

A Parking Payment And Enforcement System Using Mobile

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Phones

This invention relates to a parking payment and enforcement system enabling a driver of a vehicle to activate parking payments during a parking procedure and to a method of managing such a system.

Background of Invention

There have been many different types of parking systems in the past that include individual parking meters, parking coupon dispensers, pre-paid parking coupons, electronic devices placed in the vehicle, telephone voice response parking solutions and SIM (Subscriber Identity Module) toolkit parking solutions. Each of them, however, has significant drawbacks that make real life implementation for parking authorities a costly exercise and usage for motorist significantly more difficult.

Individual parking meters and parking coupon dispensers, for example, require heavy initial capital investments and continuous maintenance costs of equipment, payment collection and paper top up. Furthermore, they suffer the need for motorist to have the correct coin amounts for the parking time required and return for a top up if an extension is needed. In addition, should the motorist return earlier, the remaining time on the meter cannot be reclaimed.

With prepaid parking coupons, it is difficult for the parking authority to identify defaulting motorist for enforcement purposes and there is additional printing as well as distribution costs for the prepaid parking coupons. The parking authority also runs the risk of illegal tampering and counterfeiting of the prepaid parking coupons. In addition, motorist need to prepay upfront for the parking coupons even though the parking cou-

pons may not be used often. And if the motorist runs out of prepaid parking coupons, it is extremely inconvenient to find an outlet for purchasing another batch of prepaid parking coupons. The need for the
5 motorist to return for a top up if an extension is required and the inability of reclaiming unused parking payments made still remains.

There have been many prior inventions of electronic devices placed in
10 the vehicle (e.g. US-A 6,249,233). The implementation of such electronic devices have fallen far short of expectations as the units are costly and need to be implemented in every vehicle.

Telephone voice response parking solutions (e.g. US-A 5,905,247,
15 US-A 5,940,481, US-A 6,243,029 and WO 9611453) have also been introduced over the recent years but have yet to take off because of the inconvenient usage for motorists and the need to put up additional parking zone markings for the parking authorities.

20 SIM toolkit parking solutions have also been introduced with the parking zone rates preprogrammed into a SIM card (e.g. WO 9910844). The solution has yet to make any significant impact as apart from inconvenient usage for motorist, extensive individual phone subscriber implementation is required.

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In view of the above discussion, it is an object of this invention is to make the payment for parking as convenient as possible to the motorist and the system implementation and migration as simple as possible to the parking authorities.

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Summary of Invention

This object is achieved, according to the invention, by a parking payment and enforcement system characterized by a parking management

server linked to at least one telecommunication network and a sending terminal located near the driver in the vehicle at least at the beginning of the parking procedure, said terminal having access to the same telecommunication network as the parking management server, and said parking management server comprising means for receiving an electronic request from said terminal via the telecommunication network, means for identifying said sending terminal and means for billing the driver, the owner of said vehicle or the owner of said terminal for parking.

The invention provides for a highly convenient parking payment and enforcement solution that enables motorists to easily activate and deactivate parking payments in conjunction with a location based service.

It may be appreciated, that the parking payment and enforcement system according to the invention works for land vehicles like cars, vans, trucks, motorbikes and bicycles as well as for water vessels like boats or ships parking in a harbor and even for aircrafts parking on airport facilities. The major field of use, however, might be the parking management for motor driven vehicles as cars and motorbikes, so that we speak below of the vehicle drivers in terms of "motorists".

In a preferred embodiment of the invention, the sending terminal is a mobile telecommunication device, in particular a standard mobile telephone, which is widely in use and very easy to handle.

In a further improvement, the mobile telecommunication device comprises an address book function with storage means, in particular for various parking tariffs, periods, reminder modes, alternative vehicle registrations and maximum payment limits, which allows motorists to configure parking payments through their mobile phones in the standard mobile phone address book.

The system according to the invention may comprise of a parking management server in which various linking information on the motorist, mobile phone, user identification, vehicle, tariffs, Cell ID and parking location details are automatically and periodically or at pre-determined intervals retrieved and stored. The server can also receive parking payment requests from motorist mobile phones through a convenient PARK message, sends user, parking tariffs and activation time confirmations based on the mobile phone location. To deactivate the service, the motorist simply sends another PARK message, thus ensuring an extremely user friendly interface for motorists. Depending on the telecommunication networks available, some PARK messages may be preceded by an *.

The PARK message also has options for the user to directly configure the payment tariff, periods, reminder modes and additional vehicle registrations using the mobile phone, thus providing maximum usage flexibility. Moreover, the motorist may reconfigure the usage settings like maximum payment limits, default reminder modes, additional vehicle registrations and bill payment modes through the parking management server internet web site.

The invention may also comprise an enforcement device which can optionally capture images of vehicles, extracting the vehicle details automatically, comparing the vehicle details with parking payment information wirelessly and generating parking bills using a wireless printing module for billing the defaulting motorist if necessary. The parking management server may automatically update payment information to the enforcement device through wireless means based on the location of the enforcement device.

According to further embodiments of the invention, there may exist a web site that allows for users to reconfigure maximum payment limits, reminder modes and additional vehicle registration.

The parking management server also may generate information for the parking authority to bill the defaulting motorist or for the mobile operator to bill the defaulting motorist on behalf of the parking authority. Alternatively, the parking management server can generate bill payments directly to the motorist on behalf of the parking authority, should it be necessary. There are options to send the parking bill together with the image through conventional or electronic mail with optional pro-rated usage billing to the motorist.

The motorist may also arrange for parking bill settlement mode through a secure payment gateway by contacting the parking management server internet web site. The mode options include parking bill settlement through the default parking bill notification mode, through a secure payment gateway to the parking authority or through the mobile phone bill, if arrangements could be made.

The above solutions may also work in conjunction with existing enforcement devices and implemented in transient phases.

The invention also may comprise an optional cost effective and self-powered receiver device with a parking status indicator that may be placed in the vehicle. The parking management server will send valid parking requests to activate the parking status indicator of the receiver device. This further facilitates the easy enforcement of parking payment.

Besides the above described hardware elements, the invention comprises also a method of managing a parking payment and enforcement

system enabling a driver of a vehicle to activate parking payments during a parking procedure, characterized by the following steps:

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(a) at the beginning, at the end or during the parking procedure, a request for parking access and/or billing for the actual parking is sent via a telecommunication network from a sending terminal to a parking management server linked to said telecommunication network;

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(b) the parking management server identifies the sending terminal and/or the vehicle and/or the driver;

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(c) the parking management server calculates the cost for the parking procedure according to a tariff to be applied and effects billing of the owner of the sending terminal and/or the owner of the vehicle and/or the driver accordingly.

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In a preferred variant of the method, the parking management server sends expiry reminders for the owner of the sending terminal, the owner of the vehicle or the driver to top up parking payment when necessary.

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In the solutions according to the invention as described above, additional tags within the vehicle, additional markings within the parking premises, registration of the motorist to use this parking scheme and parking coupons are no longer necessary.

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Brief Description of Drawings

The present invention will be understood and appreciated more fully from the following detailed description, taken into conjunction with the drawings in which:

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Figure 1 is the simplified pictorial illustration of the parking management system overview in accordance with the preferred embodiment of the present invention.

Figure 2 illustrates the background processes.

Figure 3 illustrates the motorist arrival and departure experience and the solutions addressing SMS network traffic congestion problems, different tariffs for different locations, addressing the motorist who forgets to stop payment, activating expiry reminders, payment of a secondary vehicle and displaying the help mode.

Figure 4 illustrates the enforcement process.

Figure 5 illustrates the storage of the solution in the standard mobile phone address book.

Figure 6 illustrates the billing and payment portions of the solution.

Figure 7 illustrates the usage of the optional cost effective self powered parking status receiver device that may be placed into the vehicle.

Detailed Description of Preferred Embodiments

The parking management system overview is pictorially illustrated in Figure 1.

The parking management server 8 is linked via either a lease line or secure internet connection to retrieve information from the databases of telecommunication operators 1 and parking authorities 2. The information may be automatically retrieved at a pre-determined time or regular intervals via FTP in a form of files (flat or other standard formats) or di

rectly from a database that supports ODBC. To reduce the amount of information transferred, files containing only updated or changed information may be transferred.

From the telecommunication operator 1, the information required could include the user's mobile phone number, the corresponding unique country wide identifier like an identity card or passport number, the corresponding mobile phone network's Cell ID and the corresponding Cell ID location details. From the parking authority 2, the minimal amount of information required would include the unique country wide identifier to vehicle number and location to parking tariff mappings.

Upon parking the vehicle 6, the motorist sends out a PARK message via a telecommunication network 3 using a mobile phone 4. On the mobile phone 4, the sequence, for example, 7 2 7 5 (for PARK) is keyed and sent to the telecommunication operator of the network 3. The request is routed to the Parking Management Server 8 together with the mobile phone number as well as mobile phone network Cell ID details (Figure 2).

Based on the Cell ID corresponding to a location, the Parking Management Server sends back to the mobile phone 4 an SMS acknowledgment with the parking tariff, default vehicle number and start parking time.

In this design, the most frequent use for the motorist would be to simply key in a PARK message, e.g. 7 2 7 5. The motorist will receive an acknowledgement from the Parking Management Server 8 with the following sample message: "Tel 98765432: \$0.45 tariff for CAR1234 from 9:15AM. Please reply within 5 minutes only if a cancellation is required." (Figure 3)

In the examples used, the default minimum and subsequent parking tariff are \$0.45 and \$0.90 respectively with the parking period interval being 30 minutes. If a cancellation request has been made through the acknowledgement reply, a cancellation confirmation will be sent.

To stop the payment, the motorist would simply key in another PARK message, i.e. 7 2 7 5. The motorist will receive an acknowledgement from the Parking Management Server 8 with the following sample message: "Tel 98765432: \$0.45 tariff for CAR1234 stopped at 9:55AM. Please reply within 5 minutes only if a cancellation is required."

For enforcement purposes, the officer merely keys in the vehicle number into a ruggedised yet compact hand held device 5 consisting of an integrated data receiver modem and an optional camera scanner. For efficient processing, several vehicle details may be keyed in and submitted to the Parking Management Server 8.

Should the vehicle details not be in the list of vehicles that have paid or the payment has expired, Parking Management Server 8 alerts the enforcement officer about the defaulting vehicle and subsequently, the parking bill can be issued 'on-the-spot' to the motorist through an external wireless printer (Figure 4).

Alternatively, the enforcement officer has the option to scan the number plate of the vehicle 6. The built in optical character recognition (OCR) application deciphers the number plate and compares it against the automatically uploaded list of vehicles that have made payment. The obvious benefits of using such a solution are the decreased error input, an increased ease of use and speed for vehicle inspection.

The type of data receiver modem to be used can be configured to suit the relevant telecommunication network provider, which might vary from

country to country. In an alternative mode of execution depending on the networks available, the Parking Management Server 8 may route the request information to the E-Parking Enforcement Devices 5 within the same vicinity using the location based technology upon receipt of the parking request.

In another execution of the solution, the historical parking bill payment for the defaulting vehicle can be retrieved and the parking bill can be compounded to accelerate future deterrence. Additional useful vehicle information can also be retrieved to assist other types of enforcement, e.g. stolen car, etc. .

The key concern of SMS network traffic congestion is addressed in this method of execution because only the return message is in the form of an SMS. Should there be any SMS network congestion where the return message is delivered late, the user merely sends another PARK message to obtain the last status and cancels it if the status has been activated. The system design inherently removes the issue of SMS network traffic congestion (see Figure 3)

Several other practical implementation issues are also addressed with this method of execution (see also Figure 3). They include concerns on different tariffs for different locations, the motorist forgets to stop payment, the motorist wishes to have the traditional fixed period of payment but with reminders, the motorist wishes to pay for another vehicle or the motorist wishes to know how to input information.

Should the details be incorrect, the motorist can cancel the request and key in the PARK sequence with its options, i.e. 7 2 7 5 * A * B * C * D, where

- "*" A" represents the parking tariff required with the value A=1 starting from the minimum parking tariff and A=2, 3, 4, etc. repre

-sending the subsequent higher parking tariff, 0 represents the help menu

- **"* B"** represents the number of parking periods required with B=1 indicating 1 period and B=2, 3, 4, etc. representing the subsequent period values,
- **"* C"** represents the reminder code with the default value C=0 indicating an OFF reminder code and C=1 representing the ON reminder code and
- **"* D"** represents the registered vehicle code with the value D=1 being the default vehicle registered and D=2, 3, 4, etc. representing the subsequent vehicles registered.

These PARK options are designed to address the motorist's varied parking preferences.

The SMS reply will almost always contain the correct tariff rates as they are normally based on significantly different geographical locations and can be sufficiently differentiated by the Cell ID. If the SMS reply contains the correct details, no additional action is required from the motorist.

In some areas where the location and tariff determination process is not so accurate, it may be necessary to key in the PARK parking tariff option, e.g. 7 2 7 5 * 2. This results in the following acknowledgement: "Tel 98765432: \$0.90 tariff for CAR1234 from 9:55AM. Please reply within 5 minutes only if a cancellation is required." In this system design, partial option input is allowed.

There are two methods to address the concern that the motorist forgets to stop the payment, typically when leaving in a rush. One is simply to fix the tariff and the number of periods, e.g. the motorist keys in the PARK parking tariff and periods option, e.g. 7 2 7 5 * 2 * 2. This re

sults in the following acknowledgement: " Tel 98765432: \$0.90 tariff for CAR1234 from 9:55AM to 10:55AM. Please reply within 5 minutes only if a cancellation is required."

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Alternatively, the motorist may use the normal method of payment and allow the payment to increase until the maximum value, e.g. \$4.50. This maximum parking payment value can be set to a default by the system and subsequently configured by the motorist via the Parking Management Server web site. The motorist will then be reminded to renew the parking payment with the following sample message: "Tel 98765432: \$0.90 tariff for CAR1234 stopped at 9:55AM. Please reply within 5 minutes only if a cancellation is required".

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Some motorist may wish to enable the expiry reminder mode, in which the PARK parking tariff, period and expiry reminder option can be keyed in, i.e. 7 2 7 5 * 2 * 2 * 1. This results in the following SMS acknowledgement : "Tel 98765432: \$0.90 for CAR1234 from 9:55AM to 10:55AM with reminder. Please reply within 5 minutes only if a cancellation is required." The default reminder mode can also be configured at the Parking Management Server web site.

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When the parking time has expired and the reminder code is active, the motorist is reminded with another SMS for another payment period "Tel 98765432: \$0.90 tariff for CAR1234 from 10:55AM to 11:55PM. Please reply within 5 minutes only if a cancellation is required". This process can continue until the motorist cancels the parking payment.

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Less frequently, the motorist may wish to request for parking payment for an additional secondary vehicle, in which the PARK parking tariff, period, reminder option and subsequent registered vehicle options are keyed in, e.g. 7 2 7 5 * 2 * 2 * 1 * 2. This results in the following acknowledgement: "Tel 98765432: \$0.90 tariff for CAR5678 from 9:55AM

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to 10:55AM with reminder. Please reply within 5 minutes only if a cancellation is required." The registration of payment for additional vehicles can be done at the Parking Management Server web site.

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When the solution is first introduced, new motorists may wish to be able to retrieve instructions on how to input information. There are many ways to address this concern and may include methods like consumer education advertisements, leaflets, etc. Another alternative would simply be for the user to key in the PARK with the help option, i.e. 7 2 7 5 * 0. The input instructions are then relayed back.

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The beauty of this solution execution is that most motorist will typically use one mode of parking that will address almost all their parking situations. Occasionally, some other parking modes are required and in most times, every individual has less than five parking preferences. A significant advantage of this system design is that personal parking preferences can be stored in the standard mobile phone's address book for highly convenient usage (Figure 5).

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In this invention, many options are also provided for billing to as well as payment from the motorist. The parking management server 8 is able to generate information for the parking authority 2 to bill the defaulting motorist or for the mobile operator to bill the defaulting motorist on behalf of the parking authority. Alternatively, the parking management server 8 can generate bill payments directly to the motorist on behalf of the parking authority 2, should it be necessary. There are options to send the parking bill together with the image through conventional or electronic mail (Figure 6).

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Another option shown in Figure 6 is a user reconfiguration by addressing the E-parking Web server using an internet terminal 7.

Further flexibility is built into this system with pro-rated parking. This involves the option for the motorist to pay only for the pro-rated time parked, rounded up to the next payable interval, i.e. the motorist pays
5 only \$0.68 for a 45 minute parking time at a \$0.45 tariff zone. This further encourages the widespread use of this solution. Other methods of encouragement may include lower parking rates because the parking authority has less printing and distribution costs.

10 The motorist may also arrange for parking bill settlement mode through the parking management server internet web site. The mode options include parking bill settlement through a secure payment gateway to the parking authority (e.g. VISA), through the mobile phone bill, if inter-party arrangements could be made or through direct parking bill notification
15 mode, if necessary.

To make the identification of the defaulting motorist even easier or when high rates of inspection are required, the E-Parking Solution has an optional cost effective self powered parking status receiver device 9
20 that may be placed into the vehicle 6. The parking management server 8 will send valid parking requests to activate the parking status indicator of the receiver device 9. Upon expiry of the parking payment, the receiver status device 9 will automatically deactivate itself. This optional device will provide enhanced visibility to the enforcement officers and
25 allow many vehicles to be inspected quickly without the need to key in or scan vehicle information (Figure 7).

Taken as a whole, this solution is highly unique as it can be used in conjunction with existing enforcement devices. Consequently, it is not
30 necessary to have all the existing enforcement devices to be upgraded and allows the solution to be implemented in transient phases. The solution is also extremely unique as additional tags within the vehicle or markings within the parking premises are unnecessary. Furthermore,

registration of the motorist to use this parking scheme may be unnecessary, thus making implementation of the solution extremely easy.

5 The invention as described above relates to a highly convenient vehicle parking system for motorist using mobile phones 4 with access to a telecommunication network 3. The system does not require the use of expensive parking meters, parking devices or tags within the vehicles 6, prepaid parking coupons, inconvenient telephone voice response systems or additional information markings at the parking location or in the vehicle 6. The parking management system comprises of a parking management server 8 linked to other telecommunication systems, at least to the telecommunication network 3, an enforcement device 5 with imaging, optical character recognition option and communication capabilities. The system can work in conjunction with the optional cost effective and self powered receiver device 9 that indicates the vehicle's parking status.

20 It is appreciated that various features of the invention which are, for clarity, described in the contexts of separate embodiments may also be provided in combination in a single embodiment. Conversely, various features of the invention which are, for brevity, described in the context of a single embodiment may also be provided separately or in any suitable sub combination.

25 It is appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. The scope of the present invention is defined by the claims which follow:

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**Claims**

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1. Parking payment and enforcement system enabling a driver of a vehicle (6) to activate parking payments during a parking procedure,

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characterized by

a parking management server (8) linked to at least one telecommunication network (3)

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and a sending terminal (4) located near the driver in the vehicle (6) at least at the beginning of the parking procedure,

said terminal (4) having access to the same telecommunication network (3) as the parking management server (8),

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and said parking management server (8) comprising means for receiving an electronic instruction from said terminal (4) via the telecommunication network (3),

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means for identifying said sending terminal (4)

and means for billing the driver, the owner of said vehicle (6) or the owner of said terminal (4) for parking.

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2. System according to claim 1, characterized in that the sending terminal (4) is a mobile telecommunication device.

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3. System according to claim 2, characterized in that the mobile telecommunication device comprises an electronic address book function with storage means, in particular for various parking tariffs, periods, reminder modes, alternative vehicle registrations and maximum payment limits.



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4. System according to any one of the preceding claims, characterized by comprising an enforcement device (5) with means for capturing an image of the defaulting vehicle (6), receiving vehicle registration information from a data base, converting the features of the captured image into data and comparing the data with the information received from the data base.
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5. System according to claim 4, characterized in that the enforcement device (5) further comprises a wireless printing module for parking bill issuance.
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6. System according to any one of the preceding claims, characterized by comprising a self powered data receiver (9) placed in the vehicle (6), with a parking status indicator that automatically deactivates upon expiry.
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7. Method of managing a parking payment and enforcement system enabling a driver of a vehicle (6) to activate parking payments during a parking procedure,
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- characterized by the following steps:
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- (a) at the beginning, at the end or during the parking procedure, a request for parking access and/or billing for the actual parking is sent via a telecommunication network (3) from a sending terminal (4) to a parking management server (8) linked to said telecommunication network (3);
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- (b) the parking management server (8) identifies the sending terminal (4) and/ or the vehicle (6) and/or the driver;
- (c) the parking management server (8) calculates the cost for the parking procedure according to a tariff to be applied and effects billing of the owner of the sending terminal (4)

and/or the owner of the vehicle (6) and/or the driver accordingly.

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8. Method according to claim 7, characterized in that the parking management server (8) sends expiry reminders for the owner of the sending terminal (4) and/or the owner of the vehicle (6) and/or the driver to top up parking payment when necessary.

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9. Method according to any one of claims 7 and 8, characterized in that the parking management server (8) generates:

- information for the parking authority to bill the defaulting driver or owner of the parking vehicle (6) or owner of the sending terminal (4);
- or information for a mobile operator to bill the defaulting driver or owner of the parking vehicle (6) or owner of the sending terminal (4) on behalf of the parking authority;
- or bill payments directly to the owner of the sending terminal (4) and/or the owner of the vehicle (6) and/or the driver on behalf of the parking authority, with options to send the parking bill through conventional or electronic mail.

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10. Method according to any one of claims 7 through 9, characterized in that the parking management server (8) sends valid parking requests to activate a parking status indicator within a self powered data receiver (9) placed in the vehicle (6).

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