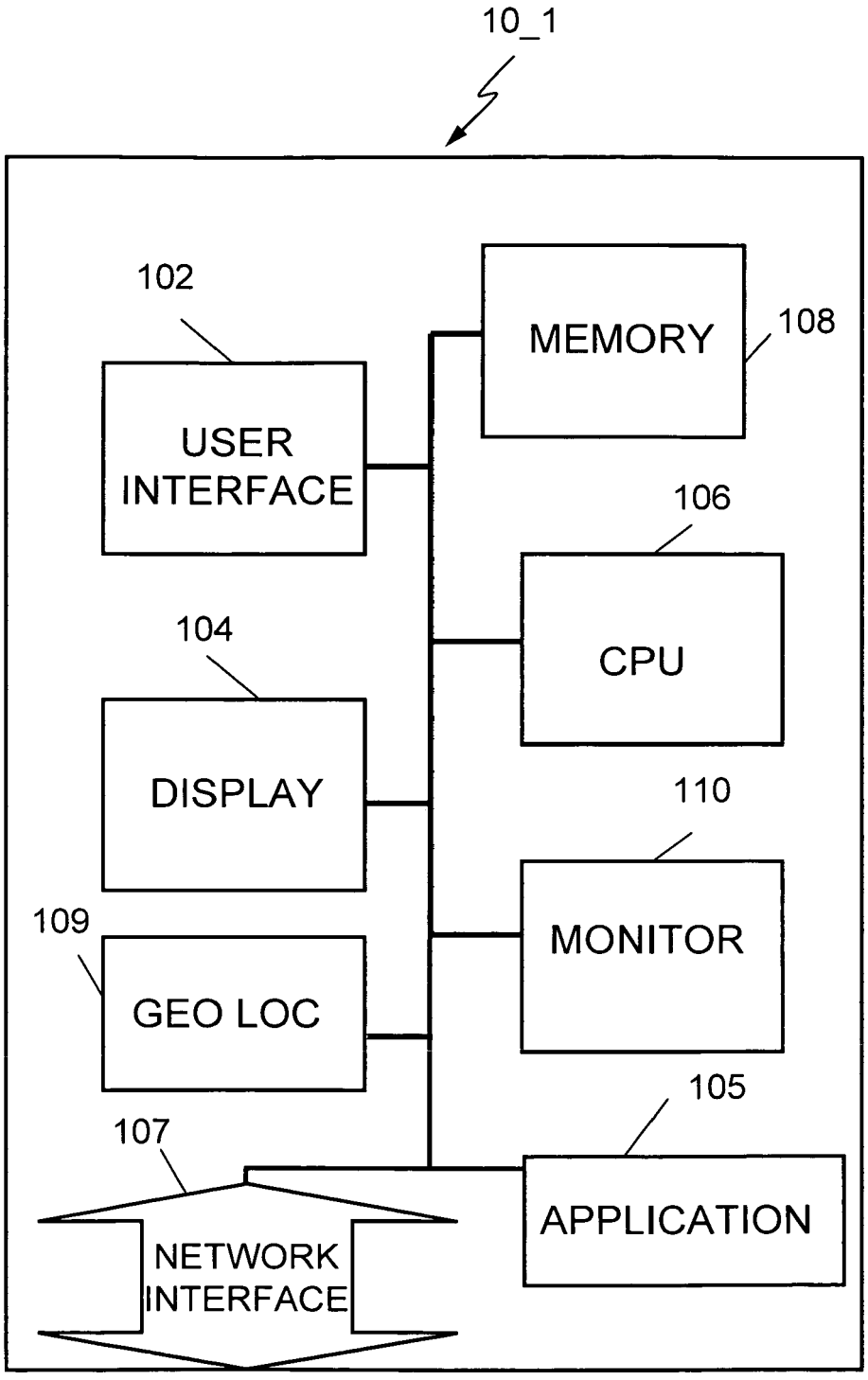
10_1
102
MEMORY
108
USER INTERFACE
106
CPU
104
DISPLAY
110
MONITOR
109
GEO LOC
105
107
APPLICATION
NETWORK INTERFACE

Fig. 2

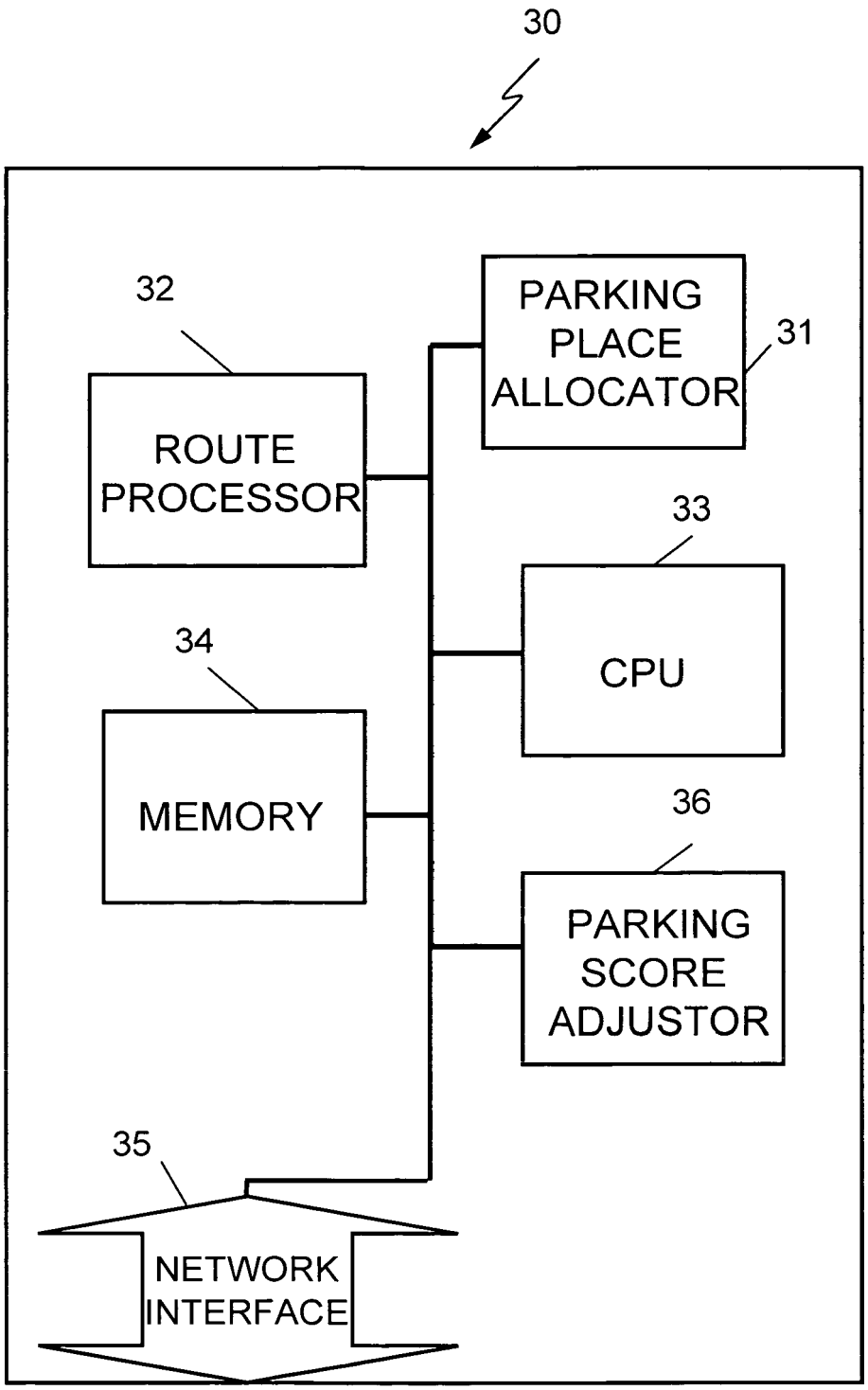
30
32
PARKING PLACE ALLOCATOR
31
ROUTE PROCESSOR
33
CPU
34
MEMORY
36
PARKING SCORE ADJUSTOR
35
NETWORK INTERFACE

Fig. 3

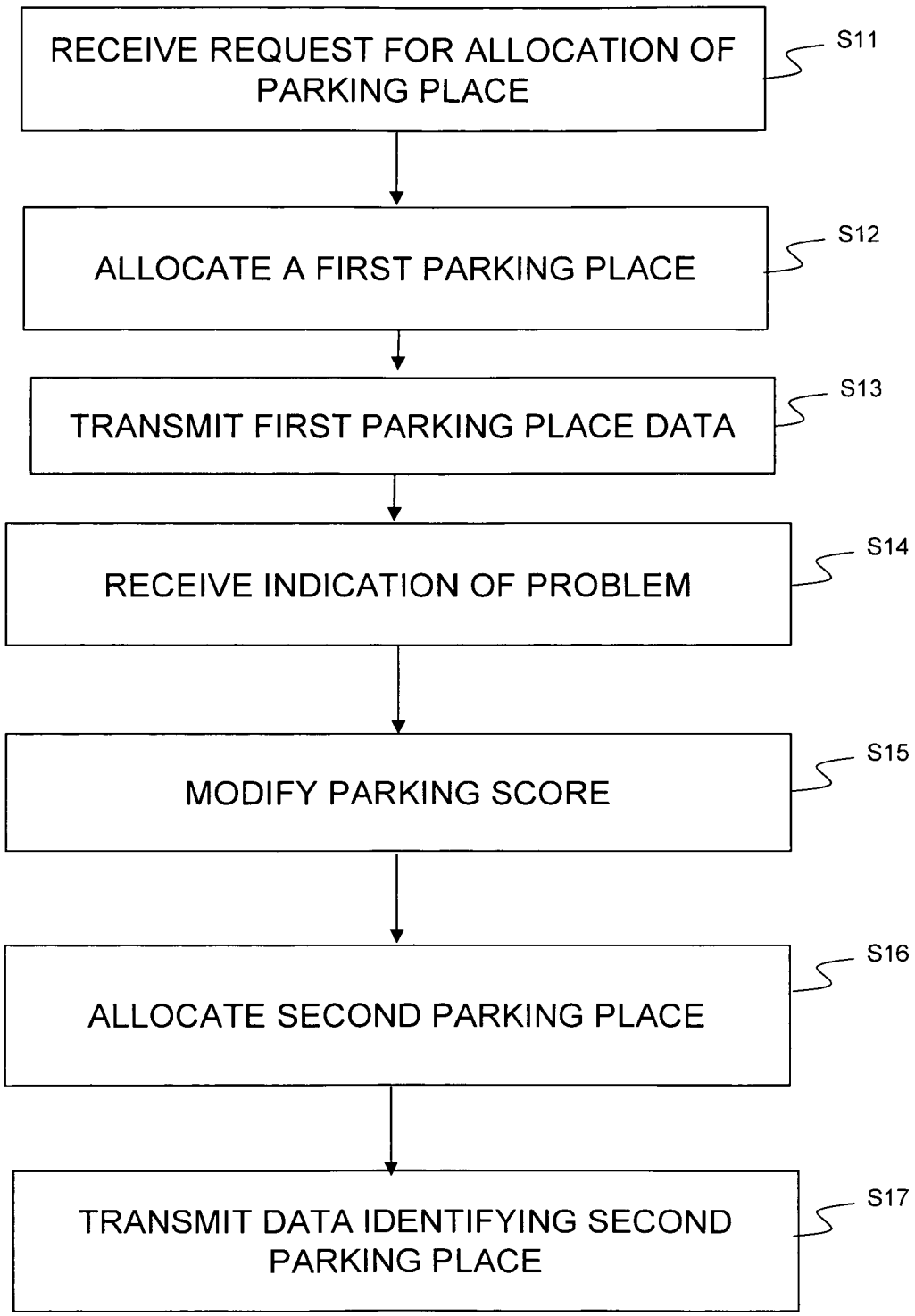
RECEIVE REQUEST FOR ALLOCATION OF PARKING PLACE
S11
ALLOCATE A FIRST PARKING PLACE
S12
TRANSMIT FIRST PARKING PLACE DATA
S13
RECEIVE INDICATION OF PROBLEM
S14
MODIFY PARKING SCORE
S15
ALLOCATE SECOND PARKING PLACE
S16
TRANSMIT DATA IDENTIFYING SECOND PARKING PLACE
S17

Fig. 4

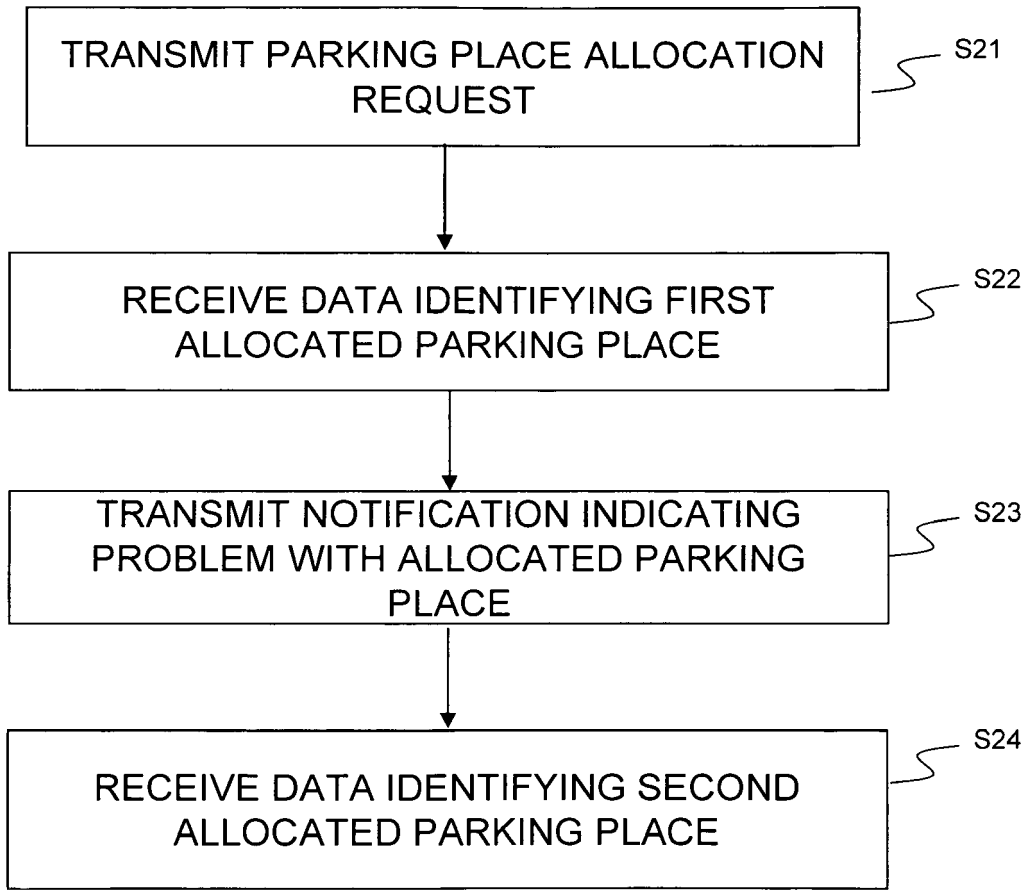
TRANSMIT PARKING PLACE ALLOCATION REQUEST
S21
RECEIVE DATA IDENTIFYING FIRST ALLOCATED PARKING PLACE
S22
TRANSMIT NOTIFICATION INDICATING PROBLEM WITH ALLOCATED PARKING PLACE
S23
RECEIVE DATA IDENTIFYING SECOND ALLOCATED PARKING PLACE
S24

Fig. 5

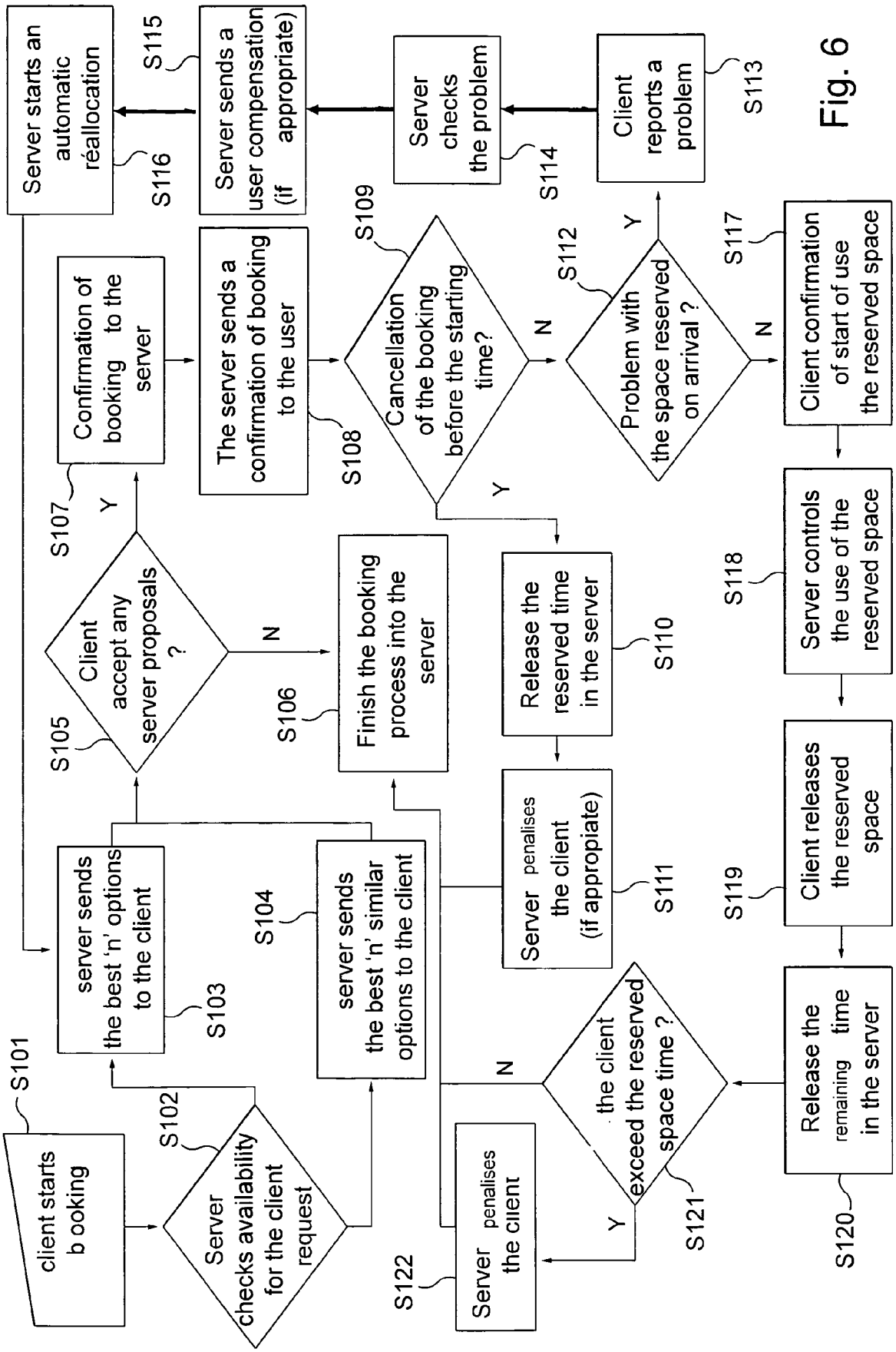
client starts b ooking
S101
Server checks availability for the client request
S102
server sends the best 'n' options to the client
S103
server sends the best 'n' similar options to the client
S104
Client accept any server proposals ?
S105
Y
N
Confirmation of booking to the server
S107
Finish the booking process into the server
S106
The server sends a confirmation of booking to the user
S108
Cancellation of the booking before the starting time?
S109
Y
N
Release the reserved time in the server
S110
Server penalises the client (if appropiate)
S111
Server penalises the client
S122
the client exceed the reserved space time ?
S121
Y
N
Release the remaining time in the server
S120
Client releases the reserved space
S119
Server controls the use of the reserved space
S118
Client confirmation of start of use the reserved space
S117
Problem with the space reserved on arrival ?
S112
Y
N
Client reports a problem
S113
Server checks the problem
S114
Server sends a user compensation (if appropriate)
S115
Server starts an automatic réallocation
S116

Fig. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 29 0607

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	WO 2011/002583 A1 (TECHNOLOGY CURRENTS LLC [US]; POTKONJAK MIODRAG [US]) 6 January 2011 (2011-01-06) * paragraph [0006] * * paragraph [0012] - paragraph [0024] * * paragraph [0028] * * paragraph [0043]; figure 1 *	1-15	INV. G08G1/14 G06Q10/02
Y	US 2002/077953 A1 (DUTTA RABINDRANATH [US]) 20 June 2002 (2002-06-20) * abstract; figure 1 * * paragraph [0017] - paragraph [0020] * * paragraph [0045] *	1-15	
E	EP 2 444 924 A1 (XEROX CORP [US]; PALO ALTO RES CT INC [US]) 25 April 2012 (2012-04-25) * paragraph [0004] - paragraph [0008] * * paragraph [0031] * * paragraph [0033] - paragraph [0036] * * paragraph [0048] * * paragraph [0113] - paragraph [0116]; figure 1 *	1,2,5,6, 9,10, 13-15	

TECHNICAL FIELDS SEARCHED (IPC)
G08G
G06Q
G08Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 May 2012	Wagner, Ulrich

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1 EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 29 0607

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-05-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011002583 A1	06-01-2011	US 2011004507 A1 WO 2011002583 A1	06-01-2011 06-01-2011
US 2002077953 A1	20-06-2002	NONE	
EP 2444924 A1	25-04-2012	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 20050280555 A **[0003]**