Title: A CLOUD-BASED SYSTEM AND METHOD FOR MANAGING VEHICLE SHARING SERVICES

Abstract: A cloud-based system and method for managing vehicle sharing services is disclosed. The cloud-based system in wireless communication with a plurality of vehicles for sharing and a plurality of subscribers, each in possession of a wireless device, has a cloud platform having a plurality of servers, thereby creating a network, enabling the plurality of subscribers to request information on a predetermined set of conditions for each vehicle for sharing when the plurality of wireless devices are within a predetermined proximity to the plurality of vehicles for sharing. The method for managing vehicle sharing services disclosed herein enables multiple subscribers to make a selection of vehicles for sharing based upon multiple vehicles that are shortlisted according to subscriber's requirements. Subscribers may enter and access vehicles for sharing upon an identification and authentication process.
A Cloud-based System and Method for Managing Vehicle Sharing Services

FIELD OF INVENTION

A cloud-based system and method for managing vehicle sharing services that enables multiple users to have seamless accessibility to a selection of vehicles registered for sharing services, according to individual user’s requirements. The system and method disclosed herein allows users to gain access to selected vehicle upon an identification and authentication process.

BACKGROUND OF INVENTION

Conventional vehicle sharing management methods requires keeping track of logistics of vehicles by service providers for sharing services and maintaining a database of users subscribed to a vehicles sharing services program.

Usually, the vehicles for sharing services are located at a designated location and registered users can only access the vehicles at the designated location. An example is as disclosed in US 20030149617 A1, which uses a fee system based on vehicle inventory. The vehicle inventory is at a designated multi-port parking facility, where registered users are to access the vehicles for sharing services at the designated parking facility. A system monitors whether a vehicle departs or arrives at the designated parking facility to keep track of vehicle inventory.

US 20160189098 A1 discloses a method for a delivery vehicle sharing services, allowing personnel from a delivery service provider to gain access to a delivery vehicle nearest to a
delivery location, for delivering an item to a user. Access and information on delivery vehicle is communicated to personnel via a portable communication device.

US 20160195404 A1 discloses a peer to peer car sharing configurator, where a server is configured to communicate data to a remote vehicle computer system and a car reservation system. Data information communicated between the systems includes vehicle for sharing, vehicle location, user location and potential parking-spot for sharing the vehicle. However, US 20160195404 does not support multiple users to access multiple vehicles for sharing seamlessly, without user’s intervention.

None of the above prior art documents provides a technical solution that allows multiple users to have seamless accessibility to multiple vehicles or a selection of vehicles, for vehicle sharing services while the registered users are physically moving from one proximity to another, without restriction to a specific parking facility or location for vehicle sharing services. Further, none of the prior art documents teaches the use of data pulling to enable seamless access to a selected vehicle for sharing service, through the assistance of recognition of users’ requirements and matching multiple vehicles to users’ requirements, for enhanced user experience.

SUMMARY OF INVENTION

It is therefore an object to provide a cloud-based system and method for vehicle sharing management, which allows service providers to offer manage vehicle sharing services seamlessly to multiple users, by offering a selection of vehicles according to the respective user’s profile, according to each of the user’s requirements.
In a first aspect, a cloud-based system for vehicle sharing management is provided. The cloud-based system is in wireless communication with a plurality of registered vehicles for vehicle sharing services, thereby creating a network of communication links connecting a plurality of servers. The cloud-based system has a cloud platform comprising (1) a service provider server configured for storing information and responding to a service requestor server, with regard to a state of availability of each of the plurality of registered vehicles; (2) a vehicle server configured for storing and providing information on a predetermined set of conditions and location of each of the plurality of registered vehicles; and (3) a service requestor server for providing information on a plurality of registered users registered for vehicle sharing services, wherein each of the plurality of servers is in wireless communication with a plurality of wireless devices, thereby enabling one or more of the plurality of registered users to initiate requests for information on the predetermined set of conditions of each of the plurality of registered vehicles based upon a profile of the respective registered users when the plurality of wearable devices are within a predetermined proximity to the plurality of registered vehicles. By setting up a cloud-based system that allows multiple users to send requests for information, the object of allowing multiple users to have accessibility to multiple vehicles for sharing is achieved. Advantageous embodiments are defined in the dependent claims. Advantageously, by initiating requests for the predetermined set of conditions and location, based upon the profile of the respective registered users, the registered users are constantly being updated on a status and location of the vehicle within a proximity of a selection of registered vehicles.

Preferably, the cloud platform includes a payment request server configured for storing credit information and responding to a
request for payment transaction. More preferably, the payment request server automatically carries out the payment once the requests by a registered user or his wireless device can be assigned to one of the available vehicles. The payment request server may also be included either in the cloud platform or externally.

The service provider server may be configured for sending a notification to the vehicle server requesting for the predetermined set of conditions and location of each of the plurality of registered vehicles when the plurality of wireless devices are within the predetermined proximity with respect to a location of the plurality of registered vehicles. An advantage of sending a notification to the vehicle server when the registered users are within a proximity of a plurality of registered vehicles allows the users to be constantly updated with the predetermined conditions or status and location of the registered vehicles, thus widening the selection of registered vehicles suitable for sharing services, according to the user’s individual requirements, thereby enhancing user experience.

The vehicle server may be configured for requesting the predetermined set of conditions and location of the plurality of registered vehicles upon receiving the notification from the service provider server. By this means the service provider server enables the registered user to make his choice of vehicle amongst others on the information provided in the predetermined set of conditions. The request from the vehicle server to the plurality of registered vehicles requests for information with regard to a set of conditions of the registered vehicles, for e.g. a state of cleanliness within an interior of the registered vehicle, the vehicle battery level, a number of favorable reviews, to assist the registered users to make a decision on which registered vehicle is most suitable for their personal
requirements. Additionally, the registered user may be able to pre-configure preferences on their mobile communication device, for instance, the state of cleanliness of the interior of the registered vehicle shall be at least 50%. In other cases, the registered user may indicate the vehicle battery level that is sufficient to meet the pre-planned destination or even indicate the review of number ratings preferred.

The service provider server may be configured to supply information on the state of availability and location of the plurality of registered vehicles to the service requestor by displaying the aforesaid information on the plurality of wireless devices. Preferably, the supplied information is used for display the state of availability on the wireless device or a vehicle itself. The displaying of information and state of availability of vehicle on the wireless device allows the registered users to receive information on a selection of registered vehicles that are suitable for their personal requirements. By indicating a location of the registered vehicles allow the registered users to easily identify and locate the registered vehicle of their choice.

The service requestor server may be configured to send a query to the registered vehicle requesting for information on the predetermined set of conditions of each of the plurality of registered vehicles within the predetermined proximity with respect to the plurality of wireless devices. The aforesaid setup is required to allow multiple users to request for information with regard to the set of conditions of each of the registered vehicles within a physical range or radius of the registered users, each carrying a wireless device. In addition, this achieves the objective of allowing registered users to access any registered vehicle of their choice while in motion.
Preferably, a vehicle body of the plurality of registered vehicles may be configured for displaying information on the predetermined set of conditions on each of the plurality of registered vehicles. The display of information is activated by means of the vehicle server, preferably upon receiving the notification from the service provider server. Displaying of information on the registered vehicles allows the registered users to easily identify the selection of registered vehicles shortlisted according to the registered users’ requirements.

In addition, each registered user has one or more wireless device configured for identifying the registered user with the cloud-based system, i.e. the cloud-system recognizes which wireless device belongs to which registered user. Advantageously, a registered user is able to receive information with regard to the predetermined set of conditions of a registered vehicle that is in the vicinity, independently of another registered user also in the vicinity. The registered user is able to select a registered vehicle according to a profile of the registered user that meets their personal requirements, by completing an authentication process. In the event that more than one registered users select the same registered vehicle, the registered user who completes the authentication process first will have access to the vehicle. If the registered user does not wish to select the registered vehicles within the vicinity, he may then move to another vicinity down the road, where another registered vehicle may be situated. The request for information with regard to the predetermined set of conditions of the subsequent registered vehicle within the vicinity may be initiated again, thus allowing the registered users to seamlessly access the selected registered vehicle and utilize the vehicle sharing services and achieving the objective of enabling registered users to access registered vehicles for vehicle sharing services without user’s intervention.
The service requestor server may be configured to track and retrieve a profile of each of the plurality of registered users through the wireless devices. The profile of the respective registered users includes data information with regard to a location, a calendar of events and an itinerary of activities. The advantage of tapping into the data or information available in wireless devices aids to customize recommendation of registered vehicles to an individual user, for improved user experience. An example of data recorded in wireless devices suitable for selecting registered vehicles by the service requestor server may be a calendar of events, for e.g. a location of appointment. This data may be utilized to determine vehicle battery level required to travel from where the registered user is located, to the location of appointment.

The predetermined set of conditions of the plurality of vehicle includes a level of cleanliness; a vehicle battery level; an indication of number of positive reviews; and a status of availability. By providing the aforesaid set of conditions, a registered user is able to select a registered vehicle that can offer the most appropriate features that fit the registered user’s requirements. For e.g. a user may have a pre-planned route and it is therefore desirable to ensure there is sufficient vehicle battery level to travel the entire journey. On the other hand, another registered user may prefer a higher level of cleanliness in interior of the registered vehicle, for better comfort.

The at least one registered user may be allowed to access at least one registered vehicle upon completion of an authentication process. The authentication process feature allows the registered user to be identified as a subscriber of the vehicle sharing services and may unlock and drive off the registered
vehicle once authentication process is completed. The authentication process comprises the completion of a payment transaction, supported by the payment request server. The initiation of the authentication process is done in the background allowing the user to access the vehicle without further interaction. Preferably, the authentication process is triggered upon the user approaching vehicle, a notification is send to the vehicle server requesting a predetermined set of conditions and / or the profile of the user matches with the need of a vehicle.

In a second aspect, a method for managing vehicle sharing services via a cloud-based system is provided. The method comprises the steps of (1) sending one or more requests from a service requestor server to a service provider server requesting for information with regard to a status of availability of a plurality of registered vehicles for vehicle sharing services within a predetermined proximity with respect to one or more wireless devices; (2) sending a notification from the service provider server to a vehicle server requesting for a predetermined set of conditions of a plurality of registered vehicles within the predetermined proximity with respect to a plurality of wireless devices; (3) sending a response from the service provider server to the service requestor service with regard to the state of availability of the plurality of registered vehicles within the predetermined proximity with respect to the plurality of wireless devices; and (4) supplying information on a predetermined set of conditions of the plurality of registered vehicles to the service requestor. Following the aforesaid steps, the registered users are allowed to select a registered vehicle most compatible with a profile of the respective plurality of registered users.

 Preferably, the profile of the respective registered users may be based upon a data information with regard to a location, a
calendar of events and an itinerary of activities. Identifying the profile of each of registered users allows the server to customize a selection of registered vehicles most suitable for the registered user and recommend which registered vehicles are available for sharing services accordingly.

The predetermined set of conditions of the plurality of vehicles includes a level of cleanliness; a vehicle battery level; an indication of number of positive reviews; and a status of availability. This feature allows the registered user to select the most desirable registered vehicle based upon personal preferences and/or travel requirements.

Ideally, the method includes an authentication process, wherein the plurality of registered users may access and drive off the selected registered vehicle upon completion of the authentication process. The authentication process may further include a mode of verifying an identification of the registered user, through an exchange of signals between the registered vehicle and the wireless device belonging to the registered user. This process assists to achieve the objective of multiple registered users to access multiple registered vehicles while moving from one proximity to another, without user’s intervention. A payment request server may be configured for storing credit information and responding to a request for payment transaction, for supporting the authentication process.

The status of availability of the plurality of registered vehicles are displayed on the plurality of wireless devices. This enables the registered users to receive notifications with regard to the different registered vehicles that have been selected for sharing services according to personal preferences and/or travel requirements.
The predetermined set of conditions of the plurality of vehicles may also be displayed on a body of the corresponding registered vehicle, thus allowing the registered user to view and select the registered vehicle located within a predetermined physical range while moving from one physical range to another physical range.

Upon completion of the authentication process, the selected registered vehicle unlocks vehicle door allowing registered user access to the registered vehicle. Alternatively, the authentication process comprises a localization process, such as an exchange of low frequency (LF), radio frequency (RF) or Bluetooth low energy (BLE) signals between the wireless device and the registered vehicle.

In a third aspect, a vehicular system for vehicle sharing services in wireless communication with a cloud-based vehicle sharing management system is provided. The vehicular system may comprise (1) a vehicle control module configured for controlling and commanding instructions to different modules on board the vehicle; (2) an access control module in communication with the vehicle control unit, configured for activate locking or unlocking operations of the vehicle doors; (3) a radio frequency control module configured for transmitting and receiving radio frequency signals for localizing a position of an object with respect to an exterior of the vehicle; (4) a door control module in communication with the seat control module and the vehicle control unit, the door control module is configured for controlling electronic components embedded around each door of the vehicle; (5) a seat control module in communication with the door control module for monitoring a level of cleanliness of seats within a passenger compartment of the vehicle; and (6) a gateway module in communication with the vehicle control unit, the gateway module configured for receiving data from other modules and routing the received data to other modules on board the
vehicle. The vehicle control module may be configured to command the door control unit to display information on a body of a vehicle for sharing services, thereby allowing reviewing a condition of the vehicle.

The system may further comprises one or more transponders suitable for transmitting and receiving low frequency (LF) transmissions, radio frequency (RF) transmissions, Bluetooth low energy (BLE) transmissions, Ultra Wide Band (UWB) transmissions, 5G transmissions, Spread Spectrum transmissions, Zigbee transmissions, Ultra Wide Band (UWB) transmissions, Millimeter wave transmissions or such as radio detection and ranging (RADAR) technology, which makes use of radio waves transmissions, to enable communications within the radio frequency ranges with the wireless device thereby enabling the communication and the authentication process.

The access control module may be configured to receive a request to activate unlock doors of the vehicle upon receiving a notification on a completed authentication process and a mode of verifying an identity of a registered user, to ensure that a person accessing the vehicle is a subscriber of the vehicle sharing services and shall have authorization to access the registered vehicle. The authentication process may be the completion of a payment transaction, supported by the payment request server, and the mode of verifying the identity of the registered user may be a localization process.

The radio frequency control module may be configured for wireless communication with at least one external wireless device. The at least one external wireless device supports wireless technologies selected from the group consisting of Bluetooth protocol, Wi-Fi and global satellite navigation systems as GPS, Glonass, Galileo or BeiDou. It shall be understood by a person
skilled in the art, other suitable RF and wireless technologies includes 5G, Spread Spectrum, Zigbee, Ultra Wide Band (UWB) or Millimeter wave or even RADAR or radio waves transmissions. The at least one external wireless device may be a wearable device. Alternatively, the at least one external wireless device may be a mobile communication devices with wireless technologies consisting of Bluetooth protocol, Wi-Fi and global positioning systems (GPS), 5G, Spread Spectrum, Zigbee, Ultra Wide Band (UWB), Millimeter wave or even RADAR, which relies on radio waves transmissions.

In a fourth aspect, a vehicle having a vehicular system as described above is provided.

DESCRIPTION OF DRAWINGS

Other objects and aspects of the invention will become apparent from the following description of embodiments with reference to the accompany drawings in which:

Fig. 1 illustrates an overview of a cloud-based system wirelessly linked to a plurality of registered vehicles and registered users.

Fig. 2 shows cloud platform according to an aspect of the preferred embodiment.

Fig. 3 shows a flowchart illustrating the method for managing vehicle sharing services via a cloud-based system according to a preferred embodiment.
Fig. 4 shows a flowchart illustrating the steps or process required for a registered user to take to enter a selected registered vehicle.

Fig. 5 shows a block diagram of a vehicular system 500a and a block diagram 500b of an external wireless according to the preferred embodiment.

Fig. 6 shows an exterior of a vehicle according to the preferred embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Herein, the term “wireless communication link” shall be construed to refer to the use of wireless data connections between two or more network nodes, i.e. physical link or logical links, e.g. data link, uplink (U/L), downlink (D/L) when applied to satellite communications or cellular networks.

The term “cloud” used herein shall be construed to refer to a network of remote servers hosted on the Internet protocol (TCP/IP) for linking devices over a wide area network, for e.g. worldwide. The network may consist of private or public cloud sub-networks, linked by conventional networking topologies. Each of the remote servers serves to store, manage and process data in place of local servers, over a cloud platform.

It is understood that the term “vehicle” or “vehicular” or other similar term as used herein is inclusive of motor vehicles in general such as passenger automobiles including sports utility vehicles (SUV), buses, trucks, various commercial vehicles, watercraft including a variety of boats and ships, aircraft, and the like, and includes hybrid vehicles, electric vehicles,
combustion, plug-in hybrid electric vehicles, hydrogen-powered vehicles and other alternative fuel vehicles (e.g. fuels derived from resources other than petroleum, for eg. automotive propelled by one or more electric motors using electrical energy).

The term “a calendar of events” shall be construed to include daily appointments, a list or schedule of planned events or activities including dates, time and location or destinations and the term “an itinerary of activities” shall be construed to include a travel diary, including the route of a journey or tour or the proposed outline of a pre-planned travel or destination.

The term “wireless device” or in plural form “wireless devices” used herein shall be construed to include wireless mobile communication devices as well as “wearable devices” enabled with wearable technologies, for e.g. smart watches, ideally having a GPS receiver and supports wireless technologies such as Bluetooth, Wi-Fi and global positioning systems (GPS), 5G, Spread Spectrum, Zigbee, Ultra Wide Band (UWB) or Millimeter wave signals or even RADAR, which relies on radio waves transmissions. The GPS is a global navigation satellite system that is capable of providing geolocation and time information to the GPS receiver. In this sense, a “wearable device” may serve to function as a front end to a remote system, such as a mobile communication device configured to synchronize with the wearable device using wireless technology. This mobile communication device may include palmtop computers such as personal digital assistant (PDA), smartphones operating on different types of operation systems, both types of devices of which, shall support wireless technologies to enable synchronizing with at least one type of compatible wireless wearable device.
Service provider server, vehicle server, payment request server and service requestor server may be in one physical server, separate physical servers in one location, or separate physical servers in multiple locations. Some of the service provider server, vehicle server, payment request server and service requestor server may be in one physical server while the rest may be in separate physical servers. For example, payment request server and service requestor server may be in one physical server, while the service provider server and vehicle server may be in another physical server.

Hereinafter, an explanation of the cloud-based system for managing vehicle sharing services will be discussed in details. Fig. 1 illustrates an overview of the cloud-based system in wireless communication with a plurality of registered vehicle 102, 104, 106 for vehicle sharing services are located on various locations along a road side. Each of the registered vehicle has at least one antenna for sending and receiving radio frequency signals 108, 110, 112. A plurality of registered users 116, 118, 120 who subscribes to the vehicle sharing services, each possesses a wireless device (not shown in Fig. 1) that is also wirelessly linked to the cloud-based system via communication link 114, thereby creating a network of communication links, connecting the plurality of registered vehicles 102, 104, 106 and the plurality of registered users 116, 118, 120 to the cloud-based system. The wireless device from each registered user is enabled to send radio frequency signals via wireless technology such as such as Bluetooth, Wi-Fi and global positioning systems (GPS). The GPS is a global navigation satellite system that is capable of providing geolocation and time information to the GPS receiver. Suitable types of wireless devices includes wearable devices enabled with wireless technology which may be synchronized with wireless mobile communication devices, e.g. palmtop computers such as personal digital assistant (PDA),
smartphones operating on different types of operation systems. It shall be understood by a person skilled in the art, the wearable device 210 functions as a front end device to mobile phone devices 210’ (as shown in Fig. 2).

Since each of the wearable devices 210 in the registered users’ possession is able to send and receive radio frequency signals, the registered users 116, 118, 120 are able to receive information with regard to one or more registered vehicles 102, 104, 106 within a specific radius or predetermined proximity 122, 124, 126 of each of the registered users.

With reference to Fig. 2, the cloud-based system comprises (1) a service provider server 202, a vehicle server 204 and a service requestor server 206. A payment request server 208 may also be included in the design of the cloud-based system, to provide payment transaction. It shall be understood for design flexibility, the payment request server 208 may be sub-server of the service provider server 202, or an external server provided by a third party, such as a financial institution or payment merchant, linked to the service provider server 202.

The service provider server 202 stores information and responds to a service requestor upon being enquired on a status of availability of each of the registered vehicle. To illustrate this communication between the service requestor server 204 and the service provider server 202 and referring back to Fig. 1, assuming a registered user 116 wearing a wearable device walks down a road passing by one or more registered vehicles 102, 104.

Since registered vehicle 102 is within the specific range or predetermined proximity of the radio frequency of the wearable device, the wireless device sends a request to the service provider 202 via the service requestor server 206 to request for a predetermined set of conditions and location of one or more
registered vehicles that are within the predetermined proximity or radius 122, 124, 126 of the radio frequency signal receivable by the wireless device 210, 210' belonging to registered user 116. In the event that there are a plurality of registered users 102, 104 and 106, then the requests to the service provider 202 via the service requestor server 206 may be sent. In this scenario as shown in Fig. 1, the registered user 102 will receive vehicle information for registered vehicles 102 and 104 which are within the predetermined proximity or radius 122 and 124. Since registered vehicle 106 is not within the predetermined proximity 122, the registered user 102 will not receive vehicle information about registered vehicle 106. A suitable type of communication link between the service provider server 202 and the service requestor server 206 may be a radio frequency (RF) communication link.

Upon receiving the requests from the wireless devices, the service provider server 202 sends a notification to the vehicle server 204 to request for the predetermined set of conditions and location of the one or more registered vehicles 102, 104, 106. Since each wireless device is enabled with global positioning satellite (GPS), a location of the registered users 102, 104, 106 will be determined. The vehicle server 204 in turn routes this request to the one or more registered vehicles 102, 104, 106 requesting for the predetermined set of conditions based upon each individual registered vehicle 102, 104, 106. This set of conditions may include (1) a state of cleanliness of the interior of the registered vehicle; (2) a vehicle battery level of the registered vehicle; and (3) the number of likes or favorable reviews rated by previous registered users 116, 118, 120 who had used the vehicle sharing services. Information with regard to the location of the one or more registered vehicles 102, 104, 106 may also be supplied to the service provider server 202. These information are then wirelessly communicated from the service
provider server 202 to the service requestor server 206, and routed to the wireless devices of the registered users 116, 118, 120 and displayed on the wireless devices 210, 210’ accordingly, via radio frequency communication links.

5

The service requestor server 206 may also track and retrieve a profile of each of the plurality of registered users 116, 118, 120 whom subscribed to the vehicle sharing services. The registered user’s 116, 118, 120 profile may include data information with regard to a location of the registered user, which may be traced via GPS based upon a location of the wireless device. The registered users’ profile may also include a calendar of events and an itinerary of activities. A calendar of events may include daily appointments, a list or schedule of planned events or activities including dates, time and location or destinations. Such data information assist the cloud-system 200 to shortlist a selection of registered vehicles 102, 104, 106 that is personalized to a registered user’s profile that most suitable, according to the registered user’s requirements. For example, a registered user 116 has a record on his mobile communication device which indicates he has an appointment at a destination approximately 50km away from his present location. By tracing this data information, the service provider server 202 is able to supply this information to the vehicle server 204, thus requesting for information of registered vehicles 102, 104, 106 that has a vehicle battery level sufficient to sustain a 50km drive to and from the appointment destination, within the predetermined proximity 122, 124, 126 of the registered user 116, with respect to the location of the registered user 116.

20

Alternatively, the data information may also include an itinerary of activities such as a travel diary of a pre-planned road trip, which allows the vehicle server 204 to provide information of one or more registered vehicles 102, 104, 106 which has a vehicle
battery level that is sufficient for the pre-planned road trip. This assist the registered user 116 to plan his trip in advance and select an appropriate registered vehicle 102 that meets his travel requirements and enhances user experience.

Other conditions which may potentially enhance user experience and comfort includes a level of cleanliness of the registered vehicles 102, 104, 106 and an indication of number of positive reviews of the registered vehicles 102, 104, 106 and a status of availability of the registered vehicles 102, 104, 106.

Fig. 3 shows a flowchart 300, illustrating a method for managing vehicle sharing services via a cloud-based system 100 as described above. In step 302, a service requestor server 206 sends one or more requests to a service provider server 202 requesting for information with regard to a status of availability of a plurality of registered vehicles 102, 104, 106 for vehicle sharing services within a predetermined proximity 122, 124, 126 with respect to one or more wireless devices 210, 210’. To illustrate this communication between the service requestor server and the service provider server, Fig. 1 is referred.

Assuming a registered user 116 wearing a wearable device 210 walks down a road passing by one or more registered vehicles 102, 104. The registered user 116 is in possession of a wireless device 210, 210’ capable of receiving and sending radio frequencies, within a specific range or predetermined proximity 122, 124, 126 of the radio frequency of the wearable device 210. Through the service requestor server 206, the wireless device 210, 210’ initiates sending of a request from the service requestor server 206 to the service provider server 202, requesting for information on a status of availability of the plurality of registered vehicles 102, 104, 106 which are detectable or traceable within the specific radius or predetermined proximity 112, 124, 126 with
respect to the wireless device. Therefore the objective of enabling multiple registered users 116, 118, 120 to have seamless accessibility to multiple registered vehicles 102, 104, 106 is achieved, thereby allowing vehicle sharing services when the registered users 116, 118, 120 are in motion or on-the-fly.

In the next step, step 304 of Fig. 3, involves sending a notification from the service provider server 202 to a vehicle server 204 requesting for a predetermined set of conditions of a plurality of registered vehicles 102, 104, 106 within the predetermined proximity with respect to the plurality of wireless devices. Step 306 receives a response from the service provider server to the service requestor server 206 with regard to the state of availability of the plurality of registered vehicles within the predetermined proximity with respect to the plurality of wireless devices. The information on the predetermined set of conditions of the plurality of registered vehicles to the service requestor server is supplied at step 308. Finally at step 310, the plurality of registered users are allowed to access at least one of the plurality of registered vehicles compatible with a profile of each of the plurality of registered users, thereby achieving the objective of enabling multiple users to access multiple registered vehicles.

At step 310, the profile of the respective registered users 316, may be based upon a location of the registered user (according to GPS), or even data information stored or recorded in the wireless device 210, 210', such as a calendar of events including details of appointment e.g. time and location of appointment or even an itinerary of activities, e.g. a pre-planned road trip.

The predetermined set of conditions of the plurality of vehicles displays the condition of a level of cleanliness of an interior of the registered vehicle, a vehicle battery level of the
registered vehicle, an indication of number of positive reviews, as well as a status of availability of the registered vehicle for sharing services.

Each registered users 116, 118, 120 is allowed to access a selected registered vehicle 102 upon completion of an authentication process. This authentication process may be a payment transaction that is completed by the payment server 208 as shown in Fig. 2. Upon receiving payment for services of vehicle sharing, the registered user 116 is verified as a subscriber of the vehicle sharing services and access to the registered vehicle of his choice is allowed. Verification of an identity of the registered user 116 may also be determined through an exchange of signals between the registered vehicle 102 and the wireless device 201, 210' belonging to the registered user 116. The sequence of the authentication process is not limited to the aforesaid, i.e. as long as the registered user is identified as a subscriber of the vehicle sharing services and the payment transaction is completed. For example, a wireless device 210, 210' belonging to the registered user 116 may initiate an exchange of signals with the registered vehicle 102, thereby verifying an identity of the registered user 116 being a subscriber of the vehicle sharing services. When the registered user 116 selects and enters a registered vehicle of his choice, say, registered vehicle 102, the registered vehicle 102 may be allocated to the registered user 116, and this information may be updated by the vehicle server 204. The vehicle server 204 communicates this to the service requestor server 202 which in turn, communicate the same message to payment server 208, thus initiating a request for payment transaction. Once the registered user 116 reaches his destination and alights from the registered vehicle 102, the service requestor server 202 communicates to vehicle server 204 which update this information accordingly.
In order to achieve the objective of allowing registered users to utilize vehicle sharing services while in motion, the status of availability of the plurality of registered vehicles is displayed on the plurality of wireless devices 210, 210’. The predetermined set of conditions of the registered vehicles are displayed on a body of the corresponding registered vehicle. This functions as a free advertisement to the registered users 116, 118, 120.

Once the registered user 116 has selected a desired registered vehicle 102, the registered user 116 may open the door of the desired registered vehicle 102, allowing the registered user to enter the registered vehicle 102. This recognition of the registered user as a subscriber of the vehicle sharing services is done using localization of the registered user, with respect to the registered vehicle. In a scenario, it is possible to identify the location of the registered user 116 with respect to the registered vehicle 102 base upon an identification of the registered user’s wireless device 210, 210’. The registered user’s wireless device 210, 210’ may then initiate an authentication process. Upon completion of the authentication process, the selected registered vehicle 102 identifies the registered user 116 as a subscriber of the vehicle sharing services and thus enables the registered user 116 to enter the desired registered vehicle 102, utilize the vehicle sharing services and walks away from the registered vehicle 1002 upon using the vehicle sharing services, with minimal or zero human intervention.

Fig. 4 shows a flowchart 400 of the steps or process required for a registered user to take to enter a selected registered vehicle according to the preferred embodiment. For clarity, the description provided below makes reference to a single registered user 102. However, it shall be understood that the system
capabilities of the cloud-based system as disclosed herein is able to send multiple requests to different servers on the cloud platform 200, thus allowing multiple users to access multiple registered vehicles concurrently. Accordingly, the same principles apply to the method disclosed herein, and the steps or process in relation to the method for managing vehicle sharing services as described below are not restricted to a single registered user.

At step 402, the service requestor server 206 sends a request to the service provider server 202, requesting for a status of availability and a predetermined set of conditions of a plurality of registered vehicles 102, 104, 106 for vehicle sharing services. This request is in turn routed to the vehicle server 206 which stores information on a location and the predetermined set of conditions of each of the plurality of registered vehicles 102, 104, 106.

In the next step, step 404, the vehicle server 204 supplies the information on the location and predetermined conditions of each of the plurality of registered vehicles 102, 104, 106 within a predetermined proximity 122, 124, 126 with respect to the wireless device 210, 210' to the service provider server 202. Upon receiving the information, the service provider server 202 informs the service requestor server 206 of the same at step 406. The information with regard to location of the plurality of registered vehicles 102, 104, 106 is displayed on the registered user’s wireless device 210, 210' and the predetermined conditions of each of the plurality of registered vehicles 102, 104, 106 is displayed on the body of the corresponding registered vehicles 102, 104, 106 at step 408. The predetermined set of conditions includes a level of cleanliness of an interior of the registered vehicle, a vehicle battery level and a number of likes or positive reviews given by registered users who has utilized the registered
vehicle 102 previously. The displaying of information allows the registered users 116, 118, 120 to view the conditions of each of the registered vehicle and select a desirable registered vehicle according to their personal requirements, for example, a registered user may wish to select a registered vehicle based upon the vehicle battery level to ensure that the registered vehicle has sufficient power to travel to a pre-planned destination, yet at the same time, the interior of the registered vehicle 102 is sufficiently clean, for hygiene and comfort purposes.

Once the registered user 116 has selected a registered vehicle 102 of his or her choice, at step 410, the registered user 116 may initiate an authentication process. This authentication process may be a payment transaction, which is to be carried out by the payment server 208. The payment server may be designed to be part of the cloud platform or an external server provided by a third party, for instance a financial institution or payment merchant.

If the registered user 116 does not find the registered vehicle 102 suitable while in range 122, the registered user 116 may continue walking until the next available registered vehicle 104 which is in range 124. Again, if registered vehicle 104 is not suitable, the registered user 116 may continue walking until the next available registered vehicle 106 which is in range 126. In this scenario, the step 406 is repeated for each range until the registered user 116 finds a suitable registered vehicle.

In the event that the service provider server 202 received confirmation from payment server 208 that authentication process is completed at step 412, in the subsequent step, step 414, the registered vehicle 102 unlock vehicle doors, allowing the registered user 116 to enter the selected registered vehicle 102. A mode of identifying whether a person attempting to unlock the
registered vehicle may be done through localizing a position of
the user with respect to the registered vehicle, through an
exchange of signals between the wireless device 210, 210’ and the
registered vehicle.

5

Fig. 5 shows a block diagram of a vehicular system 500a of a
registered vehicle 102 according to the preferred embodiment as
disclosed herein and a block diagram 500b of an external wireless
device 210, 210’. Vehicular system 500a comprises of a vehicle
control module 502, an access control module 504, a radio
frequency control module 506, a door control module 508, a seat
control module 510 and a gateway module 512.

10

The vehicular system 500a is configurable to be in wireless
communication with a cloud-based vehicle sharing management
system. The vehicle control module 502 may be configured for
controlling and commanding instructions to different modules on
board the vehicle. As such, it shall be understood that the
vehicle control module 502 is in duplex communication with
multiple modules within the vehicular system.

15

The access control module 504, which is in communication with the
vehicle control module 502, may be configured for activate
locking or unlocking operations of the vehicle doors. The radio
frequency control module 506 may be configured for transmitting
and receiving radio frequency signals from external sources, such
as servers on a cloud platform or an external wireless device,
e.g. a wearable device 210 or a wireless communication device 210’
enabled with wireless technology such as Bluetooth, Wi-Fi and
global positioning systems (GPS). It shall be understood by a
person skilled in the art, other suitable RF and wireless
technologies includes 5G, Spread Spectrum, Zigbee, Ultra Wide
Band (UWB), Millimeter wave or even RADAR or radio waves
transmissions. The radio frequency control module 506 may be
configured for localizing a position of an object with respect to an exterior of the vehicle. The object may be for instance, an approaching registered user, with a wireless device 210, 210' in possession, for exchanging signals with the registered vehicle for identification purposes. The door control module 508 is in communication with the seat control module 510 and the vehicle control unit 502, the door control module 508 is configured for controlling electronic components embedded around each door of the vehicle.

The seat control module 510 is in communication with the door control module 508 for monitoring a level of cleanliness of seats within a passenger compartment of the vehicle. The seat control module 510 is in communication with the door control module 508 for monitoring a level of cleanliness of seats within a passenger compartment of the vehicle and the access control module 504 for granting a subscriber of the vehicle sharing services access to the vehicle. The gateway module 512 is in communication with the vehicle control unit 502, the gateway module 512 configured for receiving data from other modules and routing the received data to other modules on board the vehicle. The vehicle control module 502 is configured to command the door control unit 508 to display information on a body of the vehicle, thereby allowing reviewing a condition of the vehicle.

To allow the vehicle to receive radio frequencies from external sources, the vehicular system may further comprises one or more transponders suitable for transmitting and/or receiving low frequency (LF), radio frequency (RF), Bluetooth low energy (BLE), 5G, Spread Spectrum, Zigbee, Ultra Wide Band (UWB), Millimeter wave or even radio wave transmission.

The access control module 504 is configured to receive a request to activate unlock doors of the vehicle upon receiving a no-
tification on an authentication process and a mode of verifying an identity of a registered user. The authentication process may include for e.g. a payment transaction process for utilizing the vehicle and identifying the payee is a subscriber of the vehicle sharing services system. It shall be understood by a person skilled in the art other forms of authentication processes are also applicable, for instance logging into a specific mobile application that are only available for subscribers of the vehicle sharing services systems. The mode of verifying the identity of the registered user relies on localization methodologies, i.e. determining a position of the registered user with respect to the registered vehicle. This verification may be done by identifying whether the registered user is in possession of a wireless device 210, 210’. Suitable localization techniques includes triangulation and power distribution methods where the detection of the wireless device is through transmitters for transmitting and receiving radio frequency (RF) signals.

The radio frequency control module 506 may be configured for wireless communication with at least one external wireless device, having technical capabilities such as that as shown in block diagram of an external wireless device 500b in Fig. 5.

The external wireless device 500b may include a radio frequency control module 514 in communication with an application control module 516 which is in communication with a security access module 518, to ensure secure wireless communication between different nodes of the wireless network communication system amongst servers on a cloud platform and the vehicle for sharing. The application control module 516 may be configured to retrieve data information with regard to a location 520 of the subscriber using global positioning system (GPS). Other data information retrievable by the application control module 516 includes a calendar of events 522 and an itinerary of activities 524.
With reference to Fig. 6, an exterior of a vehicle 602 having a vehicular system according to the preferred embodiment is shown. The exterior of the vehicle has an antenna 606 electronically connected to the vehicle, for receiving and sending wireless signals 606. The body of the vehicle may include a display configured for displaying information with regard to a set of conditions of the vehicle for sharing. In Fig. 6, while the body of the vehicle configured for displaying is shown to be part of a door of the vehicle, this may not be so limited and the display may be comprised in a window or windscreen of the vehicle or any other part of the body of the vehicle. The set of conditions may include a level of cleanliness of an interior of the vehicle 610, a vehicle battery level of the vehicle 612 and a number of likes or favorable reviews received by subscribers who have used the vehicle previously.

While the preferred embodiment and alternative embodiments of the invention have been disclosed and described in detail herein, it may be apparent to those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope thereof.
Patent claims

1. A cloud-based system (100) for vehicle sharing management in wireless communication with a plurality of registered vehicles (102, 104, 106) for vehicle sharing services, thereby creating a network of communication links connecting a plurality of servers (202, 204, 206, 208), the cloud-based system (100) having a cloud platform (200) comprising:

   A service provider server (202) configured for storing information and responding to a service requestor, with regard to a state of availability of each of the plurality of registered vehicles;

   A vehicle server (204) configured for storing and providing information on a predetermined set of conditions and location of each of the plurality of registered vehicle;

   A service requestor server (206) for storing information on a plurality of registered users (116, 118, 120) for vehicle sharing services;

   wherein each of the plurality of servers (202, 204, 206, 208) is in wireless communication with a plurality of wireless devices (210, 210'), thereby enabling one or more of the plurality of registered users (116, 118, 120) to initiate requests for information on the predetermined set of conditions of each of the plurality of registered vehicles (102, 104, 106) based upon a profile of the respective registered user (116, 118, 120) when the plurality of wireless devices (210, 210') are within a predetermined proximity (122, 124, 126) to the plurality of registered vehicles (102, 104, 106).

2. The cloud-based system of Claim 1, wherein the cloud platform includes a payment request server configured for storing credit information and responding to a request for payment transaction.
3. The cloud-based system of Claim 1 and 2, wherein the service provider server (202) is configured for sending a notification to the vehicle server (204) requesting for the predetermined set of conditions and location of each of the plurality of registered vehicles (102, 104, 106) when the plurality of wireless devices (210, 210’) are within the predetermined proximity (122, 124, 126) with respect to a location of one of the registered vehicles (102, 104, 106).

4. The cloud-based system of Claim 3, wherein the vehicle server (204) is configured for requesting the predetermined set of conditions and location of the plurality of registered vehicles (102, 104, 106) upon receiving the notification from the service provider server (202).

5. The cloud-based system of Claims 1 to 4, wherein service provider server (202) is configured to supply information on the state of availability and location of the plurality of registered vehicles (102, 104, 106) to the service requestor server (206) and the plurality of wireless devices (210, 210’).

6. The cloud-based system of Claims 1 to 5, wherein the service requestor server (206) is configured to send a query to the plurality of registered vehicles (102, 104, 106) at the same time.

7. The cloud-based system of Claim 6, wherein a vehicle body of the plurality of registered vehicles (102, 104, 106) is configured for displaying information on the predetermined set of conditions on each of the plurality of registered vehicles (102, 104, 106).
8. The cloud-based system according to any of the preceding claims, wherein each of the plurality of wireless devices (210, 210’) is configured for at least one registered user (116).

9. The cloud-based system according to any of the preceding claims, wherein the service requestor server (206) is configured to track and retrieve a profile of each of the plurality of registered users through the wireless devices (210, 210’).

10. The cloud-based system of Claim 9, wherein the profile of each of the plurality of registered users (116, 118, 120) includes data information with regard to a location (520), a calendar of events (522) and an itinerary of activities (524).

11. The cloud-based system according to any of the preceding claims, wherein the predetermined set of conditions of the plurality of vehicle includes a level of cleanliness (612); a vehicle battery level (614); an indication of number of positive reviews (610); and a status of availability.

12. The cloud-based system according to any of the preceding claims, wherein the at least one registered user is allowed to access at least one registered vehicle upon completion of an authentication process (410).

13. A method for managing vehicle sharing services via the cloud-based system according to any of the preceding claims, the method comprising:

    Sending one or more requests from a service requestor server to a service provider server requesting for information with regard to a status of availability of a
plurality of registered vehicles for vehicle sharing services within a predetermined proximity with respect to one or more wireless devices (302);

Sending a notification from the service provider server to a vehicle server requesting for a predetermined set of conditions of a plurality of registered vehicles within the predetermined proximity with respect to a plurality of wireless devices (304);

Sending a response from the service provider server to the service requestor server with regard to the state of availability of the plurality of registered vehicles within the predetermined proximity with respect to the plurality of wireless devices (306);

Supplying information on a predetermined set of conditions of the plurality of registered vehicles to the service requestor server (308); wherein the registered users are allowed to select a registered vehicle most compatible with a profile of the respective registered users (310).

14. The method according to Claim 13, wherein the profile of the respective registered users is based upon a data information with regard to a location, a calendar of events and an itinerary of activities.

15. The method according to Claim 13, wherein the predetermined set of conditions of the plurality of vehicles includes a level of cleanliness (612); a vehicle battery level (614); an indication of number of positive reviews (610); and a status of availability.

16. The method according to Claim 13, wherein each registered users (116, 118, 120) is allowed to access a selected
registered vehicle upon completion of an authentication process (410).

17. The method according to Claim 13, wherein the status of availability of the plurality of registered vehicles (102, 104, 106) the plurality of registered vehicles (102, 104, 106) is displayed on the plurality of wireless devices (210, 210’).

18. The method according to Claims 13 to 15, wherein the predetermined set of conditions of the plurality of registered vehicles (102, 104, 106) are displayed on a body of the corresponding registered vehicle.

19. The method according to Claim 16, wherein upon completion of the authentication process (410), the selected registered vehicle (102) unlocks vehicle door allowing registered user (116) access to the registered vehicle (102).

20. A vehicular system 500a for vehicle sharing services in wireless communication with a cloud-based vehicle sharing management system, the vehicular system 500a comprising:
   a vehicle control module (502) configured for controlling and commanding instructions to different modules on board an vehicle,
   an access control module (504) in communication with the vehicle control unit (502), configured for activate locking or unlocking operations of vehicle doors;
   a radio frequency control module (506) configured for transmitting and receiving radio frequency signals, for localizing a position of an object with respect to an exterior of the vehicle;
   a door control module (508) in communication with the seat control module(510) and the vehicle control unit
(502), the door control module (508) is configured for controlling electronic components embedded around each door of the vehicle;

a seat control module (510) in communication with the door control module (508) for monitoring a level of cleanliness of seats within a passenger compartment of the vehicle;

a gateway module (512) in communication with the vehicle control unit (502), the gateway module (512) configured for receiving data from other modules and routing the received data to other modules on board the vehicle; wherein the vehicle control module (502) is configured to command the door control unit (508) to display information on a body of the electric vehicle for sharing services, thereby allowing reviewing a condition of the vehicle.

21. The vehicular system of Claim 20, wherein the system further comprises one or more transponders for receiving a low frequency (LF) signal, a radio frequency (RF) signal, and/or a Bluetooth low energy (BLE) signal, 5G, Spread Spectrum, Zigbee, Ultra Wide Band (UWB) or Millimeter wave signals or even radio signals

22. The vehicular system of Claim 20 or 21, wherein the access control module (504) is configured to receive a request to activate unlock doors of the vehicle upon receiving a notification on an authentication process (410) and a mode of verifying an identity of a registered user.

23. The vehicular system of any one of Claims 20 to 22, wherein the radio frequency control module (506) is configured for wireless communication with at least one external wireless device (210, 210’).
24. The vehicular system of Claim 23, wherein the at least one external wireless device (210, 210’) supports wireless technologies selected from the group consisting of Bluetooth protocol, Wi-Fi and global positioning systems (GPS), 5G, Spread Spectrum, Zigbee, Ultra Wide Band (UWB), Millimeter wave or radio waves.

25. The vehicular system of Claim 23 or 24, wherein the at least one external wireless device (210, 210’) is a wearable device (210) and/or a mobile communication device (210’).

26. A vehicle having a vehicular system according to any one of Claims 20 to 25.
300

Sending one or more requests from a service requestor server to a service provider server requesting for information with regard to a status of availability of a plurality of registered vehicles for vehicle sharing services within a predetermined proximity with respect to one or more wireless devices

302

Sending a notification from the service provider server to a vehicle server requesting for a predetermined set of conditions of a plurality of registered vehicles within the predetermined proximity with respect to a plurality of wireless devices

304

Sending a response from the service provider server to the service requestor with regard to the state of availability of the plurality of registered vehicles within the predetermined proximity with respect to the plurality of wireless devices

306

Supplying information on a predetermined set of conditions of the plurality of registered vehicles to the service requestor server

308

Allowing plurality of users to access at least one of the plurality of registered vehicles compatible with a profile of each of the plurality of registered users.

310

Fig. 3
Start

Service Requestor Server sends request to Service Provider Server

Vehicle Server sends vehicle information to Service Provider Server

Service Provider Server supplies the same information to Service Requestor Server

Predetermined set of conditions displayed on corresponding registered vehicles

User select vehicle & initiate authentication process?

Y

Payment Server confirms authentication process completed

Registered vehicle unlock doors to allow registered user to enter

End

N

Fig. 4
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

<table>
<thead>
<tr>
<th>Inv.</th>
<th>G06Q10/02</th>
<th>G06Q30/06</th>
<th>G06Q50/30</th>
</tr>
</thead>
</table>

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)

**G06Q**

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

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

**EP0-Internal**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US 9 365 188 B1 (PENILLA ANGEL A [US] ET AL) 14 June 2016 (2016-06-14) abstract column 18, line 33 - column 18, line 64; figure 6 column 18, line 65 - column 19, line 54; figure 7 column 19, line 55 - column 20, line 27; figure 8 column 21, line 53 - column 22, line 45; figure 10 column 24, line 55 - column 25, line 43; figure 12 column 25, line 44 - column 26, line 41; figure 13A column 28, line 62 - column 29, line 42; figure 16A column 33, line 62 - column 35, line 63; figure 17</td>
<td>1-26</td>
</tr>
</tbody>
</table>

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

**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
  * **L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  * **O** document referring to an oral disclosure, use, exhibition or other means
  * **P** document published prior to the international filing date but later than the priority date claimed

Date of the actual completion of the international search  
**12 September 2017**

Date of mailing of the international search report  
**27/09/2017**

Name and mailing address of the ISA/
European Patent Office, P.B. 5018 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-3040,  
Fax: (+31-70) 340-3016

Authorized officer  
**Weidmann, Matthias**

Form PCT/ISA/210 (second sheet) (April 2005)
<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2016318481 A1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2017050617 A1</td>
</tr>
<tr>
<td>US 9171268 B1</td>
<td>27-10-2015</td>
<td>NONE</td>
</tr>
<tr>
<td>US 2013124006 A1</td>
<td>16-05-2013</td>
<td>NONE</td>
</tr>
</tbody>
</table>