An Improved System and Method for Wireless Power Charging

Field of the invention

[0001] The present invention relates, generally, to wireless power transmission and reception, and more particularly, to an improved system and method for optimizing wireless power charging of electronic devices.

Background of the invention

[0002] In today's day and age, wireless charging of electronic devices has emerged as a preferred alternative to traditional wired charging adaptors. Particularly, with prolonged usage of electronic devices and consequent increase in battery power consumption, it has become more and more necessary for the electronic devices to remain charged at all times of the day. Users staying mostly out of home may not always carry a wired charging adaptor or a power bank and may require charging options available at hand. One of the solutions is installation of wireless charging devices in various public places, which can transmit power wirelessly to such electronic devices, as the wireless charging devices usually do not provide physical constraints which are typically attributed to wired charging adaptors or power banks. With various emerging wireless charging options, a suitable wireless charging solution is desirable for users of electronic devices, which suits his expectations, charging needs and expenses.

[0003] Conventionally, wireless charging solutions for wireless power transfer and control employ components and functionalities which are complex and not easy to maintain which further increases cost of deployment or installation. Further, in existing systems and methods, users are restricted from authenticating their electronic devices in the absence of data connection and consequently from

charging. Furthermore, in existing wireless charging systems a separate component is typically deployed for detecting and controlling wirelessly chargeable electronic devices, which makes the existing systems bulky and further increases its installation and operational cost. Yet further, it has been observed that the existing wireless power charging systems are not suited for installation in rugged environments due to apparatus limitations and other infrastructural constraints.

[0004] In light of the aforementioned drawbacks, there is a need for a system and a method for improved wireless power charging. There is a need for a system and a method which is user-friendly and permits verification and authentication of user details for connecting to wireless power charging devices in the absence of any data communication. Furthermore, there is a need for a system and a method which eliminates installation of expensive components for detecting wireless chargeable electronic devices and controlling their charging. Furthermore, there is a need for a system and a method which can be employed in rugged environmental conditions for providing robust structural functionalities. Yet further, there is a need to provide a cost effective system and a method for wireless power charging.

Summary of the invention

[0005] In various embodiments of the present invention, a wireless power transmitting device for transmitting power wirelessly to an electronic device for charging is provided. The wireless power transmitting device comprises a smart communication device configured to receive wireless power transmission instructions associated with a wireless power transmitter from a server. The smart communication device further configured to control wireless power transmission from the wireless power transmitter to the electronic device based on the wireless power transmission instructions. The

wireless power transmitting device further comprises the wireless power transmitter. The wireless power transmitter configured to transmit power wirelessly to the electronic device. The wireless power transmitter transmits power wirelessly to the electronic device for a pre-determined time interval based on the wireless power transmission instructions received by the smart communication device responsive to a message from the electronic device, and resumes the transmission to the electronic device based on the wireless power transmission instructions received by the smart communication device responsive to an invocation of a wireless charging interface unit in the electronic device.

[0006] In various embodiments of the present invention, an electronic device for receiving power wirelessly from a wireless power transmitter of a wireless power transmitting device for charging is provided. The electronic device comprises a wireless charging interface unit. The wireless charging interface unit configured to communicate with a server and the wireless power transmitter for enabling reception of wireless power transmission from the wireless power transmitter. The electronic device further comprises a receiver unit. The receiver unit configured to receive wireless power transmission from the wireless power transmitter for charging the electronic device. The wireless charging interface unit is invocable for resuming reception of power wirelessly from the wireless power transmitter if the receiver unit receives wireless power transmission for a pre-determined time-interval responsive to a message sent by the electronic device to the server via a predefined number for initiating wireless power transmission from the wireless power transmitter.

[0007] In various embodiments of the present invention, a method for wirelessly charging an electronic device is provided. The method comprises transmitting, by the wireless power transmitting device, power wirelessly to the electronic

device for a pre-determined time interval based on wireless power transmission instructions received from a server responsive to a message transmitted by the electronic device to the server. The method further comprises resuming, by the wireless power transmitting device, the wireless power transmission to the electronic device based on the wireless power transmission instructions received from the server responsive to an invocation of a wireless charging interface unit in the electronic device.

Brief description of the accompanying drawings

[0008] The present invention is described by way of embodiments illustrated in the accompanying drawings wherein:

[0009] FIG. 1 illustrates a block diagram of a system for wireless power transfer and charging of electronic devices, in accordance with an embodiment of the present invention;

[0010] FIG. 2 and FIG. 2A is a flowchart illustrating a method for wireless power transfer and charging of electronic devices in the presence of a data connection, in accordance with an embodiment of the present invention;

[0011] FIG. 3 and FIG. 3A is a flowchart illustrating a method for wireless power transfer and charging of electronic devices in the absence of a data connection, in accordance with another embodiment of the present invention; and

[0012] FIG. 4 illustrates an exemplary computer system in which various embodiments of the present invention may be implemented.

Detailed description of the invention

[0013] A system and a method for wireless power charging of electronic devices is disclosed. In accordance with various embodiments of the present invention, an optimized wireless power charging of electronic devices is provided. Further,

the invention provides for efficient power transfer and control of wireless charging of electronic devices. Yet further, the invention provides for a robust and a cost effective wireless power charging system and a method with effective data exchange between various components of the wireless charging system and without any complex infrastructural system requirements.

[0014] The system may be installed and implemented for wirelessly charging personal electronic devices in public places. Public places may include, but are not limited to, charging counter or a kiosk, offices, education campuses, hospitals, malls, markets, shops, eateries, restaurants, lounges, movie theatres, airports, railways stations, metro stations, bus stops, bus terminals, taxi stands, car parking or the like. Further, the wireless power charging system may be installed in a car, a train, a metro train, a taxi, or a bus and a traveller may charge his personal electronic device wirelessly while travelling. Further, the wireless power charging system and method may be configured to charge a vehicle such as, but is not limited to an electric car, an electric bus, an electric two-wheeler or the like. Furthermore, the wireless power charging system may be installed and implemented in personal property premises.

[0015] The disclosure is provided in order to enable a person having ordinary skill in the art to practice the invention. Exemplary embodiments herein are provided only for illustrative purposes and various modifications will be readily apparent to persons skilled in the art. The general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the invention. The terminology and phraseology used herein is for the purpose of describing exemplary embodiments and should not be considered limiting. Thus, the present invention is to be accorded the widest scope encompassing numerous alternatives, modifications and equivalents

consistent with the principles and features disclosed herein. For purposes of clarity, details relating to technical material that is known in the technical fields related to the invention have been briefly described or omitted so as not to unnecessarily obscure the present invention.

[0016] The present invention would now be discussed in context of embodiments as illustrated in the accompanying drawings.

[0017] FIG. 1 illustrates a block diagram of a system (100) for wireless power transfer and charging, in accordance with various embodiments of the present invention. Referring to FIG. 1, the wireless power transfer and charging system (100) comprises a wireless power transmitting device (102), an electronic device (104), a beacon (108), a server (106), a power source (116) and an alternate current to direct current converter (ADC) (118). In an exemplary embodiment of the present invention, the wireless power transmitting device (102) connects to the server (106) via a smart communication device (146) over the communication channel (110). The electronic device (104) connects to the server (106) via a communication module (142) over the communication channel (110). The communication channel (110) may include a physical transmission medium, such as a wire, or a logical connection over a multiplexed medium, such as, a radio channel in telecommunications and computer networking. The examples of radio channel in telecommunications and computer networking may include, but are not limited to, GPRS, 2G, 3G, 4G, 5G, LAN, MAN, WAN, WLAN. The communication channel (110) may also include a wireless transmission medium. The wireless transmission medium may include, but is not limited to, Wi-Fi network, Bluetooth, ZigBee™ etc.

[0018] In an exemplary embodiment of the present invention, the wireless power transmitting device (102) may be installed on a surface, under a surface or may be embedded in a surface

or embedded in other devices or may be portable. The wireless power transmitting device (102) may be associated with a form factor which makes the wireless power transmitting device (102) suitable for installation in rugged environment conditions. Further, the wireless power transmitting device (102) may comprise heat vents (not shown) for thermal heat dissipation which is produced at the time of operation. The vents (not shown) may comprise aluminium chassis vents providing thermal vents cut-out for allowing cool air to enter the device (102), subsequently cool down the heated internal components and side vents to dissipate the heated air. The vents aids in circulation of air only if the internal components gets heated up. In an exemplary embodiment of the present invention, the wireless power from the wireless power transmitting device (102) is delivered to the electronic device (104) as power as a service.

[0019] In various embodiments of the present invention, multiple wireless power transmitting devices (102) may be deployed at different locations and each of the wireless power transmitting devices (102) are associated with a unique identification number (UIN). The UIN is an identifier which uniquely identifies each of the multiple wireless power transmitting devices (102). The electronic device (104) may be configured to connect to the wireless power transmitting devices (102) for charging using the UIN. The UIN may be in the form of, but is not limited to, a six digit hex code, quick response (QR) code, alphanumeric code, a bar code and the like. In another embodiment of the present invention, UIN may be assigned to various components of the wireless power transmitting device (102) which transmits radio frequencies. The radio frequency transmitted by various components of the wireless power transmitting device (102) may interact with the electronic device (104) for wireless charging connection enablement and data exchange. In an exemplary embodiment of the present invention, the UIN may be displayed on the

wireless power transmitting device (102) in a printed form on the body of the wireless transmitting device (102), in a digital form displayed on the display unit (126), in an audio form or a combination thereof. In another exemplary embodiment of the present invention, the UIN may be programmed in various components or units of the wireless power transmitting device (102).

[0020] In various embodiment of the present invention, the wireless power transmitting device (102) comprises the smart communication device (146) and a wireless power transmitter (164). In an embodiment of the present invention, the wireless power transmitter (164) operates in conjunction with the smart communication device (146). In an exemplary embodiment of the present invention, the smart communication device (146) and the wireless power transmitter (164) may be installed separately in near range operating conditions such that the smart communication device (146) is a detachable unit and the wireless power transmitter (164) is fixed to a surface. In another exemplary embodiment of the present invention, the smart communication device (146) and the wireless power transmitter (164) may be installed as one working unit in a housing (not shown). In yet another exemplary embodiment of the present invention, the smart communication device (146) may be fixed to a surface and the wireless power transmitter (164) may be a detachable unit working in conjunction with each other.

[0021] In an exemplary embodiment of the present invention, an external switch (not shown) may be provided on either the smart communication device (146) or the wireless power transmitter (164) or on both, for individually regulating power functionalities of the smart communication device (146) and the wireless power transmitter (164). In another exemplary embodiment of the present invention, the smart communication device (146) or the wireless power transmitter

(164) or both may have a utility reset switch (not shown) for resetting the functionalities of the smart communication device (146) or the wireless power transmitter (164) or both.

[0022] In an embodiment of the present invention, the wireless power transmitting device (102) is configured to receive power from an external power source (116). In various embodiments of present invention, the wireless power transmitting device (102) is connected to the external power source (116) via an alternating current (AC) to direct current (DC) converter (ADC) (118). The ADC (118) converts the input AC to DC and thereafter the output DC from ADC (118) is fed to the wireless power transmitting device (102) via the smart communication device (146). In another embodiment of the present invention, the wireless power transmitting device (102) is configured to receive power from a power bank unit (not shown) attached directly to the smart communication device (146). In an embodiment of the present invention, the smart communication device (146) is configured to control and monitor the external power supply received from the power source (126) or the power bank unit (not shown) to the wireless power transmitter (164) for wireless power transmission.

[0023] In an embodiment of the present invention, the smart communication device (146) comprises a controller (128), a communication unit (130) and a battery B (148). In various embodiments of present invention, the controller (128), the communication unit (130) and the battery B (148) operates in conjunction with a processor (152) which executes instructions stored in a memory (154).

[0024] In an embodiment of the present invention, the communication unit (130) is operable to communicate with the server (106) via the communication channel (110). Further, the communication unit (130) is operable to communicate with

the controller (128). The communication unit (130) of the smart communication device (146) communicates with the server (106) and the controller (128) to enable reception and transmission of wireless power transmission instructions between the controller (128) and the server (106). The wireless power transmission instructions comprises, but are not limited to, the electronic device (104) authentication details and instructions to allow or cease wireless power supply to the wireless power transmitter (164). The authentication process includes at least validating the electronic device (104) details by the server (106), validating the user details associated with the electronic device (104) by the server (106) and validating the UIN associated with the wireless power transmitting device (102) by the server (106) etc. The communication unit (130) may include, but is not limited to, an Internet of Things (IoT) device, narrow band IoT device, a Wi-Fi, a Bluetooth, a Zigbee™, Near Field Communication (NFC), a device with wired connection etc.

[0025] In an embodiment of the present invention, the controller (128) of the smart communication device (146) is operable to control the input and output current or voltage of the wireless power transmitter (164) by performing an action on a switch (124) in the wireless power transmitter (164). The controller (128) is configured to receive power from the power source (116) or the power bank unit (not shown) via the battery B (148) or directly from the battery B (148). Further, the controller (128) controls the switch (124) by turning the switch (124) 'ON' or 'OFF' based on wireless power transmission instructions received from the server (106) via the communication unit (130). The controller (128) may include, but is not limited to, a universal asynchronous receiver/transmitter (UART) controller or inter-integrated circuit (I2C) controller or the like. In an exemplary embodiment of the present invention, the controller (128) of

the smart communication device (146) is configured to maintain the wireless power transmitter (164) in a low power mode, for example in a power standby mode via the switch (124). The low power mode is maintained for enabling the wireless power transmitter (164) to sense placement or near presence of the electronic device (104) on or near the wireless power transmitter (164).

[0026] In an exemplary embodiment of the present invention, the battery B (148) in the smart communication device (146) may be a rechargeable battery such that the battery B (148) may be detached and recharged. Thereafter, the battery B (148) may be reattached to the smart communication device (146) for providing power to the wireless power transmitter (164). In another embodiment of the present invention, the smart communication device (146) may be detached and the battery B (148) may be recharged. Thereafter, the smart communication device (146) may be reattached to the wireless power transmitter (164) for providing power to the wireless power transmitter (164).

[0027] In an embodiment of the present invention, the wireless power transmitter (164) comprises a primary coil/resonator (120), a transmitter unit (122), the switch (124), a display unit (126) and a battery A (150). In various embodiments of the present invention, the primary coil/resonator (120), the transmitter unit (122), the switch (124), the display unit (126) and the battery A (150) operates in conjunction with a processor (156) which executes instructions stored in a memory (158).

[0028] In an embodiment of the present invention, the wireless power transmitter (164) is configured to transmit power wirelessly based on a magnetic induction or a magnetic resonance phenomenon. The wireless power transmitter (164) operating in conjunction with the smart communication device

(146) is configured to charge a battery (138) of the electronic device (104) wirelessly. In an exemplary embodiment of the present invention, the electronic device (104) may be placed on top of the wireless power transmitter (164) or held at a distance in the range of between 15mm-40mm from the wireless power transmitter (164) for receiving power wirelessly from the wireless power transmitter (164).

[0029] In an embodiment of the present invention, the transmitter unit (122) in the wireless power transmitter (164) receives power from the external power source (116) or the power bank unit (not shown) or the battery A 150 via the switch (124). The switch (124) receives external power via the controller (128) of the smart communication device (146). The transmitter unit (122) thereafter optimizes power for wireless transmission to the electronic device (104). In an exemplary embodiment of the present invention, the power generated by the transmitter unit (122) may be in the form of one or more pre-determined power modes such as, but are not limited to, a low power of 5W, a medium power in the range of between 5W-40W or a high power in the range of between 10kW-20kW. The power generated by the transmitter unit (122) is received and converted to wireless power using one of electromagnetic induction phenomenon or magnetic resonance phenomenon via the primary coil/resonator (120) for wireless transmission to the electronic device (104). The primary coil/resonator (120) within the wireless power transmitter (164) is configured to transmit the power wirelessly in the form of electromagnetic induction or magnetic resonance coupling to the electronic device (104).

[0030] In an embodiment of the present invention, the switch (124) within the wireless power transmitter (164) is an 'ON/OFF' logic switch. The switch (124) is operable to turn 'ON' the transmitter unit (122) or cease the supply of power to the transmitter unit (122) according to wireless power

transmission instructions received via the controller (128) of the smart communication device (146) from the server (106). For example, if the transmission power is in excess than that required by the electronic device (104), then the controller (136) in the electronic device (104) detects the increase in power and sends an instruction to the server (106). Subsequently, the server (106) sends an instruction to the controller (128) for turning 'OFF' the switch (124) to cease the power supply to the transmitter unit (122). In another example, if a power turn 'OFF' command is received by the smart communication device (146) from the server (106), the controller (128) turns 'OFF' the power supply to the switch (124) and ceases power supply to the transmitter unit (122). In yet another example, if the authentication of the electronic device 104 is successful or unsuccessful, then the controller (128) turns 'ON' or 'OFF' the transmitter unit (122).

[0031] In an embodiment of the present invention, the display unit (126) is in communication with the smart communication device (146) via the controller (128) of the smart communication device (146) and is operable to display charging operations of the wireless power transmitting device (102). The display unit (126) receives power from the battery A (150). The display unit (126) may display the wireless power transmitting device (102) operations based on wireless power transmission instructions received from the controller (128) of the smart communication device (146) and is controlled by the said controller (128) of the smart communication device (146). The operation may include, but is not limited to, working condition of the wireless power transmitting device (102), busy condition of the wireless power transmitting device (102) or the like. The display unit (126) may include, but is not limited to, an organic light emitting diode (OLED) screen, an liquid crystal display (LCD) screen, light emitting diode (LED) screen, plasma display, a

touch screen or the like. The display unit (126) may be of various shapes and sizes, which may include, but are not limited to, circular, rectangular, triangular, square etc. and a combination thereof. Further, in an embodiment of the present invention, the display unit (126) may be operable to display an advertisement. In another embodiment of the present invention, the wireless power transmitter (164) may have a changeable panel instead of a display unit (126), for displaying advertisements or other information. The changeable panel may be made of, at least, but is not limited to, silicon, glass, toughened glass, acrylic, leather, etc. The changeable panel may be customizable according to the display requirements of the wireless power transmitting device (102). In an exemplary embodiment of the preset invention, the changeable panel may include a preventive layer to reduce heat generated during operation.

[0032] In an embodiment of the present invention, the battery A (150) in the wireless power transmitter (164) may be a rechargeable battery such that the battery A (150) may be detached from the wireless power transmitter (164) and recharged. Thereafter, the battery A (150) may be reattached to the wireless power transmitter (164) for wireless power transmission to the electronic device (104). In another embodiment of the present invention, the wireless power transmitter (164) may be detached and the battery A (150) may be recharged. Thereafter, the wireless power transmitter (164) may be reattached to the smart communication device (146) for wireless power transmission to the electronic device (104).

[0033] In an embodiment of the present invention, the electronic device (104) is a wireless power receiving device. The electronic device (104) is configured to receive power wirelessly from the wireless power transmitting device (102) to charge the rechargeable battery (138). In an embodiment

of present invention, the electronic device (104) comprises a secondary coil/resonator (132), a receiver unit (134), a controller (136), the battery (138), a display panel (140) and a communication module (142). In various embodiments of present invention, the secondary coil/resonator (132), the receiver unit (134), the controller (136), the battery (138), the display panel (140) and the communication module (142) operates in conjunction with a processor (160) which executes instructions stored in a memory (162). Further, in various embodiments of present invention, the electronic device (104) is a device capable of executing instructions and communicating via at least a cellular network amongst other network channels. The electronic device (104) may be a portable device which may include, but is not limited to, a smart phone, a tablet, a laptop, a notebook or the like. Further, the electronic device (104) may be a wireless power chargeable vehicle, for example, an electric car, an electric bus or an electric two-wheeler. In an embodiment of the present invention, the electronic device (104), in order to receive power wirelessly from the wireless power transmitter (164), comprises a wireless charging interface unit (144). In an exemplary embodiment of the present invention, the wireless charging interface unit (144) may be a software module or a hardware module integrated with the electronic device (104). In another embodiment of the present invention, the wireless charging interface unit (144) may be a web application. The wireless charging interface unit (144) enables the electronic device (104) to interact with the wireless power transmitting device (102) and the server (106) for reception of wireless power transmission. In an exemplary embodiment of present invention, the wireless charging interface unit (144) may be pre-configured on the electronic device (104). In another exemplary embodiment of the present invention, if the wireless charging interface unit (144) is not pre-configured on the electronic device (104), it may be configured when the electronic device (104) is in a near

vicinity of the wireless power transmitting device (102) and receives a low power signal from the beacon (108).

[0034] In an embodiment of the present invention, the secondary coil/resonator (132) is configured to generate an induced current in response to changes in an electromagnetic field generated by the primary coil/resonator (120) of the wireless power transmitting device (102). The receiver unit (134) is configured to receive power from the secondary coil/resonator (132). The receiver unit (134) may operate as a rectifier and convert the received power into a voltage required by the electronic device (104) to charge the battery (138). Further, the controller (136) is configured to control the wireless charging interface unit (144) based on the wireless power transmission instructions received from the server (106) via the communication module (142). The instructions may include, but is not limited to, communicating UIN, communicating the electronic device (104) details, communicating user details, etc. The communication module (142) is configured to communicate with the wireless power transmitting device (102) and the server (106) to perform data exchange communication therebetween over the communication channel (110) via the wireless charging unit (144). The communication module (142) may include, but is not limited to, a Bluetooth module, a Wi-Fi module, a network communication module or the like. The display panel (140) is a display screen on the electronic device (104). The display panel (140) provides the user of the electronic device (104) an interface to operate the wireless charging interface unit (144). In an exemplary embodiment of the present invention, the display panel (140) is a touch based display panel.

[0035] In various embodiments of the present invention, the wireless power transmitting device (102) is controlled by the server (106) via the smart communication device (146). In an exemplary embodiment of the present invention, the server

(106) and the smart communication device (146) are in direct communication via the communication channel (110). The server (106) may be at a location remote to the wireless power transmitting device (102) and the electronic device (104). In an exemplary embodiment of the present invention, the server (106) may be a cloud server. In an embodiment of the present invention, a user information database (112) is maintained in the server (106). The user information database (112) comprises data associated with user of the wireless power transmitting device (102) and information related to the wireless charging enabled electronic devices (104). In an exemplary embodiment of the present invention, the data associated with user of the wireless power transmitting device (102) and information related to the wireless charging enabled electronic device (104) may include, but is not limited to, user email id, phone number(s) registered with the electronic device (104), the electronic device (104) model number, user registration details for accessing the wireless power transmitting device (102), user payment information or the like. In an embodiment of the present invention, the user information database (112) may be updated in real-time by the wireless charging interface unit (144) installed on the electronic device (104). In an exemplary embodiment of the present invention, the user information database (112) may be updated when the wireless charging interface unit (144) is invoked on the electronic device (104). In another exemplary embodiment of the present invention, the user information database (112) may be updated by the controller (128) of the smart communication device (146), when the electronic device (104) is connected to the wireless power transmitting device (102). The user information database (112) may be updated using one or more cognitive computing techniques which may include, but is not limited to, machine learning techniques, artificial intelligence, pattern recognition techniques, deep learning techniques or the like.

[0036] In another embodiment of the present invention, a wireless power transmitting device database (114) may be maintained in the same server (106) as the user information database (112) or in a separate server. The wireless power transmitting device database (114) comprises data associated with the wireless power transmitting device (102). In an exemplary embodiment of the present invention, the data associated with the wireless power transmitting device (102) may include, but is not limited to, UINs of the various wireless power transmitting devices (102), the wireless power transmitting device (102) location information, model number, power transmission strength, power output, voltage output, working temperature or the like. In an embodiment of the present invention, the wireless power transmitting device database (114) may be updated in real-time by connecting directly to the smart communication device (146) of the wireless power transmitting device (102).

[0037] In an embodiment of the present invention, the beacon (108) transmits, at regular intervals, low frequency signals. The low frequency signal may include, but is not limited to, a Bluetooth signal, infrared signal, ZigBee™, Z-Wave™ etc. The beacon (108) may be configured to communicate with the server (106) via the communication channel (110). The beacon (108) is operable to communicate with the electronic device (104) via the communication module (142) of the electronic device (104). The beacon (108) communicates with the electronic device (104) to allow the electronic device (104) to detect presence of the wireless power transmitting device (102). In another embodiment of the present invention, the beacon (108) may be configured to receive from the electronic device (104), information associated with the electronic device (104) and communicate the same to the server (106), such that the server (106) communicates promotional ads and

offers to the user associated with the electronic device (104).

[0038] In another embodiment of the present invention, the wireless power transmitting device (102) and the electronic device (104) may be configured to communicate with each other in real-time. In an exemplary embodiment of the present invention, the wireless power transmitting device (102) communicates with the electronic device (104) via the communication module (142). The communication module (142) may include a Bluetooth, a Wi-Fi signal, or wired connections. The communication may include, but is not limited to, exchange of device information, sending and receiving of instructions, data exchange, selecting fast or slow charging, user feedback, charging stop message, object detection, foreign object detection, alerts & alarms, temperature, current and voltage requirements. Further, the communication may be a one-way communication or a two-way communication between the wireless power transmitting device (102) and the electronic device (104). In an exemplary embodiment of the present invention, the one-way communication may include, but is not limited to, transmission of power and the wireless power transmitting device (102) information, by the wireless power transmitting device (102) to the electronic device (104). In another exemplary embodiment of the present invention, the two-way communication may include, but is not limited to, receiving feedback from the electronic device (104) by the wireless power transmitter (164), after the wireless power charging has been used by the electronic device (104).

[0039] In operation, in an embodiment of the present invention, the electronic device (104) may connect to the wireless power transmitting device (102) via the wireless charging interface unit (144) configured on the electronic device (104) for receiving wireless power. In another

embodiment of the present invention, the electronic device (104) may connect with the wireless power transmitting device (102) based on authentication process using a pre-defined number in an offline mode. The pre-defined number provides a link between the server (106) and the electronic device (104) over the communication network (110). Further, in another embodiment of the present invention, the electronic device (104) connects with the wireless power transmitting device (102) via the communication module (142) for data exchange between the wireless transmitting device (102) and the electronic device (104).

[0040] In an exemplary embodiment of the present invention, the wireless charging interface unit (144) may be invoked on the electronic device (104) and a connection is established between the electronic device (104) and the server (106) over the communication channel (110) in an online mode, if data connection is available on the electronic device (104). The wireless charging interface unit (144) may be a graphical user interface on the electronic device (104), which may also be capable of taking touch inputs on the electronic device (104). The wireless charging interface unit (144) is an interactive interface which provides various options to the user associated with the wireless power transmitting device (102). The options may include, but are not limited to, wireless power transmitting device (102) locations, strength of charging provided by the wireless power transmitting device (102) at the locations of the wireless power transmitting device (102), charging voltage output value of the wireless power transmitting device (102) at the locations of the wireless power transmitting device (102), power output value of the wireless power transmitting device (102) at the locations of the wireless power transmitting device (102), etc. The wireless charging interface unit (144) may provide a map view of wireless charging locations. The user of the electronic device (104) may select a desired charging

location and the navigation system may guide the user to the charging location. The navigation system may be a real-time route display with audio output or a graphical real-time route display or a combination thereof. The user of the electronic device (104) may select the desired charging location and is guided to the charging location by the navigation system. The selection of the desired charging location is sent as a request to the server (106) by the wireless charging interface unit (144) via the communication module (142). The request may be representative of, at least, a user desirous of using the wireless power transmitting device (102) for charging his electronic device (104) at the selected location.

[0041] In an exemplary embodiment of the present invention, in the event the user associated with the electronic device (104) accesses the desired charging location, an instruction is sent by the communication module (142) of the electronic device (104) to the server (106) for authenticating the electronic device (104) details and user details stored in the user information database (112). The details may include, but are not limited to, user name, phone number, email id, electronic device model number or the like. The server (106) is configured to fetch information of the electronic device (104) and the user details from the user information database (112). The server (106), thereafter, sends a confirmation message to the electronic device (104) associated with the user. The confirmation message may include, but is not limited to, a welcome message, a beep, a promotion message with an advertisement or the like.

[0042] In an embodiment of the present invention, the server (106) is configured to send, via the communication module (142), wireless power transmission instructions including a first command message to the wireless charging interface unit (144) for communicating the UIN displayed on the display unit

(126) of the wireless power transmitting device (102), when the user accesses the wireless charging location and launches wireless charging interface unit (144) on the electronic device (104). Thereafter, a connection is established between the server (106) and the electronic device (104). The first command message may include, but is not limited to, scanning the UIN, if the UIN is in QR code form, and uploading the scanned UIN in the wireless charging interface unit (144), or inputting the UIN in the wireless charging interface unit (144) if the UIN is displayed as a pop-up, a notification, and a dialogue box. The wireless charging interface unit (144) sends the UIN to the server (106) via the communication module (142) in the electronic device (104). In another embodiment of the present invention, the wireless power transmitting device (102) is configured with a unique acoustic signal which is correlated to the UIN. Further, when the electronic device (104) is in near vicinity of the wireless power transmitting device (102), the unique acoustic signal is detected by the electronic device (104) and subsequently the UIN correlated with the unique acoustic signal is transmitted to the server (106) via the wireless charging interface unit (144). Therefore, the server (106) is configured to send back the unique acoustic signal to the smart communication device (146) of the wireless power transmitting device (102) upon successful authentication of the UIN for switching 'ON' the wireless power transmitter (164). In an embodiment of the present invention, the UIN enables the server (106) to identify the wireless power transmitting device (102) which is to be activated for wireless power transfer to the electronic device (104). Subsequent to communicating the UIN to the server (106), the UIN is received by the wireless power transmitting device database (114) and a check is performed by the server (106) in the wireless power transmitting device database (114) for a match with the stored UINs. In an exemplary embodiment of the present invention, if the received UIN is not matched

successfully, the server (106) resends the first command message to the wireless charging interface unit (144) of the electronic device (104) via the communication module (142) to recover the correct UIN.

[0043] Further, the server (106) is configured to send, via the communication module (142), wireless power transmission instructions including a second command message to the electronic device (104) for, at least, communicating the electronic device (104) details and user details to the server (106) subsequent to sending the first command message. The user details may include, but are not limited to, user login id, user email id, user pin, password etc. The wireless charging interface unit (144) sends the electronic device (104) details and user details to the server (106) via the communication module (124). The electronic device (104) details includes, but are not limited to, Mobile Station International Subscriber Directory Number (MSISDN), international Mobile Equipment Identity (IMEI) number etc. The electronic device (104) details enables the server (106) to determine whether the user associated with the electronic device (104) is a registered user or is an unregistered user (new user).

[0044] In an exemplary embodiment of the present invention, the registered user is a user, whose user and the electronic device (104) details are pre-stored in the user information database (112). The unregistered user (new user) is a user, whose user and the electronic device (104) details are not stored in the user information database (112).

[0045] In an embodiment of the present invention, the server (106) is configured to send wireless power transmission instructions to the communication unit (130) of the smart communication device (146) after successful authentication of the UIN and authentication of the user as a registered

user by the server (106). The instruction includes instruction for switching 'ON' the switch (124) of the wireless power transmitter (164) for wireless power transmission to the electronic device (104). The switch (124) is switched 'ON' and the transmitter unit (122) transmits power wirelessly via the primary coil/resonator (120) for charging the electronic device (104) associated with the authenticated user. The electronic device (104) may be placed on the wireless power transmitter (164) or held at a distance in the range of between 15mm-40mm from the wireless power transmitter (164) for wireless power charging. Furthermore, the server (106) by connecting via the communication channel (110) to the electronic device (104) simultaneously checks charging requirements of the electronic device (104) communicated via the wireless charging interface unit (144) and further sends an alert to the electronic device (104). The alert may include, but is not limited to, a pop-up, a message, a notification or the like informing the user that the wireless power transmitter (164) is switched 'ON'. The charging requirements may include, but are not limited to, voltage required for charging, power required for charging, battery (138) level of the electronic device (104), time required for charging etc. A notification message is sent to the electronic device (104) for indicating the charging requirements detected by the server (106). The message may include, but is not limited to, a simple notification service (SNS) or the like.

[0046] In an embodiment of the present invention, the charging is enabled for a pre-determined interval of time for the registered user. In an exemplary embodiment of the present invention, the charging of the electronic device (104) in the pre-determined interval of time for the registered user is a prolonged pre-determined time interval.

[0047] In an embodiment of the present invention, the server (106) is configured to send a wireless power transmission instruction to the controller (128) via the communication unit (130) of the smart communication device (146) after the prolonged pre-determined interval of time, (146) to switch 'OFF' the switch (124) and stop wireless power transfer to the electronic device (104). The server (106) simultaneously transmits wireless power transmission instruction including a switching 'OFF' notification to the electronic device (104). The notification may include, at least, a message to remove electronic device (104), a message of charging completion, a message indicating charging time interval over or the like. The notification is received by the communication module (142) of the electronic device (104) and is, thereafter, received and processed by the controller (136) to control the wireless charging interface unit 144. In an embodiment of the present invention, the notifications are displayed on the display panel (140) of the electronic device (104).

[0048] Further, if the user is determined as an unregistered user (new user), the second command message is resent by the server (106) to the wireless charging interface unit (144) in the electronic device (104), informing the user associated with the electronic device (104) for sending the user details to the server (106) for registration. Thereafter, wireless charging is enabled from the wireless power transmitter (164) for wirelessly charging the electronic device (104). In another embodiment of the present invention, if the user is an unregistered user associated with the electronic device (104) and the electronic device (104) is not configured with the wireless charging interface unit (144), a message is sent including the user details and the UIN of the wireless power transmitting device (102) via the communication module (142) of the electronic device (104) to a pre-defined number associated with the server (106).

[0049] In another embodiment of the present invention, the electronic device (104) configured with the wireless charging interface unit (144) is operable to connect to the server (106) if there is no data communication network available on the electronic device (104) i.e. in the offline mode. The electronic device (104) is configured to connect to the server (106) via a message to the pre-defined number, if there is no data communication network available on the electronic device (104). The pre-defined number provides a link to connect the server (106) and the electronic device (104) over the communication network (110).

[0050] In operation, in an embodiment of the present invention, a first message to the server (106) is sent via the pre-defined number over the communication channel (110). The first message may include, a message with the UIN of wireless power transmitting device (102) and user personal details, such as, but are not limited to, email id of user, phone number of user, or the like. The first message is received by the server (106) and processed. The processing is done to determine whether the received UIN, match with the stored UINs in the wireless power transmitting device database (114) and the received user details match with the stored user details in the user information database (112). The processing of user details further allows the server (106) to determine the user as a registered user or an unregistered user (new user).

[0051] Further, the server (106) determines the UIN as a correct UIN and the user as the registered user and then the server (106) sends the wireless power transmission instructions including switching 'ON' the switch (124) of the wireless power transmitter (164), to the controller (128) via the communication unit (128) of the smart communication device (146) of the wireless power transmitting device (102).

The switching 'ON' of the switch (124) enables the wireless power transmitter (164) to transmit power wirelessly via the primary coil/resonator (120). Furthermore, in an embodiment of the present invention, simultaneously, the server (106) sends a second message to the electronic device (104) including, a message with a switch 'ON' status of the wireless power transmitter (164) associated with the authenticated UIN. Further, the server (106) also identifies the said electronic device (104) associated with the registered user as a target electronic device. Thereafter, the target electronic device (104) associated with the registered user may be placed on the wireless power transmitter (164) for wireless power charging or held at a distance in the range of between 15mm-40mm from the wireless power transmitter (164) for wireless power charging. The pre-determined time interval of charging for the registered user may be a prolonged pre-determined time interval.

[0052] In an embodiment of the present invention, after the prolonged pre-determined time interval for charging the electronic device (104), the wireless power transmission instructions including turning 'OFF' the switch (124) of the wireless power transmitter (164) is sent by the server (106) to the controller (128) via the communication unit (130) of the smart communication device (146). The switching 'OFF' of the switch (124) ceases the wireless power transmission to the electronic device (104) of the registered user.

[0053] In another embodiment of the present invention, after receiving the first message from the user, the server (106) determines the UIN as a correct UIN and the user as an unregistered user (new user), and then sends the wireless power transmission instructions including switching 'ON' the switch (124) of the wireless power transmitter (164), to the controller (128) via the communication unit (128) of the smart communication device (146) of the wireless power

transmitting device (102). The switching 'ON' of the switch (124) enables the wireless power transmitter (164) to transmit power wirelessly via the primary coil/resonator (120) for a pre-determined time interval. Furthermore, in an embodiment of the present invention, simultaneously, the server (106) sends a third message to the unregistered user (new user) on the electronic device (104). The third message may include, a message informing the unregistered user (new user) of switch 'ON' status of the wireless power transmitter (164) associated with the authenticated UIN and a universal resource locater (URL) link to configure the wireless charging interface unit (144) on the electronic device (104). Thereafter, the electronic device (104) associated with the unregistered user (new user) may be placed on the wireless power transmitter (164) or held at a distance of 15mm to 40mm from the wireless power transmitter device (102) for wireless power charging. The pre-determined time interval for wireless charging may be less for the unregistered user (new user) than provided to the registered user. For example, the wireless charging of the electronic device (104) associated with the unregistered user (new user) is a complimentary trial for a pre-determined time interval.

[0054] In an embodiment of the present invention, after the complimentary trial pre-determined time interval for charging the electronic device (104) by an unregistered user (new user), the wireless power transmission instruction including turning 'OFF' the switch (124) of the wireless power transmitter (164) is sent by the server (106) to the controller (128) via the communication unit (130) of the smart communication device (146). The switching 'OFF' of the switch (124) ceases the wireless power transmission to the electronic device (104) of the unregistered user (new user). Furthermore, in an embodiment of the present invention, simultaneously, the server (106) while sending the instruction for switching 'OFF' the switch (124) of the

wireless power transmitter (164) is configured to send a fourth message to the electronic device (104) associated with the unregistered user (new user). The fourth message may include, but is not limited to, a message informing the switch 'OFF' status of the wireless power transmitter (164) along with the URL link to configure the wireless charging interface unit (144) on the electronic device (104) by the user to connect to the wireless power transmitting device (102) for further charging.

[0055] In an exemplary embodiment of the present invention, if the user is not able to send the first message, he may access a device (not shown) in the wireless charging location of the wireless power transmitting device (102) to log on to the wireless charging interface unit (144) in that device (not shown) and feed the UIN of the wireless power transmitting device (102) and the user information. The fed UIN and user information is sent to the server (106) by the wireless charging interface unit (144) in that device (not shown). The server (106) thereafter, authenticates the user details and sends the second message to the user on the electronic device (104) that the wireless charging has been enabled on the wireless power transmitting device (102) for a pre-determined time interval if the user is identified as a registered user.

[0056] In an embodiment of the present invention, the wireless power transmitting device (102) is configured with a voice bot. The voice bot may include, an artificial intelligence (AI) based voice bot (e.g. Amazon Alexa, etc.). The voice bot is configured to receive voice commands from the user associated with the electronic device (104) for operating the wireless power transmitting device (102) and performing functions associated with the voice bot provider. The wireless power transmitting device (102) operation may include, but is not limited to, automatically operating the

wireless power transmitting device (102), waking up the wireless power transmitting device (102) from the standby mode, determining other wireless power transmitting device (102) locations, carrying out electronic device (104) authentication by connecting to the server (106), integrating with other systems etc. The functions associated with the voice bot provider may include, but are not limited to, language translation, backend integration, error handling, response types etc.

[0057] In an embodiment of the present invention, the wireless power transmitting device (102) may provide for payment request to the electronic device (104). The payment information is to be collected from the user for usage of the wireless power transmitting device (102) for charging the electronic device (104) for a pre-determined interval of time. The server (106) may be configured to transmit the payment information via the wireless charging interface unit (144). The user may select an appropriate option for payment, transmitted by the server (106), after the electronic device (104) is completely charged. In an exemplary embodiment of the present invention, if the user is a new user, he may be provided free charging for a pre-determined interval of time and thereafter is charged for further charging.

[0058] In an embodiment of the present invention, a security and surveillance system (not shown) is provided in order to protect the wireless power transmitting device (102) from theft or unwanted damages. A Bluetooth or similar wireless based security system is in-built with each wireless power transmitting device (102). In an exemplary embodiment of the present invention, if the wireless power transmitting device (102) is installed in a public place and the wireless power transmitting device (102) moves out of a pre-determined range, the Bluetooth based system sends a notification to the server (106) via the smart communication device (146) and the

server (106) subsequently sends a notification to the security and surveillance system (not shown) for generating an alarm. The alarm may include, sending a warning notification to the wireless power transmitting device (104) management device (not shown), a high frequency sound alert, etc. Further, electronic device (104) is associated with a Bluetooth system, a global positioning system (GPS) and Wi-Fi system which may be used by the security and surveillance system (not shown) as an electronic device (106) detection triangulation technique for determining the real-time location of the electronic device (106) with respect to the wireless power transmitting device (102) in its near vicinity.

[0059] Advantageously, the present invention uses a robust and cost effective mechanism for wireless power charging. In accordance with various embodiments of present invention, the wireless power transmitting devices (102) are controlled directly by the server (106) and therefore a separate component or interface for connecting to a server is not required. Further, the wireless power transmitting devices (102) are provided the UIN which is to be used for connecting to the wireless charging system (100) which further negates the need for using separate electronic device detection techniques. This in turns reduces the cost of installing separate management servers for wireless chargeable device detection. Furthermore, the user is also given an option to connect to the wireless charging system in the absence of any data connection on the electronic device i.e. user can connect to the wireless charging system in the offline mode. Additionally, the present invention facilitates an unregistered user to access wireless charging in accordance with various embodiments of the present invention.

[0060] FIG. 2 and FIG. 2A illustrates a method for wireless power transfer and charging of electronic devices in the

presence of a data connection i.e. in online mode, in accordance with various embodiments of the present invention.

[0061] At step 202, the wireless power charging location is accessed by a user associated with an electronic device. In an embodiment of the present invention, the wireless power charging location is accessed via a wireless charging interface unit configured on the electronic device. Multiple wireless power transmitting devices are installed at the charging locations. The user selects a wireless power transmitter and a request is sent to the server by the wireless charging interface unit. The request may be representative of, at least, a user desirous of using the wireless power transmitting device for charging his electronic device at the accessed location.

[0062] At step 204, a first command message is sent on the electronic device associated with the user to communicate the unique identification number (UIN) displayed on the selected wireless power transmitting device. In an embodiment of the present invention, the UIN is a unique identifier associated with the wireless power transmitter device. The UIN may be in the form of, but is not limited to, a six digit hex code, QR code, alphanumeric code, a bar code and the like. The UIN may be communicated via the wireless charging interface unit by, at least, scanning the UIN if the UIN is in QR code form, or by inputting the UIN in the wireless charging interface unit if the UIN is displayed as a pop-up, a notification, and a dialogue box. In another embodiment of the present invention, the wireless power transmitting device is configured with a unique acoustic signal which is correlated to the UIN. Further, when the electronic device is in near vicinity of the wireless power transmitting device, the unique acoustic signal is detected by the electronic device and subsequently the UIN correlated to the unique acoustic signal is transmitted to the server via the wireless charging

interface unit. Therefore, the server is configured to resend the unique acoustic signal to the smart communication device of the wireless power transmitting device upon successful authentication of the UIN for switching 'ON' the wireless power transmitter. The UIN enables to identify which wireless power transmitting device is to be activated for wireless power charging of the electronic device.

[0063] At step 206, a check is performed to determine if the communicated UIN matches with the stored UINs in the server. If the UIN is not matched successfully, the server resends the first command message to the electronic device to communicate the correct UIN.

[0064] At step 208, a second command message is sent to the electronic device associated with the user to communicate the electronic device details and the user details, if the UIN is matched successfully in the server subsequent to sending the first command message. The user details may include, but are not limited to, user login id, user email id, user pin, password etc. The wireless charging interface unit (144) sends the electronic device (104) details and user details to the server (106) via the communication module (124). The electronic device (104) details includes, but are not limited to, Mobile Station International Subscriber Directory Number (MSISDN), international Mobile Equipment Identity (IMEI) number etc.

[0065] At step 210, a check is performed to determine if the user associated with the electronic device is a registered user. In an embodiment of the present invention, if the user is determined as an unregistered user (new user), the second command message is resent to the electronic device, informing the user associated with the electronic device to send user details for registration and thereafter for enabling wireless charging for wirelessly charging the electronic device.

[0066] At step 212, the wireless power transmitter is switched 'ON' and wireless power charging is enabled for a prolonged pre-determined interval of time, if the user associated with the electronic device is determined as a registered user. In an embodiment of the present invention, the wireless power transmission instruction is sent to the wireless power transmitting device for switching 'ON' the wireless power transfer to the electronic device. Further, an alert is sent to the electronic device when the power is being transmitted wirelessly to the electronic device. The alert may include, but is not limited to, a pop-up, message, notification or the like informing the user of the wireless power charging. The electronic device may be placed on the wireless power transmitter for wireless power charging or held at a distance in the range of between 15mm-40mm from the wireless power transmitter for wireless power charging.

[0067] At step 214, the wireless power charging is switched 'OFF' after the prolonged pre-determined interval of time. In an embodiment of the present invention, a wireless power transmission instruction is sent to the wireless power transmitting device for switching 'OFF' the wireless power transfer to the electronic device after the prolonged pre-determined interval of time. The registered user associated with the electronic device is notified of the completion of wireless power charging after the prolonged pre-defined interval of time. In an embodiment of the present invention, the notification is sent on the electronic device via the wireless charging interface unit. The notification may include, at least, a message to remove electronic device, a message of charging completion, a message regarding charging time interval over or the like.

[0068] At step 216, payment details are sent to the registered user on the electronic device after the prolonged

pre-defined time interval for wireless power charging of electronic devices. The payment details includes the payment to be made after usage of wireless power transmitting device for charging of electronic device by the user.

[0069] Fig. 3 and FIG. 3A illustrates a method for wireless power transfer and charging of electronic devices in the absence of a data connection i.e. in offline mode, in accordance with various embodiments of the present invention.

[0070] At step 302, a first message is sent by an electronic device associated with a user via a pre-defined number. In an embodiment of the present invention, the first message may include, a message with a unique identification number (UIN) of wireless power transmitting device and user personal details, such as, but are not limited to, email id of user, phone number of user, or the like.

[0071] At step 304, a check is performed to determine whether the received UIN matches with the stored UINs in the server and at step 306, a check is performed to determine, whether the received user details match with the stored user details in the server. The matching of user details further allows the server to determine the user as a registered user or unregistered user (new user).

[0072] At step 308, if the user is determined as a registered user, the wireless power charging is switched 'ON' for charging for a pre-determined time interval, and a second message is sent to the electronic device including a switch 'ON' status of the wireless power transmitter. Further, if the user is identified as a registered user, the electronic device associated with the registered user is identified as a target electronic device. Thereafter, the target electronic device associated with the registered user may be placed on the wireless power transmitter for wireless power charging

or held at a distance in the range of between 15mm-40mm from the wireless power transmitter for wireless power charging. The time interval of charging for the registered user may be a prolonged pre-determined time interval.

[0073] At step 310, if the user is identified as an unregistered user (new user) the wireless power charging is switched 'ON' for a pre-determined time interval and a third message is sent to the electronic device including a switch 'ON' status of the wireless power transmitter and a link to configure the wireless charging interface unit on the electronic device. Thereafter, the electronic device associated with the unregistered user (new user) may be placed on the wireless power transmitter for wireless power charging or held at a distance in the range of between 15mm-40mm from the wireless power transmitter for wireless power charging. The pre-determined time interval for wireless charging may be less for the unregistered user (new user) than provided to the registered user. For example, the wireless charging of the electronic device associated with the unregistered user (new user) is a complimentary trial for the pre-determined time interval.

[0074] At step 312, the wireless power charging is switched 'OFF' for the registered user after the prolonged pre-determined time interval and a notification is sent on the electronic device informing the completion of wireless power charging for the electronic device. The switching 'OFF' of the wireless power transmission ceases the wireless power transmission to the electronic device of the registered user. At step 314, payment information is sent to the electronic device associated with the registered user after the completion of the wireless charging device. The payment may be made by the registered user when a data connection is available on the electronic device or may be made manually at the wireless charging location.

[0075] At step 316, the wireless power charging is switched 'OFF' for the unregistered user (new user) after the complimentary trial pre-determined time interval for charging. Thereafter, a fourth message is sent to the electronic device associated with the unregistered user (new user) informing the switching 'OFF' of the wireless power transmitter and the link to configure the wireless charging interface unit on electronic device is resent for further charging. The wireless charging to the electronic device is resumed after the wireless charging interface unit is invoked on the electronic device.

[0076] FIG. 4 illustrates an exemplary computer system in which various embodiments of the present invention may be implemented. The computer system 402 comprises a processor 404 and a memory 406. The processor 404 executes program instructions and is a real processor. The computer system 402 is not intended to suggest any limitation as to scope of use or functionality of described embodiments. For example, the computer system 402 may include, but not limited to, a programmed microprocessor, a micro-controller, a peripheral integrated circuit element, and other devices or arrangements of devices that are capable of implementing the steps that constitute the method of the present invention. In an embodiment of the present invention, the memory 406 may store software for implementing various embodiments of the present invention. The computer system 402 may have additional components. For example, the computer system 402 includes one or more communication channels 408, one or more input devices 410, one or more output devices 412, and storage 414. An interconnection mechanism (not shown) such as a bus, controller, or network, interconnects the components of the computer system 402. In various embodiments of the present invention, operating system software (not shown) provides an operating environment for various software's executing in the

computer system 402, and manages different functionalities of the components of the computer system 402.

[0077] The communication channel(s) 408 allow communication over a communication medium to various other computing entities. The communication medium provides information such as program instructions, or other data in a communication media. The communication media includes, but not limited to, wired or wireless methodologies implemented with an electrical, optical, RF, infrared, acoustic, microwave, Bluetooth or other transmission media.

[0078] The input device(s) 410 may include, but not limited to, a keyboard, mouse, pen, joystick, trackball, a voice device, a scanning device, touch screen or any another device that is capable of providing input to the computer system 402. In an embodiment of the present invention, the input device(s) 410 may be a sound card or similar device that accepts audio input in analog or digital form. The output device(s) 412 may include, but not limited to, a user interface on CRT or LCD, printer, speaker, CD/DVD writer, or any other device that provides output from the computer system 402.

[0079] The storage 414 may include, but not limited to, magnetic disks, magnetic tapes, CD-ROMs, CD-RWs, DVDs, flash drives or any other medium which can be used to store information and can be accessed by the computer system 402. In various embodiments of the present invention, the storage 414 contains program instructions for implementing the described embodiments.

[0080] The present invention may suitably be embodied as a computer program product for use with the computer system 402. The method described herein is typically implemented as a computer program product, comprising a set of program

instructions which is executed by the computer system 402 or any other similar device. The set of program instructions may be a series of computer readable codes stored on a tangible medium, such as a computer readable storage medium (storage 414), for example, diskette, CD-ROM, ROM, flash drives or hard disk, or transmittable to the computer system 402, via a modem or other interface device, over either a tangible medium, including but not limited to optical or analogue communications channel(s) 408. The implementation of the invention as a computer program product may be in an intangible form using wireless techniques, including but not limited to microwave, infrared, Bluetooth or other transmission techniques. These instructions can be preloaded into a system or recorded on a storage medium such as a CD-ROM, or made available for downloading over a network such as the internet or a mobile telephone network. The series of computer readable instructions may embody all or part of the functionality previously described herein.

[0081] The present invention may be implemented in numerous ways including as a system, a method, or a computer program product such as a computer readable storage medium or a computer network wherein programming instructions are communicated from a remote location.

[0082] While the exemplary embodiments of the present invention are described and illustrated herein, it will be appreciated that they are merely illustrative. It will be understood by those skilled in the art that various modifications in form and detail may be made therein without departing from or offending the spirit and scope of the invention.