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(54) MOBILE CARE-GIVING AND INTELLIGENT ASSISTANCE DEVICE

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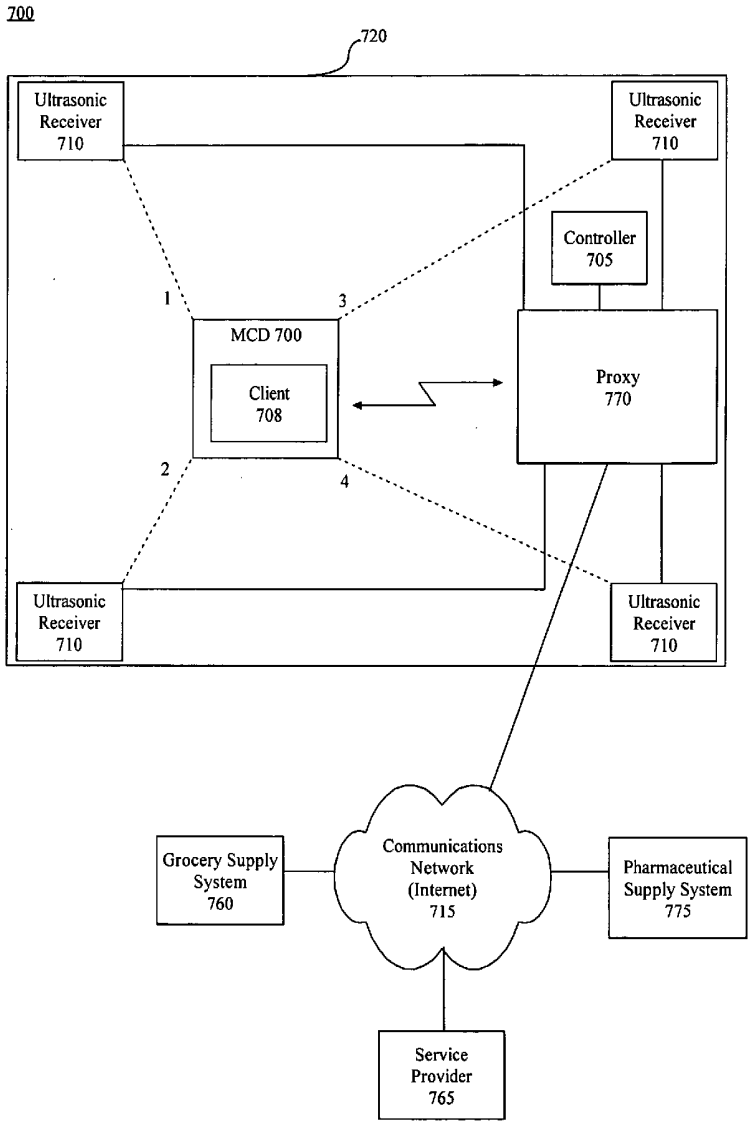
(52) **U.S. Cl.** **455/41.2**

(57) **ABSTRACT**

A mobile communication device can include a cellular radio-frequency transceiver serviceable by a commercial carrier and a short-range wireless transceiver for communicating with a local access point. The mobile communication device can further include a processor configured to control the operation of the short-range wireless transceiver and the cellular radio-frequency transceiver.



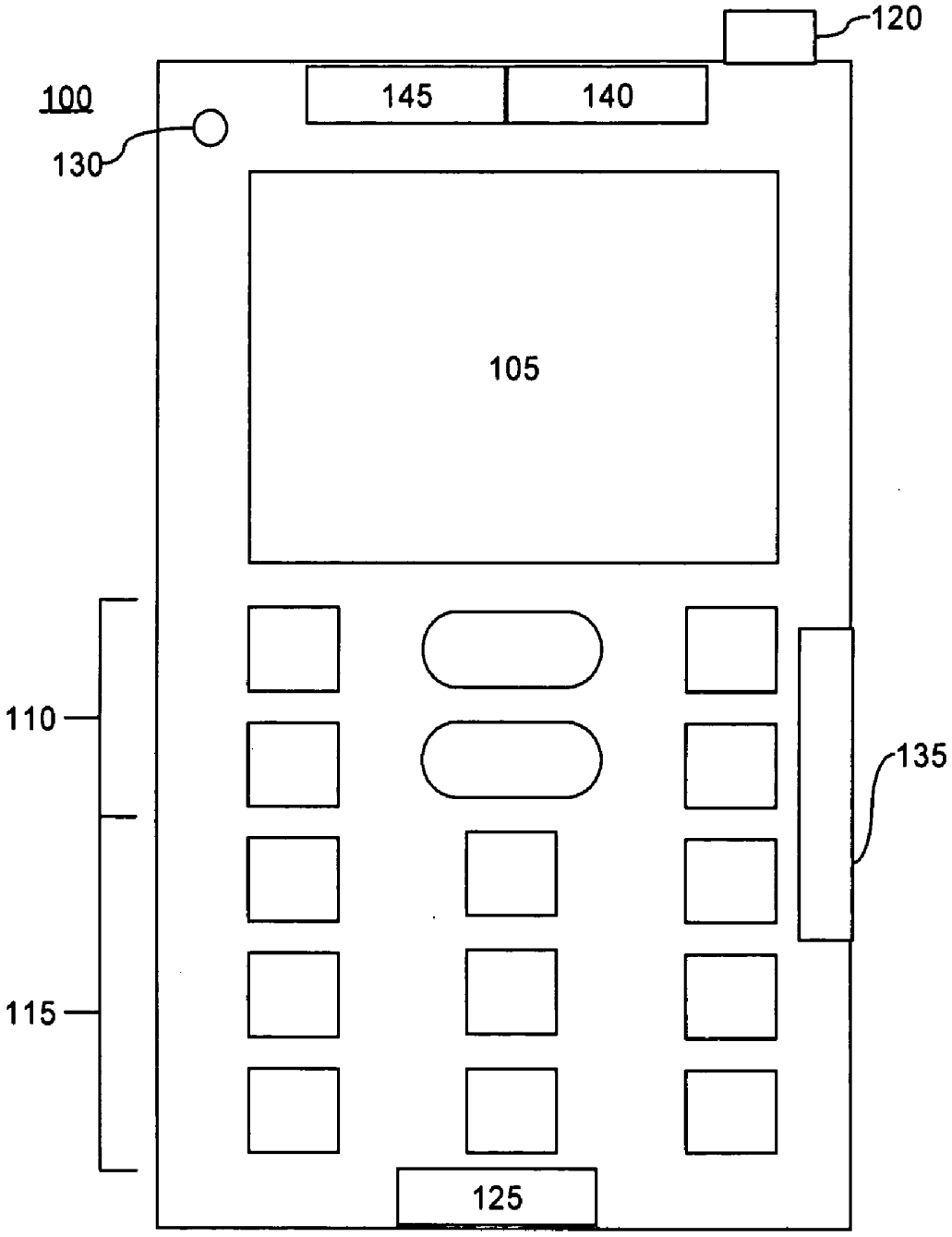


FIG. 1

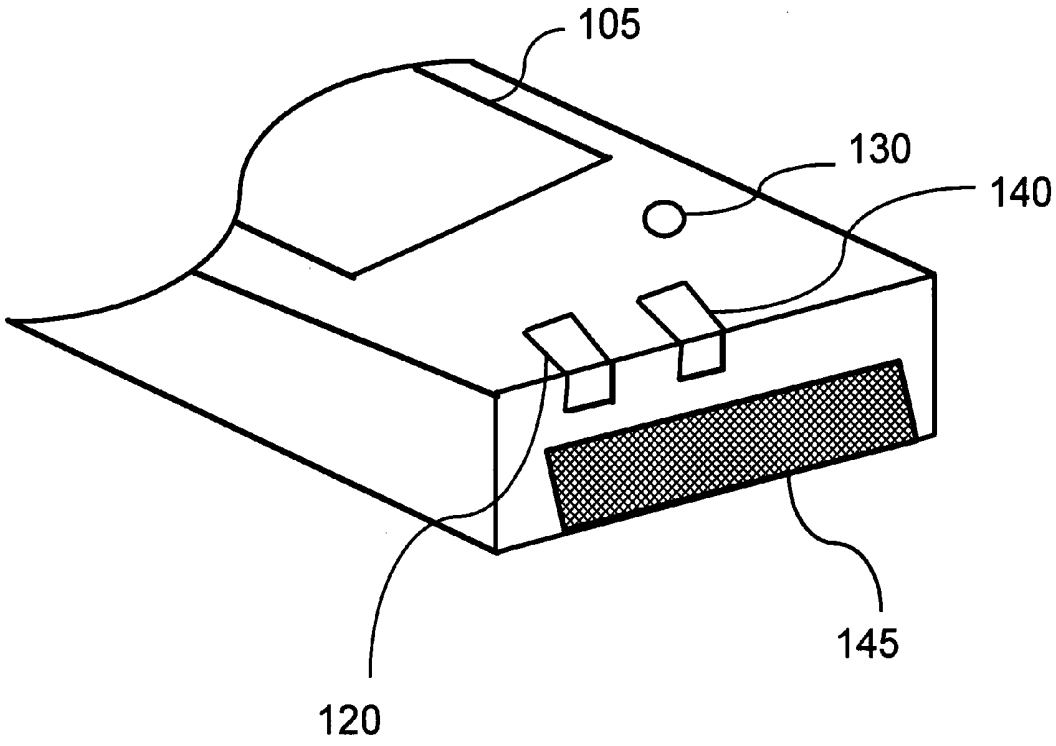


FIG. 2

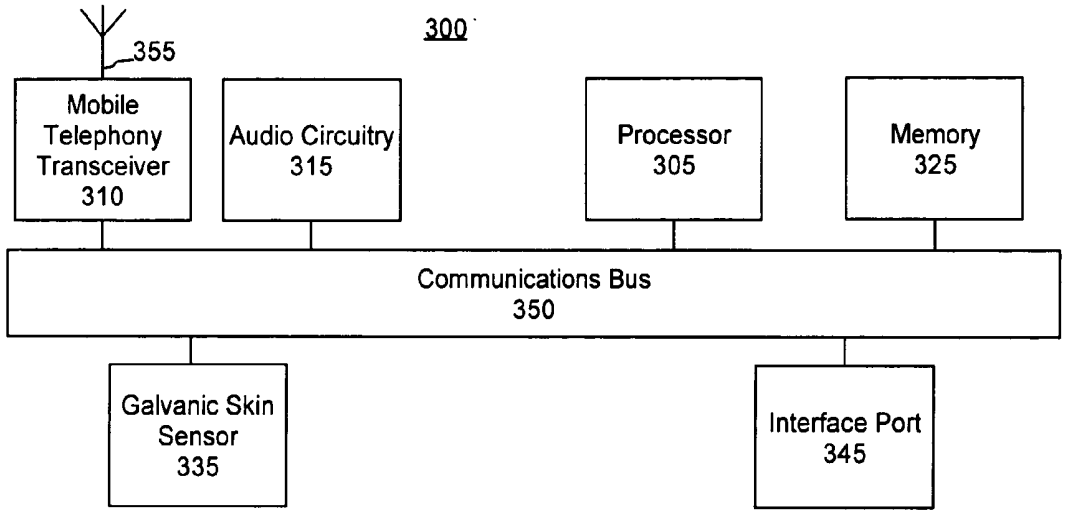

300
355
Mobile Telephony Transceiver 310
Audio Circuitry 315
Processor 305
Memory 325
Communications Bus 350
Galvanic Skin Sensor 335
Interface Port 345

FIG. 3

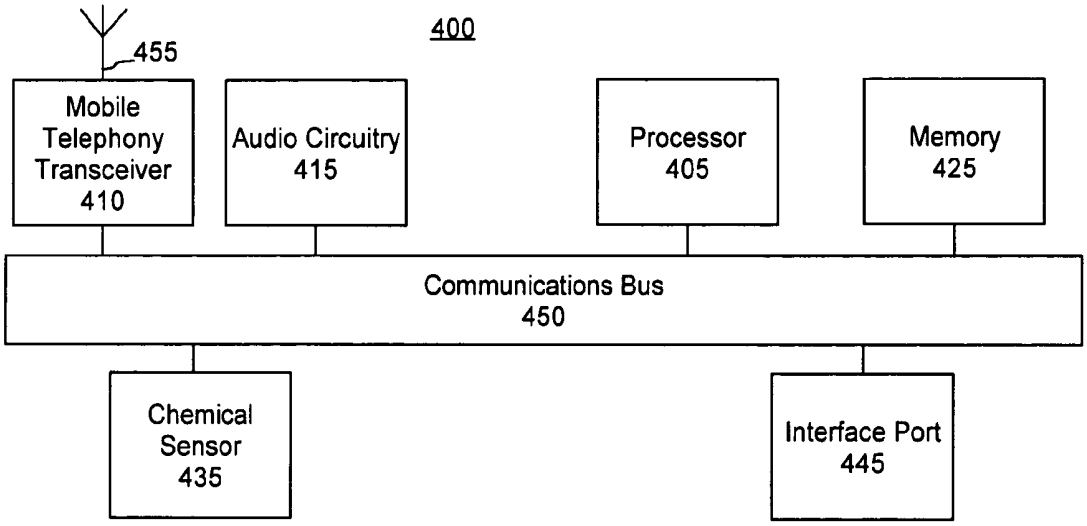

400
455
Mobile Telephony Transceiver 410
Audio Circuitry 415
Processor 405
Memory 425
Communications Bus 450
Chemical Sensor 435
Interface Port 445

FIG. 4

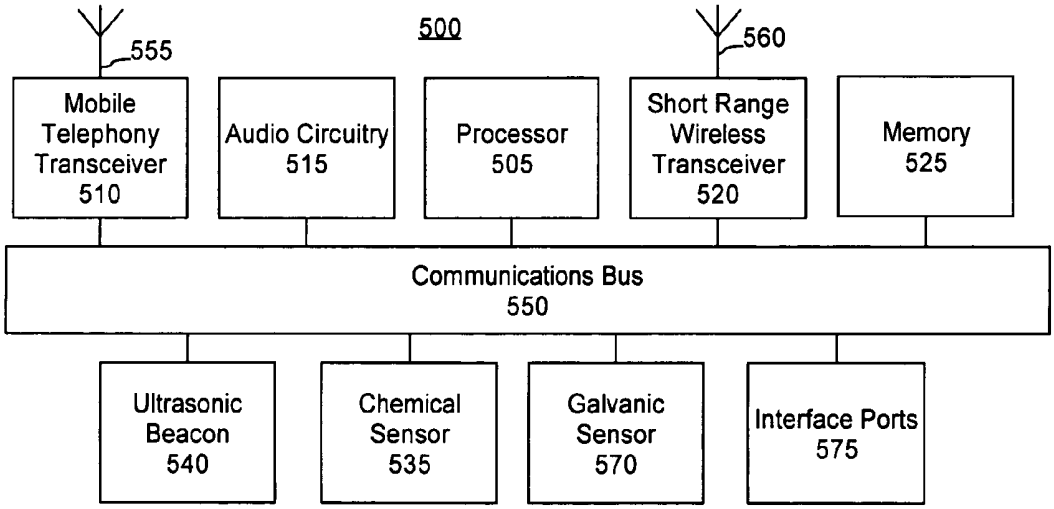

500
555
560
Mobile Telephony Transceiver 510
Audio Circuitry 515
Processor 505
Short Range Wireless Transceiver 520
Memory 525
Communications Bus 550
Ultrasonic Beacon 540
Chemical Sensor 535
Galvanic Sensor 570
Interface Ports 575

FIG. 5

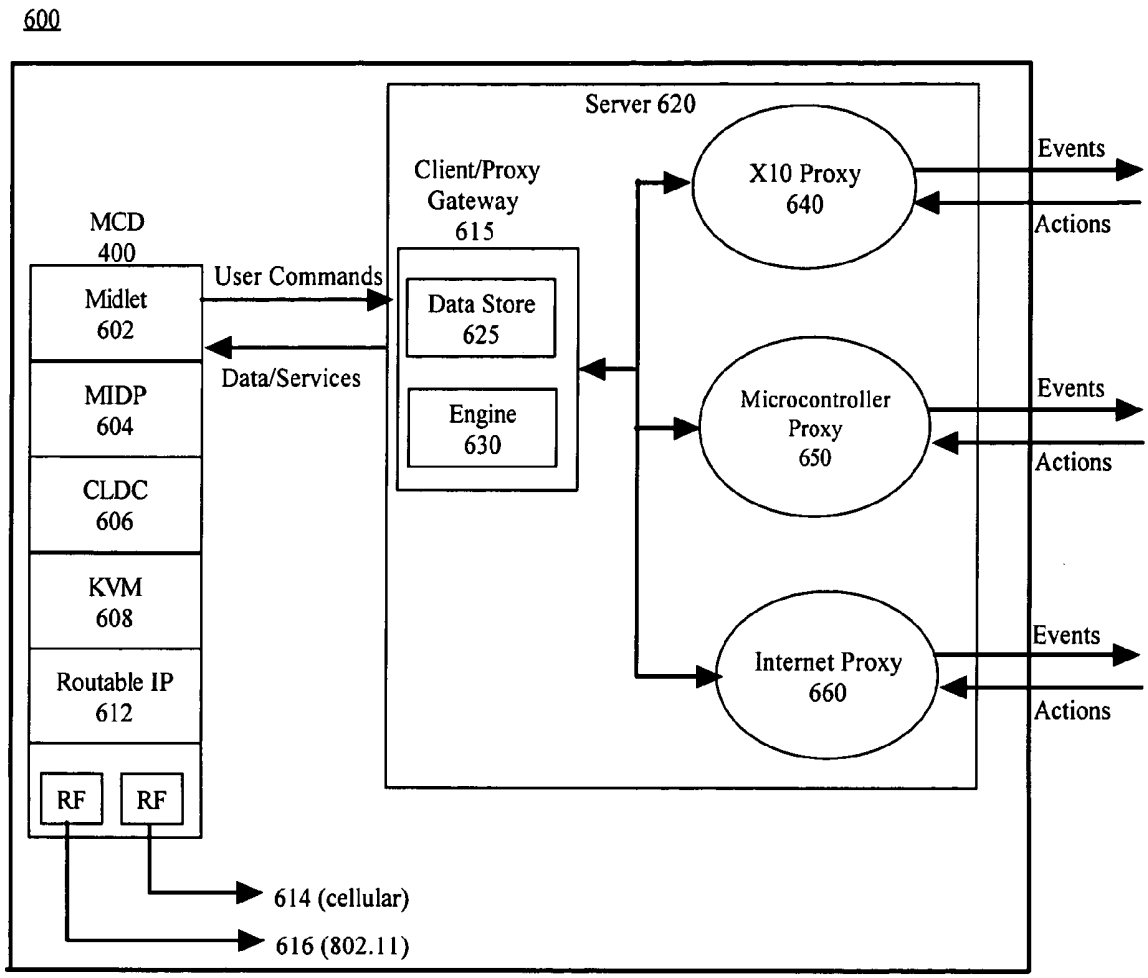

600
Server 620
Client/Proxy Gateway 615
X10 Proxy 640
Events
Actions
MCD 400
User Commands
Midlet 602
Data Store 625
Data/Services
MIDP 604
Engine 630
Microcontroller Proxy 650
Events
Actions
CLDC 606
KVM 608
Routable IP 612
Internet Proxy 660
Events
Actions
RF
RF
614 (cellular)
616 (802.11)

FIG. 6

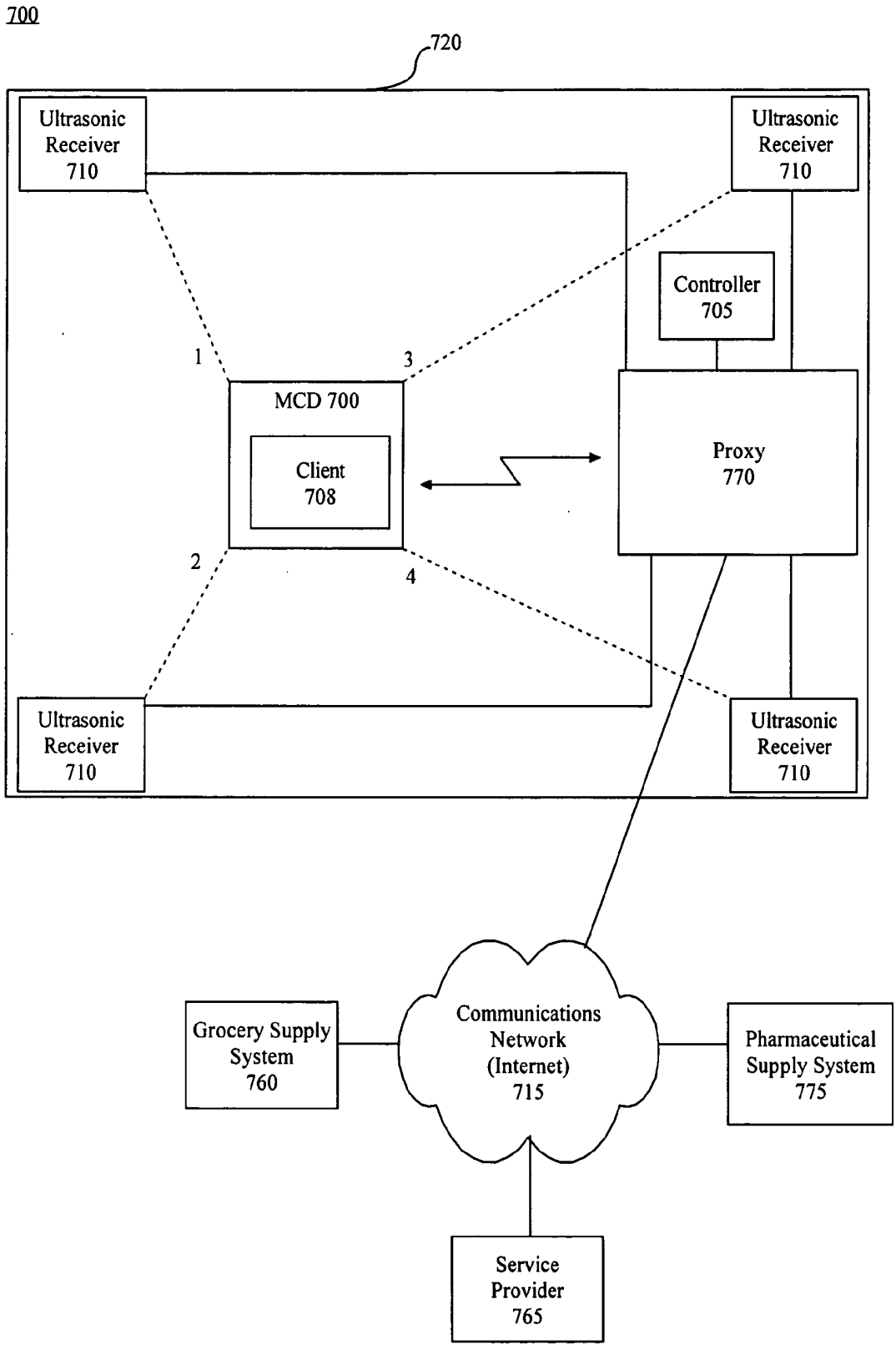

700
720
Ultrasonic Receiver 710
Ultrasonic Receiver 710
Controller 705
1
3
MCD 700
Client 708
Proxy 770
2
4
Ultrasonic Receiver 710
Ultrasonic Receiver 710
Grocery Supply System 760
Communications Network (Internet) 715
Pharmaceutical Supply System 775
Service Provider 765

FIG. 7

MOBILE CARE-GIVING AND INTELLIGENT ASSISTANCE DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application No. 60/486,018, filed in the United States Patent and Trademark Office on Jul. 10, 2003, and U.S. Provisional Application No. 60/490,717, filed in the United States Patent and Trademark Office on Jul. 29, 2003, the entirety of both which are incorporated herein by reference.

BACKGROUND

[0002] 1. Field of the Invention

[0003] The present invention relates to the field of portable computing devices and, more particularly, to a portable computing device for providing mobile care-giving and intelligent assistance.

[0004] 2. Description of the Related Art

[0005] The world population of people over the age of 65 is growing rapidly. Moreover, the costs associated with home health services for elder persons with disabilities is increasing with the rapidly growing elder population. Further, the quality of life and independence of elder individuals are impacted by disabilities, and health and caregiver systems are increasingly stressed as the numbers of elder citizens increase.

[0006] Many of the elderly reach a point where they can no longer live independently without some form of assistance. Often the elderly person is taken to a care facility, such as a nursing home or assisted care center. However, it is well documented that those who live in nursing homes tend to require more hospitalization and medical visits. Further, once moved into a facility, it is common for elders to become depressed due to a lack of independence. This evidence suggests that it is in everyone's best interests for the elderly to live independently for as long as possible. At the same time, there is a need to innovate cost-effective ways to help elders maintain their independence, and reduce caregiver burden.

[0007] Many elders capable of living independently still require some assistance performing daily activities. For example, elders commonly suffer from some memory dysfunction, and may need to be reminded to perform critical daily tasks, such as eating a certain number of meals a day, feeding a pet, calling a relative, or the like. Further, some elders may require assistance making decisions, such as deciding what to wear prior to going outside. Additionally, elders who live independently may need assistance with the various responsibilities of maintaining a residence, such as providing security, ensuring that all doors and windows are locked, and checking for potential disastrous events, such as water leaks, gas leaks, fires, or the like. Still, elders who live alone may need the assurance that a caregiver can be reached immediately in the event of an emergency.

[0008] Technology now has permeated virtually all facets of life in today's society, and has brought with it many conveniences and time saving features. Elders, and other persons who suffer from cognitive impairments, should be able to take advantage of computerized devices to augment their fading sensory and motor abilities. However, many technological devices designed to make life simpler, such as cell phones, PDAs, and personal computers, are designed for young and highly mobile individuals, and are intimidating to those with cognitive challenges.

SUMMARY OF THE INVENTION

[0009] The present invention provides an apparatus for providing care-giving and intelligent assistance using a mobile communication device, such as a mobile telephone. More specifically, the mobile communication device can allow a user, such as an elder, to access a variety of functions which will support the elder in many aspects of daily life. The ergonomic features of the mobile communication device are specifically designed to maximize use by a cognitively impaired user, such as an elder. The mobile communication device can also allow a user to control a home or other environment by interfacing with an X10 controller, or other security system. Further, the mobile communication device can allow the user to access a variety of service systems from the convenience of the user's home, or other location. Additionally, the mobile communication device can provide intelligent assistance to the user, such as reminding the user to perform a specific task, informing the user of the weather outside, and instructing the user of how to dress for the weather.

[0010] One aspect of the present invention can include a mobile communication device. The mobile communication device can include a short-range wireless transceiver for communicating with a local access point, and a processor configured to control the operation of the short-range wireless transceiver. In another arrangement, the mobile communication device can include an ultrasonic beacon configured to be detected by at least one ultrasonic receiver. In yet another arrangement, the device can include a code reader, a temperature sensor, and/or a radio frequency identification mechanism.

[0011] In one embodiment of the present invention, the mobile communication device can include at least one biosensing device, and a processor configured to process the information received from the biosensing device. In one aspect, the biosensor can be a chemical sensor configured to detect airborne particulates. In another aspect, the biosensor can be a galvanic skin sensor configured to measure a change in conductivity of skin. It should be appreciated that the mobile communication device further can include a cellular radio-frequency (RF) transceiver for communication through a commercial carrier.

[0012] Another aspect of the invention can include a system for providing mobile care-giving and intelligent assistance. The system can include a mobile phone comprising a short-range wireless transceiver configured to communicate with a local computing device. The system can also include a proxy server comprising a short-range wireless transceiver configured to establish communications between a target device and the mobile phone, where the proxy server and the mobile phone communicate over a short-range wireless connection. Further, the proxy server can include a gateway. The gateway can include a data store for storing a programmatic action corresponding to a predetermined event. The gateway can further include a software engine configured to initiate the programmatic action responsive to the occurrence of the predetermined event.

[0013] In one embodiment of the present invention, the short-range wireless connection can use an 802.11 wireless networking protocol. In one aspect, the target device can be at least one of a remote service provider or a local controller. In one embodiment, the remote service provider can be a pharmaceutical supply system, a grocery supply system, or a weather service provider. In another embodiment, the local controller can be an X10 controller.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] There are shown in the drawings, embodiments that are presently preferred; it being understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

[0015] **FIG. 1** is a schematic diagram illustrating an embodiment of a mobile communication device (MCD) configured in accordance with the inventive arrangements disclosed herein.

[0016] **FIG. 2** is a schematic diagram illustrating an embodiment of an MCD in accordance with the inventive arrangements disclosed herein.

[0017] **FIG. 3** is a schematic diagram illustrating another embodiment of an MCD in accordance with the inventive arrangements disclosed herein.

[0018] **FIG. 4** is a schematic diagram illustrating another embodiment of an MCD in accordance with the inventive arrangements disclosed herein.

[0019] **FIG. 5** is a schematic diagram illustrating yet another embodiment of an MCD in accordance with the inventive arrangements disclosed herein.

[0020] **FIG. 6** is a schematic diagram illustrating a system within which an MCD can be utilized in accordance with another embodiment of the present invention.

[0021] **FIG. 7** is a schematic diagram illustrating yet another system within which an MCD can be utilized in accordance with another embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0022] **FIG. 1** is a schematic diagram illustrating an embodiment of a mobile communications device (MCD) **100** in accordance with the inventive arrangements disclosed herein. As shown, the MCD **100** can include a display **105**, one or more control or operational keys **110**, which can include special function command keys for operation of one or more of the functions disclosed herein, alphanumeric keys or buttons **115**, and one or more antennas **120** (which may be configured to be fully located within the MCD **100**). The MCD **100** further can include a battery or other power source. Notably, the MCD **100** can include a rechargeable battery as well as additional power sources to enable the MCD **100** to be active for extended periods of time.

[0023] The physical arrangement of the MCD **100** has been provided for purposes of illustration only. As such, it should be appreciated that the various components can be located in any of a variety of different configurations. For example, the MCD **100** can include additional keys or controls disposed on the frontal portion or the sides of the unit.

[0024] According to one embodiment of the present invention, the physical arrangement of the MCD **100** can be conducive for use by visually impaired individuals or those that may have difficulty accessing and/or operating the keys and/or controls of conventional mobile computing devices, such as the elderly, persons with physical disabilities, or other infirmities. For example, the control keys **110** and the alphanumeric keys **115** of the MCD **100** can be larger in size than conventional mobile device keys and can be spaced a greater distance from one another with respect to both the width and length of the MCD **100**. That is, the horizontal key spacing and the vertical key spacing can be greater than that found with conventional mobile devices. Further, the control keys **110** can include Braille markings for key identification purposes.

[0025] The display **105** can be a liquid crystal display (LCD) implemented in either grayscale or color, a touch screen, or any other type of suitable display screen. The display **105** can be larger than those found on conventional mobile computing devices and can have an increased contrast ratio if so desired.

[0026] The MCD **100** can include a variety of sensors. As shown in **FIG. 1**, the MCD **100** can be configured with one or more location detection mechanisms **125** to be described herein. While the location detection mechanism **125** can be positioned on the MCD **100** in any of a variety of different locations, according to one embodiment, the location detection mechanism **125** can be positioned at the bottom portion of the MCD **100**. Still, the location detection mechanism **125**, as is the case with other sensors to be described herein, can be located within or throughout the exterior portion of the MCD **100**.

[0027] The MCD **100** can also be configured to include a chemical sensor **140**. While the chemical sensor **140** can be positioned on the MCD **100** in any of a variety of different locations, according to one embodiment, the chemical sensor can be positioned at the top portion of the MCD **100**. Additionally, a temperature sensor **130** for measuring the ambient temperature of an environment can be located near the top or bottom of the MCD **100**. Similarly, a bar code reader **145** can be located on the top or bottom of the MCD **100**. Notably, the chemical sensor **140**, the temperature sensor **130**, and the bar code reader **145** can be positioned such that the sensors are not obstructed by the hand of a user when held.

[0028] The MCD **100** can also include physiological sensors, such as a galvanic skin sensor **135**, which measures the change in a user's skin conductivity resulting from stress, excitement, or shock. The galvanic skin sensor **135** can be positioned to come in contact with a hand of a user when the MCD **100** is held, and can therefore be disposed on either side portion of the MCD **100**, as well as on the backside of the MCD **100**. Similarly, the MCD **100** can be configured to include other physiological sensors to measure such parameters as blood volume, respiration, heart rate, skin resistivity, body temperature, or the like.

[0029] The MCD **100** can further include a variety of other sensors disposed throughout the exterior portion of the MCD **100**. For example, the MCD **100** can include a radio frequency identification (RFID) reader (not shown) and a GPS outdoor location sensor (not shown). It should be appreciated that the aforementioned examples of sensors have been

provided for purposes of illustration only and should not be construed as limitations of the present invention.

[0030] **FIG. 2** is a schematic diagram illustrating a three dimensional, cross sectional view of the MCD depicted in **FIG. 1**, in accordance with the inventive arrangements disclosed herein. According to one embodiment, the bar code reader **145** can be mounted on the top edge portion of the MCD **100**. Further, the antenna **120** and the chemical sensor **140** can be positioned on the top edge portion of the MCD **100**, while the temperature sensor **130** and the display **105** can be located on the front side portion of the MCD **100**. Notably, **FIG. 2** has been provided for purposes of illustration only. It should be appreciated that the components depicted in **FIG. 2** can be implemented in a variety of configurations throughout the exterior of the MCD **100**. As such, **FIG. 2** is not intended as a limitation of the present invention.

[0031] **FIG. 3** is a schematic diagram illustrating an embodiment of an MCD **300** configured in accordance with the inventive arrangements disclosed herein. As shown, the MCD **300** can include a processor **305**, a mobile telephony transceiver **310**, for example a cellular radio-frequency (RF) transceiver that can be serviced by a commercial carrier, audio circuitry **315**, and a memory **325**. Each of the aforementioned components can be communicatively linked via a suitable communications bus **350** or other circuitry. For example, the MCD **300** can be implemented as a mobile phone having the features described herein.

[0032] The processor **305** can execute a suitable operating system and one or more applications for controlling the various functions of the MCD **300**. For example, the processor **305** can execute an operating system that can support the execution of one or more applications intended to run on that platform and which support operation of the various functions and features disclosed herein. As the MCD **300** can include one or more sensors to be described in greater detail herein, the operating system and computing architecture can be designed to support the operation of such sensors. According to one embodiment, the MCD **300** can be compatible with the JAVA 2 Platform, Micro Edition (J2ME®.

[0033] The memory **325** can be implemented as random access memory, read-only memory, erasable programmable read-only memory, or any other type of physical memory suitable for use within a mobile communication device, such as the MCD **300**. It should be appreciated that the memory **325**, while illustrated as a separate component, can be incorporated into the processor **305** or another component. In any case, the memory **325** can include programmatic instructions to be executed by the processor **305** as well as any operational data necessary for operation of the MCD **300**.

[0034] Wireless signals can be received and sent via the antenna **355** which can be suited for longer-range mobile communications such as conventional cellular or personal communication service (PCS) communications. Accordingly, the antenna **355** can be operatively connected to the mobile telephony transceiver **310**. Signals detected by antenna **355** can be provided to the mobile telephony transceiver **310** for processing and decoding. For example, the mobile telephony transceiver **310** can include a codec for coding and decoding information received or to be sent via wireless transmission. The transceiver **310** can make the decoded signals and/or information available to other components of the MCD **300** for processing. Outbound information received by the mobile telephony transceiver **310** can be coded and/or formatted for wireless transmission by the codec and then provided to the antenna **355** for transmission.

[0035] Thus, it should be appreciated that the MCD **300** can communicate via conventional mobile calls and access wireless networks, for example using Wireless Access Protocol or another suitable data wireless communications protocol, such that the MCD **300** can access the Internet, the Web, and/or a wide area network, as well as any applications and/or services disposed on such networks via a wireless communications link.

[0036] The audio circuitry **315** can include a microphone or other audio input transducer for receiving sound and one or more analog-to-digital converters for digitizing the received sound. The audio circuitry **315** further can include one or more digital-to-analog converters for converting digital information into an analog signal, and one or more analog-to-digital converters for converting an analog signal into a digital format. The audio circuitry **315** can include a speaker or other audio output transducer for generating sound from an analog signal as well as one or more amplifiers for driving the speaker.

[0037] It should be appreciated that the audio circuitry **315** can include additional processors, such as digital signal processors (DSPs) as may be required for processing audio and performing functions such as audio encoding, audio decoding, noise reduction, and the like. According to one embodiment of the present invention, the audio circuitry can be implemented using one or more discrete components. In another arrangement, the audio circuitry **315** can be implemented using one or more integrated circuits configured to perform the various functions disclosed herein. Thus, the MCD **300** can be configured to play various audio formats from streaming formats to MP3's, or other audio file formats such as .wav or .aiff files.

[0038] The audio circuitry **315** can also include and/or be communicatively linked to automatic speech recognition (ASR) and synthetic speech generation components that can be used to perform text-to-speech and speech-to-text conversions. When the audio circuitry **315** includes ASR and/or speech generation components, suitable software and/or firmware can be embedded within the audio circuitry **315**, and/or executed by the processor **305**. When the audio circuitry **315** is communicatively linked to remotely located ASR and/or speech generation components, communications between the audio circuitry **315** and the remotely located components can occur using the mobile telephony transceiver **310**, the interface port **345**, or any other suitable interface.

[0039] The MCD **300** can also include one or more interface ports **345** used to physically connect devices and/or peripherals to the MCD **300**. For example, the interface port **345** can be a standard wall jack to initiate telephone calls over the Public Switched Telephone Network (PSTN). The interface port **345** can also include a universal serial bus (USB) port, a firewire (IEEE 1394) port, a parallel port, a serial port, an Ethernet port, an audio port, or the like. Use of the interface port **345** for communicatively linking the MCD **300** with external devices can be advantageous in

situations where wireless connectivity may not be available, is intermittent, or otherwise unsuitable for a particular purpose.

[0040] As noted, the MCD **300** can include a variety of sensors. As shown in **FIG. 3**, the MCD **300** can be configured with a galvanic skin sensor **335**. The galvanic skin sensor **335** can be configured to detect anxiety related conditions being experienced by the user. That is, the galvanic skin sensor **335** can be configured to measure the psychogalvanic reflex of the user that results in a change in the conductivity of the skin during periods of stress, excitement, or shock. Under such conditions skin conductivity increases, whereas during periods of relaxation conductivity declines to a minimum.

[0041] Each of the various components of the MCD **300** disclosed herein can be communicatively linked with one another using appropriate circuitry, whether through the memory **325**, one or more additional memories (not shown), the processor **305**, one or more additional interface processors or logic controllers (not shown), and/or the communications bus **350**. One skilled in the art will recognize that the components disclosed herein can be embodied in other forms and that the configuration disclosed and described with reference to **FIG. 3** is provided for purposes of illustration only. For example, the components can be implemented as one or more discrete components, as one or more processors, logic controllers, DSPs, or any combination thereof.

[0042] **FIG. 4** is a schematic diagram illustrating an embodiment of an MCD **400** configured in accordance with the inventive arrangements disclosed herein. The components of the MCD **400** are substantially similar to the components described with reference to MCD **300** in **FIG. 3**. That is, the MCD **400** can include a processor **405**, a mobile telephony transceiver **410** as previously described, an antenna **455**, audio circuitry **415**, a memory **425**, and an interface port **445**. Further, the aforementioned components can be communicatively linked via a suitable communications bus **450** or other circuitry. The MCD **400** can be implemented as a mobile phone having the features described herein.

[0043] The MCD **400** can also include a variety of sensors. As shown in **FIG. 4**, the MCD **400** can be configured to include a chemical sensor **435**. According to one aspect of the present invention, the chemical sensor **435** can operate as an electronic or artificial nose for the detection and identification of odors, vapors, gases, or the like. For example, the chemical sensor **435** can include a chemical sensing system and a pattern recognition system. In one embodiment, the chemical sensing system can include an array of chemical sensors, such as gas sensors, where each sensor can measure a different property of the sensed chemical. The sensor array can be configured to "sniff" the vapors from a sample and provide a set of measurements to the pattern recognition system. Accordingly, the pattern recognition system can compare the pattern of the measurements to stored patterns for known materials.

[0044] In one embodiment of the present invention, the chemical sensor **435** can be configured to detect potentially harmful household odors, such as carbon monoxide, as well as hazardous chemical spills, gas leaks, smoke, or the like. This embodiment can be used for early detection of potentially harmful situations, or when the sensing ability of the user is impaired in some way. In another embodiment, the chemical sensor **435** can be configured to identify the contents of a container, such as medicine in a bottle. It should be appreciated by those skilled in the art that the chemical sensor **435** can also be a diagnostic tool for detecting odors associated with certain diseases, undrinkable water, spoiled food, or the like. Notably, the aforementioned examples of applications for the chemical sensor **435** are not intended as limitations of the present invention, but rather as examples intended to broaden the scope of the inventive arrangements disclosed herein.

[0045] **FIG. 5** is a schematic diagram illustrating an embodiment of an MCD **500** configured in accordance with the inventive arrangements disclosed herein. The components of the MCD **500** are substantially similar to the components described with reference to MCD **300** in **FIG. 3** and MCD **400** in **FIG. 4** respectively. That is, the MCD **500** can include a processor **505**, a mobile telephony transceiver **510**, an antenna **555**, audio circuitry **515**, a memory **525**, and an interface port **575**. Further, the MCD **500** can also be configured to include a plurality of sensor devices to be described herein. The aforementioned components can be communicatively linked via a suitable communications bus **550** or other circuitry. The MCD **500** can be implemented as a mobile phone having the features described herein.

[0046] The MCD **500** also can include a short-range wireless transceiver **520** as well as an antenna **560** operatively connected thereto. The short-range wireless transceiver **520** can both send and receive data. For example, according to one embodiment of the present invention, the short-range wireless transceiver **520** can be implemented as a BlueTooth-enabled wireless transceiver, or as a transceiver configured to communicate via one of the 802.11 family of short-range wireless communications specifications. The short-range wireless transceiver **520** and accompanying antenna **560** can be configured to communicate using any of a variety of similar short-range, wireless communications protocols and/or systems. Through the short-range wireless transceiver **520**, the MCD **500** can communicate with a local area network, a short-range network, or device. For example, MCD **500** can send and receive data as well as speech to be processed or played. Still, the various examples disclosed herein have been provided for purposes of illustration only and should not be construed as limitations of the present invention.

[0047] As noted, the MCD **500** can include a plurality of sensor devices. For example, the ultrasonic beacon **540** or transponder can be used to determine the position of the MCD **500** within a defined space. That is, the ultrasonic beacon **540** can be detected by one or more ultrasonic receivers referred to as pilots or monitors. These pilot devices can be dispersed throughout a room or other environment, known as a "smart" environment, to detect the location of the MCD **500**, or any other device having one or more such ultrasonic beacons **540**.

[0048] It should be appreciated, however, that the present invention is not limited to the use of ultrasonic beacons as a means of determining location. Rather, any suitable technology can be used. For example, the MCD **500** can include an RFID mechanism **580**, which can be a radio-frequency-based location detection system, such as one utilizing radio-

frequency identifier tags or another radio-frequency beacon. In another example, the MCD **500** can be equipped with a Global Positioning System receiver or other satellite-based location detection system. (not shown).

[**0049**] The MCD **500** can also include a variety of other sensors. For example, the MCD **500** can include a chemical sensor **535** and a galvanic skin sensor **570**, which are similar in operation to those depicted with reference to **FIGS. 2 and 3** respectively. Other sensors can include a temperature sensor **590** and a code reader **585**. The temperature sensor **590**, for example, can be configured to measure the temperature of the user, the ambient temperature of the environment, or the like. The code reader **585** can be an optical device capable of reading various coding schemes such as bar codes, or other visual patterns, including, but not limited to, single and/or multi-dimensional bar codes or other visual coding schemes. The code reader **585** can include a scanning device capable of directing a beam of light across the visual code and measuring the amount of light that is reflected back as dark areas reflect less light than white or lighter areas. The scanner converts the light energy into electrical energy, which is then converted to data by a codec.

[**0050**] It should be appreciated by one skilled in the art that the MCD **500** can include a variety of other sensors, such as physiological sensors configured to measure respiration, blood volume/pressure, heart rate, or the like. The listing of sensors disclosed herein is not intended to be a comprehensive list, but rather is an example intended to broaden the scope of the inventive arrangements disclosed herein. Further, **FIG. 5** depicts the sensors as being integrated into the MCD **500**. Alternately, the sensors can be external devices which can communicate with the MCD **500** in a variety of ways, such as via the interface port **575**, or via a BlueTooth-enabled wireless transceiver. This also applies to the sensors depicted in **FIGS. 3 and 4** with reference to MCD **300** and MCD **400** respectively.

[**0051**] **FIG. 6** is a schematic diagram illustrating a system **600** within which a mobile communication device MCD **600** can be utilized in accordance with another embodiment of the present invention. System **600** depicts the software architecture of the present invention, which can include an MCD **600** and a server **620**.

[**0052**] According to one embodiment, the MCD **600** can be compatible with J2ME®. J2ME, or another suitable platform, allows MCDs, such as cell phones, to engage as clients in networked client/server interactions, and execute customized programs. For example, in a J2ME implementation, the MCD **600** can include a Kilobyte Virtual Machine (KVM) **608**, which is a JAVA virtual machine designed for use with J2ME. Further, the MCD **600** can contain at least two programming specifications for use with J2ME, the Connected Limited Device Configuration (CLDC) **606**, and the Mobile Information Device Profile (MIDP) **604**.

[**0053**] The CLDC **606** can define the application program interface (API) and KVM **608** functions needed to support the MCD **600**. The MIDP **604** can add to the CLDC **600** the functions needed to integrate J2ME and the MCD **600**, such as the user interface, networking, and messaging details. Further, the MCD **600** can contain one or more MIDlets **602**, which are small JAVA applications similar to applets for use within mobile devices, such as the MCD **600**. For example, MIDlet **602** can be configured to send user commands and information between the MCD **600** and the server **620**. It should be appreciated, however, that the MCD **600** can support other MIDlets for performing a plurality of functions.

[**0054**] The MCD **600** can be configured to accommodate a general-purpose computing platform which can access servers and information sources on a network, including Web services. The MCD **600** can include a fixed Internet address (routable IP) **612**, which identifies each sender or receiver of information that is sent in packets across the Internet. Additionally, the MCD can include a mobile radio frequency (RF) interface **614** and wireless local RF interface **616**. The mobile RF interface **614** can be controlled by a commercial carrier, which incurs connection charges for voice minutes or data packets. Using its mobile RF interface **614**, the MCD **600** can initiate or receive a voice phone call through the nearest base station. It can also send or receive data packets through a base station, which can be connected through a gateway to the Internet. Further, the MCD **600** can communicate with any routable IP on the Internet, including server **620** through a broadband Internet service provider.

[**0055**] The wireless local RF interface **616** can be configured to communicate using any of a variety of short-range, wireless communications protocols and/or systems, such as Bluetooth, or via the 802.11 family of short-range wireless communications specifications. Such short-range capability can provide local connections between the MCD **600** and an appropriate near-by wireless access point. Using its wireless local RF interface **616**, the MCD **600** can connect to a home network via a near-by access point. Further, the MCD **600** can send or receive data packets to/from the server **620**, or route packets through a home network router to external Internet destinations.

[**0056**] **FIG. 6** also depicts the server **620**, which can function as an interface between the MCD **600** and external devices and systems by creating a series of connectivity paths between the MCD **600** and the user's home environment. As shown, the server **620** can include a client/proxy gateway **615** and a series of specialized middleware proxies to be described herein. The server **620** can be configured to be in an "always-on" mode, and can include a routable Internet Protocol (IP) address. Further, the server **620** can connect to the Internet through a broadband Internet service provider, such as a cable modem, DSL, or dial-up if so required. The server **620** can also be configured to connect to a high-speed, home wire-line network, such as fast Ethernet.

[**0057**] The software architecture of the server **620**, which is illustrated in **FIG. 6**, can be event driven, where actions are initiated in response to the occurrence of specific events and/or conditions. Accordingly, the client/proxy gateway **615** can include a rules data store **625** and a corresponding rules engine **630**. The data store **625** can specify and store rules corresponding to events, conditions, and actions. Upon the occurrence of an event and/or condition, the engine **630** can evaluate the rules stored within the data store **625** and initiate the appropriate action. For example, event X can be a user command issued from the MCD **600**. A corresponding rule can be stored in the data store **625** specifying an action Y. Upon detection of event X, the engine **630** can initiate the action Y.

[**0058**] The engine **630** can operate in conjunction with a series of specialized middleware proxies, such as an X10

proxy **640**, one or more microcontroller proxies **650**, and one or more Internet proxies **660**. A proxy can provide an interface between the MCD **600** and various entities in the intelligent environment. That is, the proxies **640**, **650** and **660** can be configured to understand both the low level details of events and actions as well as any corresponding abstractions, and will provide the correct mapping between the two. Further, all proxies will conform to a unified representation of events, conditions, and actions.

[**0059**] The X10 proxy **640** can interface the MCD **600** to an X10 home controller via the client/proxy gateway **615**. An X10 home controller can be connected through the home power-line network to a plurality of X10 module interfaces, which can remotely monitor and/or control various home appliances, devices, alarm circuitry, or the like. In operation, an X10 event can be a command issued from the MCD **600** to turn on the living room lights. The data store **625** can store a corresponding rule specifying that a function call be initiated to the X10 proxy **640**. The function call can be a request to the X10 home controller to activate the X10 module interface controlling the lights. Thus, upon receipt of the command to turn on the lights, the engine **630** can initiate the corresponding function call to the X10 proxy **640**.

[**0060**] The microcontroller proxy **650** can interface the MCD **600** to a microcontroller disposed within the intelligent environment via the client/proxy gateway **615**. A microcontroller, such as a Dallas Semiconductor Tiny Internet Interface (TINI), can be configured to monitor and/or control any one of a plurality of devices and/or appliances, such as a TV remote control, a garage door opener, smart tags, JAVA rings, or the like. In operation, a microcontroller event can be a signal received by the microcontroller proxy **650** from a microcontroller indicating that the doorbell is ringing. Subsequently, the engine **630** can initiate an action indicated by a corresponding rule stored in the data store **625**, for example, to display an image of the person at the door on the MCD **600**, for example by interfacing with a home security system or other camera.

[**0061**] The Internet proxy **660** can interface the MCD **600** to an Internet-based service via the client/proxy gateway **615**. Internet-based services can include service providers, such as a weather service provider, or web-based supply systems, such as a grocery supply system or a pharmaceutical supply system. For example, an Internet service event can be a request issued from the MCD **600** for a weather report. In this case, the engine **630** can initiate an action specified by a corresponding rule stored in the data store **625**, such as, request a weather report from a weather service provider via the Internet proxy **660**, and display the report on the MCD **600**.

[**0062**] The listing of proxies disclosed herein is not intended to be an all inclusive list, but rather is an example intended to broaden the scope of the present invention. It should be appreciated that specialized proxies can be developed for each class of events within the user's environment. Further, the server **620** can include specially adapted administrative tools that will allow for the rapid creation of intelligent environments, and minimize the overhead storage requirement. Such administrative tools can allow additional proxies to be added to an existing system in a plug-and-play format such that retrofitting will not require recompiling of the software and middleware applications.

[**0063**] It should also be appreciated that the present invention can include a user profile including timing information specifying particular times when the user is to be located at home, when lights are to be turned off, when medications are to be taken, and time guidelines for other aspects of one's life. In any situation where the MCD **600** is to remind the user through a notification, the MCD **600** can be programmed to await a response. If no response is received, the MCD **600** can be configured to notify one or more persons and/or computing systems.

[**0064**] More particularly, the MCD **600** can be configured to notify one or more persons, whether family, friends, or medical personnel in the event that the user does not follow one or more of the guidelines programmed into the MCD **600**. Such guidelines can include, but are not limited to, deviating from a particular dietary plan, not being located at home during certain time periods, not responding to reminders to take medications, and the like. Persons can be notified using any of a variety of different messaging techniques. For example, the MCD **600** can be configured to send predetermined audio messages, text messages, electronic mail messages, pages, telephone calls, including calls to 911, and the like.

[**0065**] **FIG. 7** is a schematic diagram illustrating a system **700** within which an MCD **700** can be utilized in accordance with another embodiment of the present invention. It should be appreciated that the MCD **700** can be configured to operate in a variety of environments, including indoor and outdoor environments. **FIG. 7** depicts a smart space **720**, which can be a customized environment equipped with suitable transceivers, communications equipment, and other controller units. For example, a home can be so configured. Alternately, a workspace, caretaking facility, building, park, mall, and/or other space that can be occupied and/or inhabited by persons can be configured as a smart space. In one embodiment the MCD **700** can interact within smart space **720**. In another embodiment, the MCD **700** can operate within a standard environment that has not been specifically modified for the needs of a physically and/or mentally challenged person or other MCD **700** user.

[**0066**] The smart space **720** can also include a plurality of ultrasonic receivers **710**, and a proxy **770**. In one aspect of the present invention, the location of the MCD **700** can be determined by the system **700**. The ultrasonic receivers **710** can detect a beacon signal emitted from an ultrasonic beacon disposed within the MCD **700**, and represented by the dashed lines numbered 1 through 4 in **FIG. 7**. Information collected by the ultrasonic receivers **710** can be provided to the proxy **770** for processing such that the proxy **770** can determine the location of the MCD **700** within the smart space. Alternatively, the MCD **700** can determine its location within the smart space **720** based upon information from the beacons. Notably, the proxy **770** can be any processing device capable of being communicatively linked to one or more ultrasonic receivers **710** and the MCD **700**, such as a computer executing a software application.

[**0067**] In another embodiment, a user can wear a jacket, vest, or other piece of clothing outfitted with one or more such beacons, for example on each shoulder. Such an arrangement allows the proxy **770** to detect not only the location of a user, but also the orientation of the user. The position of the beacon(s), whether within the MCD **700** or

a piece of clothing, can be calculated based upon the time required by the ultrasonic waves to reach each receiver. A trilateration technique also can be used.

[0068] Still, as noted, any of a variety of location detection mechanisms can be used. For example, digital image processing using one or more video cameras, sound, and/or motion detection technology can be used to determine the location of a user. In the case where GPS or other satellite technology is used, the MCD **700** can determine its own location. Accordingly, such information can be sent to the proxy **770** through any of the aforementioned communication techniques.

[0069] The MCD **700** can incorporate a thin client **708**, which can be a software application executing within the MCD **700**. As shown, the MCD **700** can be communicatively linked to the proxy **770**. Accordingly, the client **708** can interact with the proxy **770** on behalf of the MCD **700**. The client **708** can include one or more application programs that allow the user to access the functionality of the various systems and/or devices communicatively linked to the proxy **770**, to be described in greater detail herein. Notably, the proxy **770** can be configured with a multitude of MCD **700** and/or user specific settings so that information exchanged between the MCD **700** and the proxy **770** cam be tailored to meet the needs, capabilities, and privileges of different users and/or MCDs.

[0070] The proxy **770** can operate as an application server, and can be located within the home, or at a remote location outside of the home. In one embodiment, the MCD **700** can communicate directly with the proxy **770** via a short-range wireless connection, such as through the 802.11 family of wireless local area networking protocols, a Bluetooth transmission, or the like. Short-range communications can be used when the MCD **700** and the proxy **770** are located within the same home or location. In another embodiment, the MCD **700** can communicate indirectly to the proxy **770** via a conventional long range data link. For example, the MCD **700** can access the proxy **770** by interfacing with a mobile base station via a phone call or data connection. Such long range communications can be used when the MCD **700** is not located within, or proximate to, the location within which the proxy **770** is disposed. However, a mobile base station can also be used to communicate with the proxy **770** when it is in close proximity to the MCD **700**. It should be appreciated that the MCD **700** can communicate with the proxy **770**, or any other proxies, using any of a variety of different communications mechanisms, and that the MCD **700** is not limited to any specific communication mechanism.

[0071] In one embodiment, the proxy **770** can communicate with controller **705** on behalf of the MCD **700**. The controller **705** can be any home automation and/or security system, such as an X10 computer-based control for home management. Notably, the MCD **700** can include one or more application programs that allow the user to access the functionality of the various devices connected to the controller **705**, such as actuators and/or sensors to monitor and control household devices, appliances, emergency events, or the like. In yet another embodiment, the MCD **700** can be configured to interface with appliances having the ability to communicate and respond to remote operational controls, such as washers, dryers, dishwashers, stoves, and the like. Similarly, applications can be configured enabling the MCD **700** to control lighting. Accordingly, using an appropriate application, the MCD **700** can turn lights on or off, dim lights, and set timing features so that lights turn on or off automatically at predetermined times, etc. Notably, additional systems which can be wired for use inside and/or outside of a home, such as cameras and/or intercoms, visual and/or audio-based systems, and surveillance systems, can be communicatively linked to the controller **705**, or the proxy **770**, and controlled via the MCD **700**.

[0072] With respect to audio, video (visual), and audiovisual systems, the MCD **700** can access an audio feed, a video feed, and/or an audiovisual feed, as well as receive audio and/or video files. For example, the MCD **700** can receive a sound signal, a digital image, or a video via short-range wireless communications, long range wireless communications, and/or wired communications as previously discussed. Accordingly, through the MCD **700** a user can view visitors at the front door if a camera is suitably positioned and communicatively linked with the proxy **770**. Further, the MCD **700** can receive audio from audio and/or surveillance systems. Notably, if a stereo is capable of linking with the proxy **770**, then the MCD **700** can be used to control the stereo as well as receive audio from the stereo such that one could listen to the stereo via the MCD **700**.

[0073] It should be appreciated that while smart spaces have been described with reference to a single, centralized computer system, one or more computer systems can be included. For example, lighting can be controlled with one computer system while temperature is controlled by another, and appliances can be controlled by yet another computer system. The various computer systems may or may not communicate with one another so long as each is able to communicate with the MCD **700**. Still, each system can be configured to communicate with the MCD **700** independently and operate on its own. For instance, each appliance can be a "smart" appliance having built-in communications and control mechanisms for being accessed remotely. In that case, each appliance need not communicate with other appliances or a centralized computing system so long as the appliance and/or system can communicate directly with the MCD **700**.

[0074] As shown with reference to the above discussion, the MCD **700** can provide a user with an integrated means for controlling many, if not most or all, aspects of one's home. Users can be provided with intuitive interfaces as well as audio notifications for the various functions disclosed herein. The present invention further can provide users with a level of comfort knowing that various appliances and systems of one's home can be checked when away from home, or simply when retiring for the evening without leaving the comfort of one's room.

[0075] System **700** can also include a communications network **715**. The network **715** can communicatively link to the MCD **700**, for example via a mobile communications link. The network **715** can also communicatively link the proxy **770** and a plurality of service providers and supply systems, to be discussed herein. The communications network **715** is depicted as an Internet network. It should be appreciated by those skilled in the art that communications network **715** can also include a wide area network, the public switched telephone network (PSTN), mobile, or other data network.

[0076] In one aspect, the network **715** can communicatively link the proxy **770** on behalf of the MCD **700** to one or more service providers **765**. For example, the service provider **765** can be a remote weather service provider which can provide weather reports, advice, and information to the user. In operation, the proxy **770** can query the weather service provider **765** for real-time weather information via the communications network **315**. Upon receiving weather data from the service provider **765**, the proxy **770** can transmit the information to the client **708** for presentation to the user. It should be appreciated that the client **708** can be configured to execute one or more software applications for presenting the information to the user, and making decisions and recommendations to the user based on the information.

[0077] Additional service providers **765** can include medical service providers, such as doctors, nurses, emergency personnel, and other third party services. The MCD **700** can be programmed to contact such service providers **765** upon request of the user and/or automatically upon the occurrence of a detected event. For example, if a biosensor within the MCD **700** detects abnormal physiological data from the user, the MCD **700** can automatically contact a doctor, nurse, 911, and/or a family member or friend. That is, the MCD **700** can include profile information or access profile information that can be stored on the proxy **770** or other remote computer system. Accordingly, as the health related or biological data detected by the MCD **700** regarding the user is obtained, such information can be compared with known baselines for that user.

[0078] In another aspect of the present invention, the network **715** can communicatively link the proxy **770** on behalf of the MCD **700** to one or more web-based supply systems, such as a grocery supply system **760**, and a pharmaceutical supply system **775**. In one embodiment, the MCD **700** can include an application configured to aid a user in ordering groceries. In the case where a market has provided a grocery order system, such as the grocery supply system **760**, which can be accessed via the Web or another network connection, the user of the MCD **700** can place grocery orders. Notably, as potential users of the MCD **700** may have particular dietary needs, the MCD **700**, or the proxy **770**, can be programmed to include any dietary restrictions and/or particular foods that the user requires. For example, the MCD **700** can be programmed with one or more rules specifying which items may or may not be purchased by the user. Further, the MCD **700** can be configured to warn a user that the item being ordered is not an approved item, or prevent the user from ordering such an item.

[0079] Alternatively, the MCD **700** can be programmed with nutritional data concerning particular foods such that as a user orders items, a running nutritional count with respect to the foods that the user is ordering can be tracked, for example in terms of caloric intake, fat, cholesterol, saturated fat, and the like. Further, information such as dietary requirements can be downloaded from a trusted source, such as a doctor's Web site, from a user computer, can be read from a visual code using the code reader, or via any other means, including, but not limited to using a charging cradle with the ability to synchronize with a computing source, whether local or not.

[0080] According to another embodiment of the present invention, the MCD **700** can be programmed to communicate with the pharmaceutical supply system **775**. For example, the MCD **700** can be programmed with a listing of each medication and/or prescribed substance a user is to take as well as the dosage guidelines and/or any other instructions including side effects pertaining to the medications. Accordingly, the MCD **700** can be used to automatically order refills, for example after a predetermined amount of time has passed. As the MCD **700** can be programmed with user prescription data including the time when medications are to be taken and dosages, the MCD **700** can calculate when the prescription is to be refilled.

[0081] Thus, the MCD **700** can remind the user, for example via an audio notification or a visual notification, to take particular medications at particular times and can remind a user to order or obtain a refill. Notably, the MCD **700** can require the user to respond to such a reminder or notification such that if no response is received, the MCD **700** can implement a programmatic action. For example, the MCD **700** can be programmed to contact a family member or a medical service provider. Such persons can be contacted via a page, an electronic mail, a text message, and/or a programmed audio message, for example after initiating a landline and/or cellular telephone call.

[0082] In yet another embodiment, the MCD **700** can be configured to automatically order a refill for the user by contacting the pharmaceutical supply system **775**. The pharmaceutical supply **775** can be implemented as a Web site, an automated phone service, or another network accessible system. For example, the MCD **700** can place an order through a Web site, be programmed to leave an automated message on a pharmacy voice mail for reordering additional medication, or contact the pharmaceutical supply system **775** by establishing a communications link via another network connection.

[0083] The inventive arrangements disclosed herein can be used within a variety of additional applications. For example, according to one embodiment of the present invention, the MCD **700** can include a medical assistant application. The medical assistant application can remind an elder user, or any user for that matter, of the times when the user is to take medication. The MCD **700** can be used to scan the barcode printed on a prescription label. The MCD **700** then can retrieve information regarding the medicine from the pharmaceutical supply system **775**. For example, the MCD **700** can retrieve the times when the user is to take a prescribed medication as well as the dosage to be taken. The MCD **700** can provide the user with alarms and intelligent reminders to take medication. The MCD **700** further can obtain and provide information about medicines, allergies, and side effects. The MCD **700** can track the quantity of the medicine and automatically order the medicine if quantity falls below a certain predetermined threshold. The medical assistant application further can be used to arrange home delivery.

[0084] It should be appreciated that the listing of service providers and systems disclosed herein is not intended to be an a comprehensive list, but rather is an example intended to broaden the scope of the present invention.

[0085] The present invention can be realized in hardware, software, or a combination of hardware and software. The

present invention can be realized in a centralized fashion in one computer system, or in a distributed fashion where different elements are spread across several interconnected computer systems. Any kind of computer system or other apparatus adapted for carrying out the methods described herein is suited. A typical combination of hardware and software can be a general purpose computer system with a computer program that, when being loaded and executed, controls the computer system such that it carries out the methods described herein.

[0086] The present invention also can be embedded in a computer program product, which comprises all the features enabling the implementation of the methods described herein, and which when loaded in a computer system is able to carry out these methods. Computer program in the present context means any expression, in any language, code or notation, of a set of instructions intended to cause a system having an information processing capability to perform a particular function either directly or after either or both of the following: a) conversion to another language, code or notation; b) reproduction in a different material form.

[0087] This invention can be embodied in other forms without departing from the spirit or essential attributes thereof. Accordingly, reference should be made to the following claims, rather than to the foregoing specification, as indicating the scope of the invention.

What is claimed is:

1. A mobile communication device comprising:

a cellular radio-frequency transceiver serviceable by a commercial carrier;

a short-range wireless transceiver for communicating with a local access point; and

a processor configured to control the operation of said short-range wireless transceiver and said cellular radio-frequency transceiver.

2. The device of claim 1, further comprising:

an ultrasonic beacon configured to be detected by at least one ultrasonic receiver.

3. The device of claim 1, further comprising:

a code reader.

4. The device of claim 1, further comprising:

a temperature sensor.

5. The device of claim 1, further comprising:

a radio frequency identification mechanism.

6. A mobile communication device comprising:

at least one biosensing device; and

a processor configured to process the information received from the biosensing device.

7. The device of claim 6, wherein the biosensor is a chemical sensor configured to detect airborne particulates.

8. The device of claim 6, wherein the biosensor is a galvanic skin sensor configured to measure a change in conductivity of skin.

9. A system for providing mobile care-giving and intelligent assistance comprising:

a mobile phone comprising a short-range wireless transceiver configured to communicate with a local computing device; and

a proxy server comprising a short-range wireless transceiver configured to establish communications between a target device and said mobile phone, wherein said proxy server and said mobile phone communicate over a short-range wireless connection.

10. The system of claim 9, said proxy server further comprising a gateway further comprising:

a data store for storing a programmatic action corresponding to a predetermined event; and

a software engine configured to initiate the programmatic action responsive to the occurrence of the predetermined event.

11. The system of claim 9, wherein the short-range wireless connection uses an 802.11x wireless local area networking protocol.

12. The system of claim 9, wherein the target device is at least one of a remote service provider or a local controller.

13. The system of claim 12, wherein the remote service provider is at least one of a pharmaceutical supply system, a grocery supply system, and a weather service provider.

14. The system of claim 12, wherein the local controller is an X10 controller.

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CPC分类号	A61B5/0062 A61B2503/08 A61B5/024 A61B5/0531 A61B5/0816 A61B5/1112 A61B5/1113 A61B5/411 A61B5/7475 A61B2560/0242 A61B2560/0468 G01C21/005 G01C21/20 G05B19/042 G06F15/16 G06F19/3406 G06F19/3418 G06Q10/10 G06Q10/109 G06Q50/00 G06Q90/00 G08B13/19658 G08B13/19684 G08B13/19697 G08B21/025 G08B21/0263 G08B21/0275 G08B21/028 G08B21/0283 G08B21/04 G08B25/008 G08B25/009 G08B25/016 G08B27/006 G08C17/00 G08C17/02 G08C2201/41 G08C2201/42 G08C2201/50 G08C2201/51 G08C2201/61 G08C2201/93 H04L12/2803 H04L12/282 H04L12/2836 H04M1/7253 H04M1/72533 H04M1/72566 H04M1/72569 H04M1/72572 H04M1/72588 H04M2250/12 A61B5/002 A61B5/0022 A61B5/02055 G16H40/63		
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摘要(译)

移动通信设备可以包括可由商业运营商服务的蜂窝射频收发器和用于与本地接入点通信的短程无线收发器。移动通信设备还可以包括处理器，该处理器被配置为控制短程无线收发器和蜂窝射频收发器的操作。