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(54) A method and portable electronic device for golf swing detection for scoring assistance

(57) A method and portable electronic device for golf swing detection for scoring assistance are provided. In accordance with one embodiment, there is provided a method for golf swing detection on a portable electronic device, comprising: monitoring for and detecting golf swing gestures; determining a location of the device; incrementing a stroke counter when a golf swing gesture is detected and a previous golf swing gesture was not detected within a predetermined distance of the determined location; and displaying the value of the stroke counter in a user interface screen displayed on a display screen of the device.

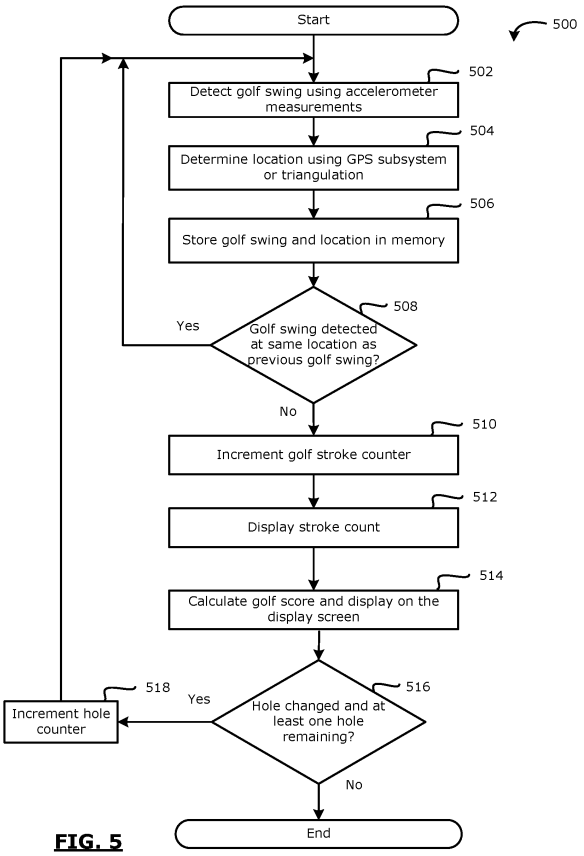

FIG. 5

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to motion detection systems, and more particularly to a method and portable electronic device for golf swing detection for scoring assistance.

BACKGROUND

[0002] A golfer can easily and often lose track of how many strokes a player has made at a given hole. Conventional golf stroke counters use indexing wheels which are advanced through a range of index positions by depressing a corresponding button which engages the wheel and which rotates it from its current index position to the next index position. Typically, a first indexing wheel is provided for counting holes (the "hole wheel") and a second indexing wheel is provided for counting strokes (the "stroke wheel"). While useful, conventional golf swing counters require user interaction at each swing (by depressing the button) and the resetting of the device at the start of each new hole.

[0003] Depending on the indexing mechanism used and the corresponding indexes, resetting the hole wheel or stroke wheel may require the player to depress the button until the corresponding indexing wheel has made a full rotation and returns to its starting (e.g., 1 or 0 stroke) position. Typically, the hole and stroke wheels each have nine or ten index positions with are marked or others indicated as values 1 to 9 or 0 to 9, depending on the number of index positions.

[0004] Depending on the rules being used by the players, which may vary between golf courses and/or players, the maximum number of golf strokes counted by the golf stroke counter may be greater than or smaller than that being used by the players. For example, if a maximum stroke count of 6 or 7 is being used, the player may have to depress the button 3 or 4 times to reset the stroke wheel. This sometimes results in "over-pressing" in which the player accidental advances the stroke wheel beyond the starting index position. If no maximum stroke count is being used by the players or a maximum stroke count of 10 or more is being used, a player with ten or more strokes may have to keep mental track of this fact since the stroke wheel typically only provides one place holder, resulting in a maximum stroke count of 9 on the device.

[0005] In view of the above, there remains a need for improved golf stroke counters.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] FIG. 1 is a block diagram illustrating a communication system including a mobile communication device to which example embodiments of the present disclosure can be applied;

[0007] FIG. 2 is a block diagram illustrating a mobile communication device in accordance with one example embodiment of the present disclosure;

[0008] FIG. 3 is a block diagram of a motion detection subsystem comprising a digital 3-axis accelerometer in accordance with one example embodiment of the present disclosure;

[0009] FIG. 4A illustrates a first second example user interface screen of a stroke count which could be displayed on a display screen of a device;

[0010] FIG. 4B illustrates a second example user interface screen of a stroke count which could be displayed on a display screen of a device; and

[0011] FIG. 5 is a flowchart illustrating example operations for golf swing detection in accordance with one example embodiment of the present disclosure.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

[0012] The present disclosure is directed to a method and portable electronic device for golf swing detection. The method and device of the present disclosure may be used to keep score more accurately than conventional devices and may require less user interaction than conventional devices. The device user player may also be provided with the option to set the scoring rules to be used and/or review and optionally edit golf scores, for example, to correct any errors in golf swing detection.

[0013] In accordance with one embodiment of the present disclosure, there is provided a method for golf swing detection on a portable electronic device, comprising: monitoring for and detecting golf swing gestures; determining a location of the device; incrementing a stroke counter when a golf swing gesture is detected and a previous golf swing gesture was not detected within a predetermined distance of the determined location; and displaying the value of the stroke counter in a user interface screen displayed on a display screen of the device.

[0014] In accordance with another embodiment of the present disclosure, there is provided a portable electronic device, comprising: a controller for controlling the operation of the device; a memory connected to the controller; a display screen

connected to the controller; the controller being configured for monitoring for and detecting golf swing gestures, determining a location of the device, incrementing a stroke counter when a golf swing gesture is detected and a previous golf swing gesture was not detected within a predetermined distance of the determined device location, and displaying the value of the stroke counter in a user interface screen displayed on the display screen of the device.

[0015] In accordance with a further embodiment of the present disclosure, there is provided a computer program product comprising a computer readable medium storing instructions in the form of executable program code for causing the portable electronic device to perform the described methods.

[0016] The embodiments described herein relate to portable electronic devices such as handheld electronic devices. Examples of handheld electronic devices include mobile communication devices such as pagers, cellular phones, Global Positioning System (GPS) navigation devices and other satellite navigation devices and smart phones, wireless organizers and personal digital assistants (PDAs). The handheld electronic device may also be a portable electronic device without wireless communication capabilities such as a PDA, electronic gaming device or digital camera. The handheld electronic device may be a special purpose golf scoring device.

[0017] Reference is now made to FIG. 2 which illustrates a mobile communication device 201 in which example embodiments described in the present disclosure can be applied. The mobile communication device 201 is a two-way communication device having at least data and possibly also voice communication capabilities, and the capability to communicate with other computer systems, for example, via the Internet. Depending on the functionality provided by the mobile communication device 201, in various embodiments the device may be a data communication device, a multiple-mode communication device configured for both data and voice communication, a smartphone, a mobile telephone or a PDA (personal digital assistant) enabled for wireless communication, or a computer system with a wireless modem.

[0018] The mobile communication device 201 includes a rigid case (not shown) housing the components of the device 201. The internal components of the device 201 are constructed on a printed circuit board (PCB). The mobile communication device 201 includes a controller comprising at least one processor 240 (such as a microprocessor) which controls the overall operation of the device 201. The processor 240 interacts with device subsystems such as a communication subsystem 211 for exchanging radio frequency signals with a wireless network 101 to perform communication functions. The processor 240 interacts with additional device subsystems including a display (screen) 204 such as a liquid crystal display (LCD) screen, input devices 206 such as a keyboard and control buttons, flash memory 244, random access memory (RAM) 246, read only memory (ROM) 248, auxiliary input/output (I/O) subsystems 250, data port 252 such as serial data port, such as a Universal Serial Bus (USB) data port, speaker 256, microphone 258, short-range communication subsystem 272, and other device subsystems generally designated as 274. Some of the subsystems shown in FIG. 2 perform communication-related functions, whereas other subsystems may provide "resident" or on-device functions.

[0019] The device 201 may comprise a touchscreen display in some embodiments. The touchscreen display may be constructed using a touch-sensitive input surface connected to an electronic controller and which overlays the display screen 204. The touch-sensitive overlay and the electronic controller provide a touch-sensitive input device and the processor 240 interacts with the touch-sensitive overlay via the electronic controller.

[0020] The communication subsystem 211 includes a receiver 214, a transmitter 216, and associated components, such as one or more antenna elements 218 and 220, local oscillators (LOs) 222, and a processing module such as a digital signal processor (DSP) 224. The antenna elements 218 and 220 may be embedded or internal to the mobile communication device 201 and a single antenna may be shared by both receiver and transmitter, as is known in the art. As will be apparent to those skilled in the field of communication, the particular design of the wireless communication subsystem 211 depends on the wireless network 101 in which mobile communication device 201 is intended to operate.

[0021] The mobile communication device 201 may communicate with any one of a plurality of fixed transceiver base stations 108 of the wireless network 101 within its geographic coverage area. The mobile communication device 201 may send and receive communication signals over the wireless network 101 after the required network registration or activation procedures have been completed. Signals received by the antenna 218 through the wireless network 101 are input to the receiver 214, which may perform such common receiver functions as signal amplification, frequency down conversion, filtering, channel selection, etc., as well as analog-to-digital (A/D) conversion. A/D conversion of a received signal allows more complex communication functions such as demodulation and decoding to be performed in the DSP 224. In a similar manner, signals to be transmitted are processed, including modulation and encoding, for example, by the DSP 224. These DSP-processed signals are input to the transmitter 216 for digital-to-analog (D/A) conversion, frequency up conversion, filtering, amplification, and transmission to the wireless network 101 via the antenna 220. The DSP 224 not only processes communication signals, but may also provide for receiver and transmitter control. For example, the gains applied to communication signals in the receiver 214 and the transmitter 216 may be adaptively controlled through automatic gain control algorithms implemented in the DSP 224.

[0022] The processor 240 operates under stored program control and executes software modules 221 stored in memory such as persistent memory, for example, in the flash memory 244. As illustrated in FIG. 2, the software modules

221 comprise operating system software 223, software applications 225 comprising a golf swing detection module 226 and a golf scoring application 228. The golf swing detection module 226 and golf scoring application 228 may, among other things, be implemented through a stand-alone software application, or combined together in one or more of the operating system 223 and applications 225. In some example embodiments, the functions performed by the golf swing detection module 226 may be realized as a plurality of independent elements, rather than a single integrated element, and any one or more of these elements may be implemented as parts of the golf scoring application 228 or other software applications.

[0023] Those skilled in the art will appreciate that the software modules 221 or parts thereof may be temporarily loaded into volatile memory such as the RAM 246. The RAM 246 is used for storing runtime data variables and other types of data or information, as will be apparent to those skilled in the art. Although specific functions are described for various types of memory, this is merely one example, and those skilled in the art will appreciate that a different assignment of functions to types of memory could also be used.

[0024] The software applications 225 may include a range of applications, including, for example, an address book application, a messaging application, a calendar application, and/or a notepad application. In some embodiments, the software applications 225 include an email message application, a push content viewing application, a voice communication (i.e. telephony) application, a map application, and a media player application. Each of the software applications 225 may include layout information defining the placement of particular fields and graphic elements (e.g. text fields, input fields, icons, etc.) in the user interface (i.e. the display screen 204) according to the application.

[0025] In some embodiments, the auxiliary input/output (I/O) subsystems 250 may comprise an external communication link or interface, for example, an Ethernet connection. The mobile communication device 201 may comprise other wireless communication interfaces for communicating with other types of wireless networks, for example, a wireless network such as an orthogonal frequency division multiplexed (OFDM) network. The auxiliary I/O subsystems 250 may comprise a navigational tool such as a clickable trackball or thumbwheel, or a vibrator for providing vibratory notifications in response to various events on the device 201 such as receipt of an electronic communication or incoming phone call, or for other purposes such as haptic feedback (touch feedback).

[0026] In some embodiments, the mobile communication device 201 also includes a removable memory card 230 (typically comprising flash memory) and a memory card interface 232. Network access typically associated with a subscriber or user of the mobile communication device 201 via the memory card 230, which may be a Subscriber Identity Module (SIM) card for use in a GSM network or other type of memory card for use in the relevant wireless network type. The memory card 230 is inserted in or connected to the memory card interface 232 of the mobile communication device 201 in order to operate in conjunction with the wireless network 101.

[0027] The mobile communication device 201 stores data 227 in an erasable persistent memory, which in one example embodiment is the flash memory 244. In various embodiments, the data 227 includes service data comprising information required by the mobile communication device 201 to establish and maintain communication with the wireless network 101. The data 227 may also include user application data such as email messages, address book and contact information, calendar and schedule information, notepad documents, image files, and other commonly stored user information stored on the mobile communication device 201 by its user, and other data. The data 227 stored in the persistent memory (e.g. flash memory 244) of the mobile communication device 201 may be organized, at least partially, into a number of databases each containing data items of the same data type or associated with the same application. For example, email messages, contact records, and task items may be stored in individual databases within the device memory.

[0028] The serial data port 252 may be used for synchronization with a user's host computer system (not shown). The serial data port 252 enables a user to set preferences through an external device or software application and extends the capabilities of the mobile communication device 201 by providing for information or software downloads to the mobile communication device 201 other than through the wireless network 101. The alternate download path may, for example, be used to load an encryption key onto the mobile communication device 201 through a direct, reliable and trusted connection to thereby provide secure device communication.

[0029] In some embodiments, the mobile communication device 201 is provided with a service routing application programming interface (API) which provides an application with the ability to route traffic through a serial data (i.e., USB) or Bluetooth® (Bluetooth® is a registered trademark of Bluetooth SIG, Inc.) connection to the host computer system using standard connectivity protocols. When a user connects their mobile communication device 201 to the host computer system via a USB cable or Bluetooth® connection, traffic that was destined for the wireless network 101 is automatically routed to the mobile communication device 201 using the USB cable or Bluetooth® connection. Similarly, any traffic destined for the wireless network 101 is automatically sent over the USB cable Bluetooth® connection to the host computer system for processing.

[0030] The mobile communication device 201 also includes a battery 238 as a power source, which is typically one or more rechargeable batteries that may be charged, for example, through charging circuitry coupled to a battery interface such as the serial data port 252. The battery 238 provides electrical power to at least some of the electrical circuitry in the mobile communication device 201, and the battery interface 236 provides a mechanical and electrical connection

for the battery 238. The battery interface 236 is coupled to a regulator (not shown) which provides power V+ to the circuitry of the mobile communication device 201.

[0031] The short-range communication subsystem 272 is an additional optional component which provides for communication between the mobile communication device 201 and different systems or devices, which need not necessarily be similar devices. For example, the subsystem 272 may include an infrared device and associated circuits and components, or a wireless bus protocol compliant communication mechanism such as a Bluetooth® communication module to provide for communication with similarly-enabled systems and devices.

[0032] A predetermined set of applications that control basic device operations, including data and possibly voice communication applications will normally be installed on the mobile communication device 201 during or after manufacture. Additional applications and/or upgrades to the operating system 223 or software applications 225 may also be loaded onto the mobile communication device 201 through the wireless network 101, the auxiliary I/O subsystem 250, the serial port 252, the short-range communication subsystem 272, or other suitable subsystems 274 or wireless communication interfaces. The downloaded programs or code modules may be permanently installed, for example, written into the program memory (i.e. the flash memory 244), or written into and executed from the RAM 246 for execution by the processor 240 at runtime. Such flexibility in application installation increases the functionality of the mobile communication device 201 and may provide enhanced on-device functions, communication-related functions, or both. For example, secure communication applications may enable electronic commerce functions and other such financial transactions to be performed using the mobile communication device 201.

[0033] The mobile communication device 201 may provide two principal modes of communication: a data communication mode and an optional voice communication mode. In the data communication mode, a received data signal such as a text message, an email message, or Web page download will be processed by the communication subsystem 211 and input to the processor 240 for further processing. For example, a downloaded Web page may be further processed by a browser application or an email message may be processed by an email message application and output to the display 242. A user of the mobile communication device 201 may also compose data items, such as email messages, for example, using the input devices in conjunction with the display screen 204. These composed items may be transmitted through the communication subsystem 211 over the wireless network 101.

[0034] In the voice communication mode, the mobile communication device 201 provides telephony functions and operates as a typical cellular phone. The overall operation is similar, except that the received signals would be output to the speaker 256 and signals for transmission would be generated by a transducer such as the microphone 258. The telephony functions are provided by a combination of software/firmware (i.e., the voice communication module) and hardware (i.e., the microphone 258, the speaker 256 and input devices). Alternative voice or audio I/O subsystems, such as a voice message recording subsystem, may also be implemented on the mobile communication device 201. Although voice or audio signal output is typically accomplished primarily through the speaker 256, the display screen 204 may also be used to provide an indication of the identity of a calling party, duration of a voice call, or other voice call related information.

[0035] The mobile communication device 201 also comprises a GPS subsystem 260. The GPS subsystem 260 comprises a transceiver for communicating with a GPS satellite network (not shown) for determining the location of the device 201. The construction and components of a GPS subsystem 260 are known and understood in the art and will not be described in the present disclosure. In some embodiments, the GPS subsystem 260 includes or has access to local mapping data in order to more accurately determine the device location relative to the device surroundings. For example, the GPS subsystem 260 may use course pin (hole) location information to determine the distance of the device 201 to the pin of the current hole being played. The device location may be reported in terms of GPS coordinates, a distance to the pin of the respective hole (typically identified by its corresponding hole number) with optional a direction to the pin of the current hole (e.g., a cardinal direction and/or a graphical representation of an arrow pointing in the direction), or both.

[0036] Typically, golf course mapping location information is generated by performing a detailed geographic survey which maps the features of the golf course in association with the GPS coordinates of those features. The golf course mapping location information could be pre-stored in the memory 244 of the device 201, wirelessly downloaded to the memory 244 of the device 201 from a corresponding data store prior to the start of the game, or provided by the golf course on a removable memory card, e.g. an Secure Digital (SD) card or microSD card, prior to the start of the game. The local mapping data may be used by a general mapping application on the device 201 or a specialized mapping application which could be part of the golf scoring application 228.

[0037] The mobile communication device 201 also comprises a motion detection subsystem 249 comprising at least one motion sensor which is connected to the processor 240 and which is controlled by one or a combination of a monitoring circuit and operating software. The motion detection subsystem 249 may comprise two or more motion sensors or a motion sensor and an electronic compass. The motion detection subsystem 249 detects the motion of the mobile communication device 201 or detects information which the motion of the mobile communication device 201 can be determined, such as acceleration using an accelerometer. In other embodiments, a motion sensor other than an

accelerometer could be used such as a cadence sensor or cadence detection system.

[0038] In other embodiments, the motion detection subsystem 249, its sensor, or both, could be a separate component incorporated in a holster for the device 201 with suitable circuitry, in a glove or watch worn by the device user, or in another accessory of the device 201 or device user. In such embodiments, motion data such as acceleration measured by the motion detection subsystem 249 or its sensor would be wirelessly transmitted from the motion detection subsystem 249 or its sensor, to the device 201 via a short-range wireless link such as Bluetooth™ or other personal area network (PAN) technology. Methods of pairing of wirelessly peripherals incorporating the motion detection subsystem 249 or its sensor with the mobile device 201 are known in the art and will not be described herein.

[0039] As will be appreciated by persons skilled in the art, an accelerometer is a sensor which converts acceleration from motion (e.g. movement of the mobile communication device 201 or a portion thereof due to the strike force) and gravity which are detected by a sensing element into an electrical signal (producing a corresponding change in output) and is available in one, two or three axis configurations. Accelerometers may produce digital or analog output signals depending on the type of accelerometer. Generally, two types of outputs are available depending on whether an analog or digital accelerometer used: (1) an analog output requiring buffering and analog-to-digital (A/D) conversion; and (2) a digital output which is typically available in an industry standard interface such as an SPI (Serial Peripheral Interface) or I2C (Inter-Integrated Circuit) interface. The output of an accelerometer is typically measured in terms of the gravitational acceleration constant at the Earth's surface, denoted *g*, which is approximately 9.81 m/s^2 (32.2 ft/s^2) as the standard average. The accelerometer may be of almost any type including, but not limited to, a capacitive, piezoelectric, piezoresistive, or gas-based accelerometer. The range of accelerometers vary up to the thousands of g's, however for portable electronic devices "low-*g*" accelerometers may be used. Example low-*g* accelerometers which may be used are MEMS digital accelerometers from Analog Devices, Inc. (ADI), Freescale Semiconductor, Inc. (Freescale) and STMicroelectronics N.V. of Geneva, Switzerland.

[0040] Referring briefly to FIG. 3, a motion detection subsystem 249 in accordance with one example embodiment of the present disclosure will be described. The circuit 300 comprises a digital 3-axis accelerometer 310 connected to the interrupt and serial interface of a controller (MCU) 312. The controller 312 could be the processor 240 of the device 201. The operation of the controller 312 is controlled by software, which may be stored in internal memory of the controller 312. The operational settings of the accelerometer 310 are controlled by the controller 312 using control signals sent from the controller 312 to the accelerometer 310 via the serial interface. The controller 312 may determine the motion detection in accordance with the acceleration measured by the accelerometer 310, or raw acceleration data measured by the accelerometer 310 may be sent to the processor 240 of the device 201 via its serial interface where motion detection is determined by the operating system 223, or other software module 221. In other embodiments, a different digital accelerometer configuration could be used, or a suitable analog accelerometer and control circuit could be used.

[0041] Referring now to FIG. 5, a method for golf swing detection in accordance with one embodiment of the present disclosure will be described.

[0042] FIG. 5 illustrates example operations 500 for performing the method. In this example embodiment, the operations 500 are carried out by the processor 240 of the handheld electronic device 102 under the instruction of the golf swing detection module 226 and possibly golf scoring application 228. The golf swing detection module 226 could be a separate module 221, or part of the golf scoring application 228 or other module 221.

[0043] As a preliminary step (not shown), prior to detecting golf swings the golf scoring application 228 which utilizes or comprises the golf swing detection module 226 is launched on the device 201 so that it becomes the active application. At this time, the device user (e.g., player) may select a set of scoring rules to be used by the golf scoring application 228, for example, from one or more predefined sets of scoring rules (e.g., match play, stroke play, etc.). The scoring rules may be based on the type of game being played. In some embodiments, the scoring rules may be customized by device user by changing or setting individual rules to be applied or a setting parameter values associated with such rules such as, for example, a maximum stroke count and the starting hole/tee number.

[0044] In some embodiments, a main or "home" user interface screen of the golf scoring application 228 is displayed on the display screen 204 when the golf scoring application 228 is started. To start a game and commence the detection golf swings and counting strokes, predetermined input may be required. This input may be the depression of a predefined or specialized key of a keyboard of the device 201, the selection of an onscreen button in the home screen via respective input (e.g., a "Start" button), or the display of a menu and selection of a corresponding menu item (e.g., a "start game" menu item) which causes the initiation of golf swing detection and stroke counting.

[0045] It will be appreciated that golf swing detection is context dependent and is only performed when the golf swing detection module 226 and/or golf scoring application 228 are active. When performing golf swing detection, other gestures or motions are not recognized. In some embodiments, as described more fully below, golf swing detection comprises comparing the acceleration measured by the accelerometer 310 to a reference signal to determine whether it is characteristic of a golf swing. The acceleration measurements are not compared to reference signals for other motions. Context dependent motion/gesture recognition may simplify motion detection and analysis by limiting the analysis to identifying a signal type of motion rather than differentiating a detected motion between different types of motion. However,

in other embodiments, the acceleration measured by the accelerometer 310 could be compared to reference signals for different types of swings to determine whether the measured acceleration is characteristic of a golf swing.

[0046] As a second preliminary step (not shown), the device user places the device 201 on his or her person so that the motion detection subsystem 249, in particular the accelerometer 310, can detect the motion of the device user during golf swings. To improve the accuracy of the golf swing detection, the device 201 should be located on or near the hip or shoulder of the device user (player). When the device 201 is a holsterable device, the device user may have to holster the device 201 by placing it in its holster and attaching the holstered device to the user's clothing (typically by clipping a clip of the holster to the belt or pants of the device user). The holstered device could also be placed in a pocket of the device user, for example, in a pant pocket. In some embodiments, when the device 201 is holsterable, the initiation of golf swing detection and stroke counting may comprise monitoring for and detecting a holstering event comprising the holstering of the device 201. In such embodiments, the device 201 uses holster-detection means to detect when the device 201 is in its holster as described more fully below.

[0047] When the device 201 is a flip-style device or slider-style device, the device user may have to close the device 201. In some embodiments, when the device 201 is a flip-style device or slider-style device, the initiation of golf swing detection and stroke counting may comprise monitoring for and detecting when the device 201 has been closed. It will be appreciated that some devices may be capable of closing and holstering, in which case the initiation of golf swing detection and stroke counting may comprise monitoring for and detecting when the device is closed and holstered. While the term holster has been used, it will be appreciated that the teachings of the present disclosure can be applied to any carrying case or other enclosure for protecting and/or carrying the device 201.

[0048] If the device user unholsters a holsterable device or opens a flip-style device or slider-style device during the operations 500, for example to answer an incoming call in the middle of a game, the operations 500 are typically paused or suspended so that the user can utilize other functions of the device 201 such as, for example, a phone application to answer the incoming call. The operations 500 may be resumed by again holstering the device 201 or closing the device 201. Corresponding input may be used to cancel the operations 500 at any time.

[0049] The holster-detection means may be implemented using any one or more of a number of different mechanisms. In some embodiments, the holster-detection means may comprise a mechanical sensor such as a depressible button on the surface of the device 201 which is adapted to depress only when the device 201 is held within a specifically-shaped holster. In other embodiments, the holster-detection means may comprise an electrical sensor such as an electrical contact on the surface of the device 201 which is adapted to close an electrical circuit when in contact with another electrical contact on the interior of a specially-designed holster. In other embodiments, the holster-detection means may comprise a magnetically-sensitive sensor as part of the device 201 which is adapted to detect the proximity of a magnet built into a specially-designed holster. Further details of an example implementation of holster-proximity detection means can be found in commonly owned U.S. Patent Application Pub. No. 2008/0191892 A1, published August 14, 2008, which is incorporated herein by reference.

[0050] A closure-detection means for monitoring for and detecting the closing of a flip-style device or slider-style device could be similar to the holster-detection means described above. A notable difference of the closure-detection means is that, rather than one of the sensors in the sensor pair being located in the device 201 and the other in the holster, one sensor is in each of the two body parts of flip-style devices, and one sensor is in each of the main body and slider body (e.g., sliding keyboard) of slider-style devices.

[0051] Next, in step 502 the golf swing detection module 226 monitors for and detects golf swings. This step comprises monitoring the output of the three-axis accelerometer 310 and detecting an output signal indicating a golf swing. In some embodiments, the accelerometer 310 reports three voltage signals corresponding to the acceleration detected along each sensing axis to the golf swing detection module 226. The output signals of the accelerometer 310 are then compared to reference accelerometer output signals ("reference signals) for each sensing axis which are characteristic of the accelerometer response to a golf swing, i.e., the motion of swinging of a golf club. If the output signals are within a predetermined variance of the reference signals, the golf swing detection module 226 detects a golf swing. The predetermined variance may comprise one or more predetermined parameters describing features of golf swing output signals. The comparison of the acceleration measurements of the accelerometer 310 to the reference signals is a matter of digital signal processing which would be understood a person skilled in the art.

[0052] In other embodiments, the accelerometer 310 reports a single multiplexed signal corresponding to the acceleration detected along each sensing axis. The multiplexing may be performed by the accelerometer 310 or the processor 240 in accordance with the instructions of the operating system 223 or golf swing detection module 226. The output signal is then compared to a single reference signal which is characteristic of the accelerometer response to a golf swing. If the output signal is within a predetermined variance of the reference signal, the golf swing detection module 226 detects a golf swing. The predetermined variance may comprise one or more predetermined parameters describing features of a golf swing output signal.

[0053] In yet other embodiments, the accelerometer 310 under the instruction of its onboard software monitors for and detects golf swings in the same or a similar manner as described above, and sends a corresponding interrupt signal

to the processor 240 via a corresponding interrupt port or interface. The receipt of this interrupt signal by the processor 240 is interpreted by the golf swing detection module 226 or operating system 223 as the detection of a golf swing. The golf swing detection module 226 may monitor for and detect a golf swing detection interrupt signal, raw output signal(s) from the accelerometer 310, or both.

[0054] The reference signal(s) may be predefined based on an average accelerometer response calculated from a large sample set of accelerometer responses to golf swings of a number of golfers. The golfers used to obtain the sample accelerometer responses may vary in skill in order to capture a wide range of accelerometer responses. Alternatively, in some embodiments the reference signals to be used in swing detection could be selected from a number of reference signal(s) based on the device user's: (i) skill level (e.g. beginner, intermediate, advanced, expert, etc.), (ii) physiological characteristics such as body weight, height and/or body shape, (iii) swing style, (iv) swing problems such as a tendency to slice or hook the ball, (v) location of the device 201 in relation to the device user's person during play (e.g., clipped near hip on/away from swinging side, near shoulder on/away from swinging side, in pocket on/away from swinging side) or any combination thereof.

[0055] The selection of reference signal(s) based on one or more of the above factors may improve the accuracy of golf swing detection. The reference signal(s) could be selected automatically by the golf swing detection module 226 based on values for one or more of the above factors which may provided and stored in memory 224, for example, during an initial configuration or setup of the golf scoring application 228. Alternatively, the reference signal(s) could be selected directly by the device user. In some embodiments, the values for one or more of the above factors and/or the reference signal(s) may be changed in-game during play, for example, to improve the accuracy of golf swing detection if errors are noted by the device user. In other embodiments, the reference signal(s) may be calibrated for each device user by measuring the acceleration detected by the accelerometer 310 over a number of golf swings (for example, using the average of these readings). To further increase accuracy, the device user may be required to perform a wide range of swing types and/or use a number of different clubs in order to capture a wide range of accelerometer responses which reflect the range of accelerometer responses which may be encountered during game play.

[0056] In some embodiments, the reference signal(s) could be dynamically selected from many predefined reference signal(s) based on club selection and/or distance of the pin of the hole being played. The club selection could be based on (a) defaults in accordance with the distance to the pin of the current hole being played determined based the GPS subsystem and GPS hole information, (b) rules set by the device user in accordance with the determined distance, or (c) club input during play, or any combination thereof.

[0057] When the reference signal(s) is based on the device 201 being located at or near a reference body part, the device 201 should be located at or on near the specified reference body part while swinging to increase the accuracy of golf swing detection. In some embodiments, the provision of reference signal(s) based on the location of the device 201 in relation to the device user's person during play allows the device user to customize the reference signal(s) used in golf swing detection based on user preferences for personal comfort and/or convenience regarding where the device 201 will be located during play.

[0058] Next, in step 504 the golf swing detection module 226 determines the current location of the device 201 in accordance with location information provided by the GPS subsystem 260. Alternatively, rather than using the GPS subsystem 260, device location may be determined using triangulation based on the distance of the device 201 to the various base stations 108 in the wireless network 101. While operable, triangulation-based device location may not be capable of determining device location with sufficient specificity required by the golf scoring application 228 in some circumstances. A specialized Location Based Service (LBS) solution such as Wi-Fi Positioning System (WPS), or Near LBS (NLBS) employing short-range technologies such as Bluetooth™, WLAN, infrared and/or RFID could be used to determine device location in other embodiments.

[0059] Next, in step 506 the golf swing and device location where the swing was taken are stored in memory 244, for example, in a golf swing log maintained by the golf scoring application 228. As noted above, device location information may be reported in terms of GPS coordinates, a distance to the pin of the respective hole (typically identified by its corresponding hole number) and optionally a direction (e.g., a cardinal direction) to the pin of the hole being played.

[0060] Next, in step 508 the golf swing detection module 226 determines whether a golf swing was previously detected at the same location or within a predetermined distance of the device location identified in step 504 (e.g., within 10 feet or less, within 5 feet or less, etc.). The predetermined distance may be configurable in some embodiments. This step involves comparing the device location determined in step 504 with the location of the previous golf swing specified in the golf swing log.

[0061] If the detected golf swing is determined to have occurred at the same location or within a predetermined distance of the previous golf swing, the stroke count is not incremented and the value of the stroke counter remains unchanged. The processing of the operations 500 then returns to step 502 where the golf swing detection module 226 monitors for and detects golf swings.

[0062] If the detected golf swing is not determined to have occurred at the same location or within a predetermined distance of the previous golf swing, the value of the stroke counter is incremented by one (step 510).

[0063] The approach described above accommodates circumstances in which the player swings his or her club multiple times at the same location, i.e. because the player takes one or more practice swings or takes a mulligan, by eliminating multiple swings taken at the same location. In this manner, a more accurate stroke count and score can be determined. In some embodiments, the golf scoring application 228 may provide a setting to enable and disable multiple swing correction. When multiple swing correction is disabled, steps 504 to 508 would be bypassed and the stroke counter would be incremented for each golf swing detected in step 502. Alternatively, multiple swing correction may be entirely omitted in some embodiments.

[0064] Next, in step 512 the new stroke count is displayed in a corresponding user interface screen on the display screen 204. In some embodiments, the user interface screen could display the current hole. The total stroke count/score could be displayed with the stroke count and current hole number, or instead of the current hole number. FIG. 4A and 4B illustrate two example user interface screens of a stroke count which could be displayed on the display screen 204, possibly as a window within a larger user interface screen of the golf scoring application 228.

[0065] The current hole is determined based on the value of a hole counter ("hole count") which is incremented when the current hole changes. When a game is started, the hole counter is set to an initial value which corresponds to the number of the starting hole. The starting value may be 1 or 10 to accommodate the start of play at either the front or back 9-holes of a golf course, but could also be a different number to accommodate an irregular starting hole sometimes referred to as a "shotgun start". In some embodiments, the hole counter has a maximum hole number which may be 9, 18, 27, 36 of other multiple of 9. In some embodiments, the hole counter counts in a repeating or cyclical fashion in which the counting restarts and the hole counter is reset to 1 when the maximum hole number is exceeded. This accommodates players starting on the back 9-holes, irregular starts, and players who play more than 18 holes or other number of holes which exceed the maximum hole number 9. The starting value and maximum of the hole counter may be set by the device user.

[0066] In some embodiments, after incrementing the stroke counter and prior to incrementing the hole counter, the value of the stroke counter for each hole ("stroke count") and the value of the hole counter ("hole count") are stored in the memory 244 of the device 201, for example, in a golf stroke log or scoring table. This step is only performed in embodiments in which the stroke count for each hole is recorded, for example, for use in calculating a game score.

[0067] Within the user interface screen displayed on the display screen 204, the golf scoring application 228 may provide the distance to the pin of the current hole and optionally a direction (e.g., a cardinal direction) to the pin of the current hole in accordance with the GPS coordinates provided by the GPS subsystem 260 or other location information. The GPS coordinates could be displayed in addition to the distance and the direction to the pin. In some embodiments, a map of the current hole with an indication (e.g., pointer or marker) of the device location relative to the pin could be generated by a mapping module of the golf scoring application 228, or by a separate mapping application which provides the map information to the golf scoring application 228. In some embodiments, wind direction may for the device location be obtained via a wireless communication link from a weather database accessible via the wireless network 101 and displayed in the user interface screen.

[0068] In some embodiments, the stroke count for other players may be added via corresponding input and the score for the other players may be determined by the golf scoring application 228. In other embodiments, the stroke count for other players may be determined by the golf swing detection module 226 using corresponding input to select the next player or a specific player in a player list. The corresponding input for switching between players for golf swing detection could be a specialized key or button of the device 201, a predetermined key combination of a keyboard of the device 201, or the selecting of a corresponding user interface element which could be already displayed in the user interface screen or which may be provided in an invokable menu.

[0069] For example, pressing "n" or other key or button could select the next player in the player list, and pressing "p" or other key or button for the previous player in the player list. A specific player in the list could be selected by pressing a corresponding number associated with the player's order in the player list, e.g., press 1 for player 1, press 2 for player 2, press 3 of player 3, 4 for player 4, etc.

[0070] In an example use case, the device user could remove the device 201 from his or her person and provide the corresponding input to switch swing detection to the next player. When a scoring table is displayed on the display screen 204 during play, this may further comprise moving an onscreen position indicator (cursor) to the stroke count field for the next player. The next player then places the device 201 on his or her person and takes a swing and operations 500 proceed as outlined above. This process can be repeated for each player in the player list. The reference signal(s) used for swing detection may be different between players, and may be selected for each player as described above.

[0071] Next, in step 514 the golf scoring application 228 calculates a score for the device user and possibly other players in accordance with the value of the stroke counter for each hole, for example, from the stroke log stored in memory 244. The score is then displayed on the display screen 204. The scores may be displayed within a scoring table on the display screen 204. The format of golf scoring tables is known in the art and will not be described in detail herein. An example of an empty scoring table for a 9-hole golf course is shown below for the purpose of explanation and is not intended to be limiting.

Hole	1	2	3	4	5	6	7	8	9	OUT
DISTANCE	489	300	320	180	362	450	416	357	171	3045
Player 1										
Player 2										
Player 3										
Player 4										
HANDICAP	2	3	7	9	6	1	4	5	8	-

[0072] The golf scoring table comprises a number of fields arranged in a series of rows and columns. Some of the columns represent the holes of the golf course being played and are labelled by the respective hole numbers 1 through. Some of the rows represent players, labelled "Player 1", "Player 2", "Player 3" and "Player 4" in the example table (the player list). For a player row, each field in a hole column is stroke count field which represents the stroke count for the respective player for the respective hole. The stroke count fields are navigable and editable in at least some embodiments.

[0073] The golf scoring application 228 calculates a score in accordance with the value of the stroke counter for each hole, and displays the score in the user interface screen displayed on the display screen 204. When a scoring table is displayed, the score is displayed in the "OUT" column or other "Total" column along with each the stroke counts for each hole. In other embodiments, the score could be displayed with the stroke count for the current hole as shown in FIG. 4B. Depending whether other player's stroke are input or detected, the stroke counts for each hole and total score may be calculated for the device user and possibly other players. The game score for each player is calculated by adding the strokes for each hole, possibly in accordance with a set of scoring rules such as a maximum stroke count per hole and/or a player handicap.

[0074] Depending on the embodiment, the stroke count and/or score may be edited to correct any errors or otherwise adjust the stroke count and/or score, for example, to take into account practice swings or a mulligan which were not caught by the multiple swing correction technique described above.

In some embodiments, when value of the stroke counter is editable, an edit mode may be invoked by: monitoring for and detecting input to edit the value of the stroke counter; updating the value of the stroke counter in response to input to edit the value of the stroke counter and receipt of a replacement value for the stroke counter; and re-displaying the value of the stroke counter in the user interface screen displayed on the display screen in accordance with the replacement value.

[0075] When a scoring table is displayed, an onscreen cursor may be provided within the navigable and editable fields of the scoring table. Typically, the onscreen cursor is positioned in the stroke count field of the scoring table which corresponds to the current hole for the device user, or possibly other player. The onscreen cursor may be navigated between stroke count fields in accordance with corresponding directional input, for example via directional/navigational buttons or keys or a navigation tool. Corresponding interaction with the device 201 may allow the currently selected stroke count field to become editable. The stroke count and/or score may then be changed by inputting the corrected value, for example, using the number keys of the keyboard of the device or corresponding numerical selection input via an onscreen user interface element such as a drop down list.

[0076] In some embodiments, the stroke count for each hole and/or score for the device user and possibly other players may be sent via a wireless communication link to a scoring database accessible via the wireless network 101. The wireless communication link may comprise the communications subsystem 211, the short-range wireless communication subsystem 272, or both. The scoring database may be maintained by a golf club/golf course or other entity for use in determining handicaps of its members, membership privileges in terms of performance or frequency of play, or other purposes.

[0077] Next, in step 516 the golf scoring application 228 determines when the current hole being played changes, i.e. when a hole has been finished by the players. This may involve the golf scoring application 228 monitoring for and detecting an event which indicates that the current hole has changed. This event may be (i) corresponding input such as the depression of a corresponding button or key of the device 201, or other interaction with the user interface, or (ii) a corresponding change in device location. The corresponding change in device location may be that the device 201 is within a predetermined distance of the tee (also referred to as the teeing ground or tee box) of the next hole and/or a predetermined distance from the pin of the previous hole in accordance with GPS coordinates describing the device location and GPS coordinates describing hole locations for the golf course (i.e., GPS coordinates about the respective holes). The predetermined distance of the tee may be based on the distance of the device 201 to a predetermined set of tee blocks, from the device 201 to the nearest edge of the tee, or from the device 201 to the centre of the teeing

ground. The next hole may be determined based on the settings of the hole counter and/or hole information for the golf course.

[0078] The predetermined distances and whether the predetermined distance from the pin of the previous is considered may be configurable in order to reduce errors when determining hole changes. Errors may result from the device user moving too close to the next tee when searching for an errant ball. Generally, the smaller the predetermined distance from the tee of the next hole, the fewer the number of errors when determining hole changes. The predetermined distances should be set to minimize errors.

[0079] When current hole has changed and there is at least one hole remaining to be played, the operations proceed to step 518 in which the hole counter is incremented or otherwise advanced to the next hole, and the stroke counter is reset. The user interface is then updated to reflect the new hole number and the reset value of the stroke counter. In some embodiments, when the stroke count for each hole is recorded, the current hole number, the stroke count of the current hole and the total number of strokes/score are displayed as shown, for example, in FIG. 4B. When a scoring table is displayed on the display screen 204, incrementing the hole counter may comprise moving an onscreen position indicator (cursor) to the field in the scoring table which corresponds to the next hole. Next, the operations look back to step 502 and the operations 500 repeated for the next hole.

[0080] When current hole has changed and there is no hole remaining to be played, the game is finished and the operations 500 end.

[0081] Tracking of the current hole based on the device location and the location of the respective holes may be used by the golf scoring application 228 to fully automate scoring. In some embodiments, the device user could play the entire game without interacting with the device 201 if desired, although any swing detection errors would not be detected by the device user. In other embodiments, the current hole is not tracked and the stroke counter is not reset automatically when the current hole being played is determined to have changed. In such embodiments, steps 514 and 516 are omitted and the stroke counter may be reset in response to corresponding input such as the depression of a corresponding button or key of the device 201, or other interaction with the user interface.

[0082] It will be appreciated that when the device 201 is holstered and/or closed, for example because the user is taking a swing, the stroke count and/or score information displayed in the user interface on the display screen 204 will not be visible to the device user. In such cases, the device user must unholster and/or open the device 201 to view the displayed information. In embodiments in which golf scoring is automated, the device user need not view the display screen 204 until the end of play. However, the device user may view his or her stroke count and/or score at any time, for example, to review and edit his or her stroke count and/or score if necessary, to add the stroke count for other players, or both.

[0083] In some embodiments, when the golf scoring application 228 is the active application, countdown timers and other triggers for locking the device 201 are disabled, particularly those related to the holstering and/or closing of the device 201, so that the device user can holster and/or close his or her device 201 during play for swing detection, and then remove the device 201 at any time to review and/or edit stroke count and/or score information.

[0084] While a three-axis accelerometer has been described in the foregoing description, an accelerometer having fewer sensing axes could be used in other embodiments.

[0085] While the operations 500 have been described as occurring in a particular order, it will be appreciated to persons skilled in the art that some of the steps may be performed in a different order provided that the result of the changed order of any given step will not prevent or impair the occurrence of subsequent steps. For example, while the calculate of the score has been shown as occurring after the stroke counter is incremented, the score may be (re)calculated and (re)displayed after each stroke is detected, after a stroke count is added or corrected, at the end of the game, after each 9-holes, or at another interval which may be set by the device user. Furthermore, some of the steps described above may be combined in other embodiments, and some of the steps described above may be separated into a number of sub-steps in other embodiments.

Example Wireless Communication System

[0086] In order to facilitate an understanding of one possible environment in which example embodiments described herein can operate, reference is made to FIG. 1 which shows in block diagram form a communication system 100 in which example embodiments of the present disclosure can be applied. The communication system 100 comprises a number of mobile communication devices 201 which may be connected to the remainder of system 100 in any of several different ways. Accordingly, several instances of mobile communication devices 201 are depicted in FIG. 1 employing different example ways of connecting to system 100. Mobile communication devices 201 are connected to a wireless network 101 which may comprise one or more of a Wireless Wide Area Network (WWAN) 201 and a Wireless Local Area Network (WLAN) 104 or other suitable network arrangements. In some embodiments, the mobile communication devices 201 are configured to communicate over both the WWAN 201 and WLAN 104, and to roam between these networks. In some embodiments, the wireless network 101 may comprise multiple WWANs 201 and WLANs 104.

[0087] The WWAN 201 may be implemented as any suitable wireless access network technology. By way of example, but not limitation, the WWAN 201 may be implemented as a wireless network that includes a number of transceiver base stations 108 (one of which is shown in FIG. 1) where each of the base stations 108 provides wireless Radio Frequency (RF) coverage to a corresponding area or cell. The WWAN 201 is typically operated by a mobile network service provider that provides subscription packages to users of the mobile communication devices 201. In some embodiments, the WWAN 201 conforms to one or more of the following wireless network types: Mobitex Radio Network, DataTAC, GSM (Global System for Mobile Communication), GPRS (General Packet Radio System), TDMA (Time Division Multiple Access), CDMA (Code Division Multiple Access), CDPD (Cellular Digital Packet Data), iDEN (integrated Digital Enhanced Network), EvDO (Evolution-Data Optimized) CDMA2000, EDGE (Enhanced Data rates for GSM Evolution), UMTS (Universal Mobile Telecommunication Systems), HSPDA (High-Speed Downlink Packet Access), IEEE 802.16e (also referred to as Worldwide Interoperability for Microwave Access or "WiMAX), or various other networks. Although WWAN 201 is described as a "Wide-Area" network, that term is intended herein also to incorporate wireless Metropolitan Area Networks (WMAN) and other similar technologies for providing coordinated service wirelessly over an area larger than that covered by typical WLANs.

[0088] The WWAN 201 may further comprise a wireless network gateway 110 which connects the mobile communication devices 201 to transport facilities 112, and through the transport facilities 112 to a wireless connector system 120. Transport facilities may include one or more private networks or lines, the public Internet, a virtual private network, or any other suitable network. The wireless connector system 120 may be operated, for example, by an organization or enterprise such as a corporation, university, or governmental department, which allows access to a network 124 such as an internal or enterprise network and its resources, or the wireless connector system 120 may be operated by a mobile network provider. In some embodiments, the network 124 may be realised using the Internet rather than an internal or enterprise network.

[0089] The wireless network gateway 110 provides an interface between the wireless connector system 120 and the WWAN 201, which facilitates communication between the mobile communication devices 201 and other devices (not shown) connected, directly or indirectly, to the WWAN 201. Accordingly, communications sent via the mobile communication devices 201 are transported via the WWAN 201 and the wireless network gateway 110 through transport facilities 112 to the wireless connector system 120. Communications sent from the wireless connector system 120 are received by the wireless network gateway 110 and transported via the WWAN 201 to the mobile communication devices 201.

[0090] The WLAN 104 comprises a wireless network which, in some embodiments, conforms to IEEE 802.11x standards (sometimes referred to as Wi-Fi) such as, for example, the IEEE 802.11a, 802.11b and/or 802.11g standard. Other communication protocols may be used for the WLAN 104 in other embodiments such as, for example, IEEE 802.11n, IEEE 802.16e (also referred to as Worldwide Interoperability for Microwave Access or "WiMAX"), or IEEE 802.20 (also referred to as Mobile Wireless Broadband Access). The WLAN 104 includes one or more wireless RF Access Points (AP) 114 (one of which is shown in FIG. 1) that collectively provide a WLAN coverage area.

[0091] The WLAN 104 comprises a wireless network which, in some embodiments, conforms to IEEE 802.11x standards (sometimes referred to as Wi-Fi) such as, for example, the IEEE 802.11a, 802.11b and/or 802.11g standard. Other communication protocols may be used for the WLAN 104 in other embodiments such as, for example, IEEE 802.11n, IEEE 802.16e (also referred to as Worldwide Interoperability for Microwave Access or "WiMAX"), or IEEE 802.20 (also referred to as Mobile Wireless Broadband Access). The WLAN 104 includes one or more wireless RF Access Points (AP) 114 (one of which is shown in FIG. 1) that collectively provide a WLAN coverage area.

[0092] The WLAN 104 may be a personal network of the user, an enterprise network, or a hotspot offered by an Internet service provider (ISP), a mobile network provider, or a property owner in a public or semi-public area, for example. The access points 114 are connected to an access point (AP) interface 116 which may connect to the wireless connector system 120 directly (for example, if the access point 114 is part of an enterprise WLAN 104 in which the wireless connector system 120 resides), or indirectly as indicated by the dashed line if FIG. 1 via the transport facilities 112 if the access point 14 is a personal Wi-Fi network or Wi-Fi hotspot (in which case a mechanism for securely connecting to the wireless connector system 120, such as a virtual private network (VPN), may be required). The AP interface 116 provides translation and routing services between the access points 114 and the wireless connector system 120 to facilitate communication, directly or indirectly, with the wireless connector system 120.

[0093] The wireless connector system 120 may be implemented as one or more servers, and is typically located behind a firewall 113. The wireless connector system 120 manages communications, including email communications, to and from a set of managed mobile communication devices 201. The wireless connector system 120 also provides administrative control and management capabilities over users and mobile communication devices 201 which may connect to the wireless connector system 120.

[0094] The wireless connector system 120 allows the mobile communication devices 201 to access the network 124 and connected resources and services such as a messaging server 132 (for example, a Microsoft Exchange™, IBM Lotus Domino™, or Novell GroupWise™ email server), and a content server 134 for providing content such as Internet content or content from an organization's internal servers, and application servers 136 for implementing server-based

applications such as instant messaging (IM) applications to mobile communication devices 201.

[0095] The wireless connector system 120 typically provides a secure exchange of data (e.g., email messages, personal information manager (PIM) data, and IM data) with the mobile communication devices 201. In some embodiments, communications between the wireless connector system 120 and the mobile communication devices 201 are encrypted. In some embodiments, communications are encrypted using a symmetric encryption key implemented using Advanced Encryption Standard (AES) or Triple Data Encryption Standard (Triple DES) encryption. Private encryption keys are generated in a secure, two-way authenticated environment and are used for both encryption and decryption of data. In some embodiments, the private encryption key is stored only in the user's mailbox on the messaging server 132 and on the mobile communication device 201, and can typically be regenerated by the user on mobile communication devices 201. Data sent to the mobile communication devices 201 is encrypted by the wireless connector system 120 using the private encryption key retrieved from the user's mailbox. The encrypted data, when received on the mobile communication devices 201, is decrypted using the private encryption key stored in memory. Similarly, data sent to the wireless connector system 120 from the mobile communication devices 201 is encrypted using the private encryption key stored in the memory of the mobile communication device 201. The encrypted data, when received on the wireless connector system 120, is decrypted using the private encryption key retrieved from the user's mailbox.

[0096] The wireless network gateway 110 is adapted to send data packets received from the mobile communication device 201 over the WWAN 201 to the wireless connector system 120. The wireless connector system 120 then sends the data packets to the appropriate connection point such as the messaging server 132, content server 134 or application servers 136. Conversely, the wireless connector system 120 sends data packets received, for example, from the messaging server 132, content server 134 or application servers 136 to the wireless network gateway 110 which then transmit the data packets to the destination mobile communication device 201. The AP interfaces 116 of the WLAN 104 provide similar sending functions between the mobile communication device 201, the wireless connector system 120 and network connection point such as the messaging server 132, content server 134 and application server 136.

[0097] The network 124 may comprise a private local area network, metropolitan area network, wide area network, the public Internet or combinations thereof and may include virtual networks constructed using any of these, alone, or in combination.

[0098] A mobile communication device 201 may alternatively connect to the wireless connector system 120 using a computer 117, such as desktop or notebook computer, via the network 124. A link 106 may be provided for exchanging information between the mobile communication device 201 and computer 117 connected to the wireless connector system 120. The link 106 may comprise one or both of a physical interface and short-range wireless communication interface. The physical interface may comprise one or combinations of an Ethernet connection, Universal Serial Bus (USB) connection, Firewire™ (also known as an IEEE 1394 interface) connection, or other serial data connection, via respective ports or interfaces of the mobile communication device 201 and computer 117. The short-range wireless communication interface may be a personal area network (PAN) interface. A personal area network is a wireless point-to-point connection meaning no physical cables are required to connect the two end points. The short-range wireless communication interface may comprise one or a combination of an infrared (IR) connection such as an Infrared Data Association (IrDA) connection, a short-range radio frequency (RF) connection such as one specified by IEEE 802.15.1 or the Bluetooth™ special interest group, or IEEE 802.15.3a, also referred to as UltraWideband (UWB), or other PAN connection.

[0099] It will be appreciated that the above-described communication system is provided for the purpose of illustration only, and that the above-described communication system comprises one possible communication network configuration of a multitude of possible configurations for use with the mobile communication devices 201. The teachings of the present disclosure may be employed in connection with any other type of network and associated devices that are effective in implementing or facilitating wireless communication. Suitable variations of the communication system will be understood to a person of skill in the art and are intended to fall within the scope of the present disclosure.

[0100] While the present disclosure is primarily described in terms of methods, a person of ordinary skill in the art will understand that the present disclosure is also directed to various apparatus such as a handheld electronic device including components for performing at least some of the aspects and features of the described methods, be it by way of hardware components, software or any combination of the two, or in any other manner. Moreover, an article of manufacture for use with the apparatus, such as a pre-recorded storage device or other similar computer readable medium including program instructions recorded thereon, or a computer data signal carrying computer readable program instructions may direct an apparatus to facilitate the practice of the described methods. It is understood that such apparatus, articles of manufacture, and computer data signals also come within the scope of the present disclosure.

[0101] The term "computer readable medium" as used herein means any medium which can store instructions for use by or execution by a computer or other computing device including, but not limited to, a portable computer diskette, a hard disk drive (HDD), a random access memory (RAM), a read-only memory (ROM), an erasable programmable-read-only memory (EPROM) or flash memory, an optical disc such as a Compact Disc (CD), Digital Versatile Disc (DVD) or Blu-ray™ Disc, and a solid state storage device (e.g., NAND flash or synchronous dynamic RAM (SDRAM)).

[0102] The various embodiments presented above are merely examples and are in no way meant to limit the scope of this disclosure. Variations of the innovations described herein will be apparent to persons of ordinary skill in the art, such variations being within the intended scope of the present application. In particular, features from one or more of the above-described embodiments may be selected to create alternative embodiments comprised of a subcombination of features which may not be explicitly described above. In addition, features from one or more of the above-described embodiments may be selected and combined to create alternative embodiments comprised of a combination of features which may not be explicitly described above. Features suitable for such combinations and sub-combinations would be readily apparent to persons skilled in the art upon review of the present application as a whole. The subject matter described herein and in the recited claims intends to cover and embrace all suitable changes in technology.

Claims

1. A method for golf swing detection on a portable electronic device, comprising:

monitoring for and detecting golf swing gestures;
determining a location of the device;
incrementing a stroke counter when a golf swing gesture is detected and a previous golf swing gesture was not detected within a predetermined distance of the determined location; and
displaying the value of the stroke counter in a user interface screen displayed on a display screen of the device.

2. The method of claim 1, wherein golf swing gestures are monitored for and detected in accordance with acceleration measurements of an accelerometer.

3. The method of claim 2, wherein monitoring for and detecting golf swing gesture comprises comparing acceleration measurements of the accelerometer with one or more reference signals, wherein golf swing gestures are detected when the acceleration measurements are within a predetermined variance of the one or more reference signals.

4. The method of any one of claims 1 to 3, further comprising: storing detected golf swings based on the determined device location in a swing log in a memory of the device, and determining whether a previous golf swing gesture was detected within a predetermined distance of the determined device location by comparing the detected swing to the determined device location of detected golf swings in the swing log.

5. The method of any one of claims 1 to 4, wherein the value of the stroke counter is editable, the method further comprising: monitoring for and detecting input to edit the value of the stroke counter; updating the value of the stroke counter in response to input to edit the value of the stroke counter and receipt of a replacement value for the stroke counter; and re-displaying the value of the stroke counter in the user interface screen displayed on the display screen in accordance with the replacement value.

6. The method of claim 5, further comprising:

determining a direction to a pin of a current hole in accordance with GPS information describing the device location and GPS information describing hole location information, wherein the direction to the pin is displayed in the user interface screen displayed on the display screen.

7. The method of claim 5 or claim 6, further comprising:

generating a map of the current hole with an indication of the determined device location on the device in accordance GPS information describing the device location and GPS information describing hole location information, wherein the map is displayed in the user interface screen displayed on the display screen.

8. The method of any one of claims 1 to 7, wherein the stroke counter is reset in response to a determination that the current hole has changed.

9. The method of any one of claims 1 to 8, wherein the value of the stroke counter is displayed with an indication of a current hole in the user interface screen displayed on the display screen.

10. The method of claim 9, wherein the current hole is determined in accordance with the value of a hole counter,

wherein the hole counter is incremented in response to a determination that the current hole has changed.

11. The method of claim 10, wherein the determination that the current hole has changed is based on a corresponding input or a determination that the device is within a predetermined distance of the teeing ground of a next hole in accordance with a number of the current hole, global positioning system (GPS) information describing the device location and GPS information describing hole location information.

12. The method of any one of claims 9 to 11, further comprising:

after incrementing the stroke counter and prior to incrementing the hole counter, storing the value of the stroke counter for each hole ("stroke count") in association with the value of the hole counter ("hole count") in a scoring table in a memory of the device.

13. The method of claim 12, further comprising:

calculating a game score in accordance with the value of the stroke counter for each hole in the storing table; and displaying the game score in the user interface screen displayed on the display screen;
wherein the game score is calculated or recalculated when the stroke counter is incremented.

14. The method of any one of claims 1 to 13, further comprising: sending the stroke counts for each hole, game score, or stroke counts for each hole and game score to a remote database over a wireless communication link.

15. A portable electronic device, comprising:

a controller for controlling the operation of the device;
a memory connected to the controller;
a display screen connected to the controller;
the controller being configured for performing the method of any one of claims 1 to 14.

Amended claims in accordance with Rule 137(2) EPC.

1. A method for golf swing detection on a portable electronic device, comprising:

monitoring for and detecting golf swing gestures, including obtaining acceleration measurements and comparing the acceleration measurements with one or more reference signals, wherein golf swing gestures are detected when the acceleration measurements are within a predetermined variance of the one or more reference signals;
determining a location of the device;
storing detected golf swings based on the determined device location in a swing log in a memory of the device;
determining whether a previous golf swing gesture was detected within a predetermined distance of the determined device location by comparing the detected swing to the determined device location of detected golf swings in the swing log;
incrementing a stroke counter when a golf swing gesture is detected and a previous golf swing gesture was not detected within a predetermined distance of the determined location; and
displaying the value of the stroke counter in a user interface screen displayed on a display screen of the device.

2. The method of claim 1, wherein the value of the stroke counter is editable, the method further comprising: monitoring for and detecting input to edit the value of the stroke counter; updating the value of the stroke counter in response to input to edit the value of the stroke counter and receipt of a replacement value for the stroke counter; and re-displaying the value of the stroke counter in the user interface screen displayed on the display screen in accordance with the replacement value.

3. The method of claim 2, further comprising:

determining a direction to a pin of a current hole in accordance with GPS information describing the device location and GPS information describing hole location information, wherein the direction to the pin is displayed in the user interface screen displayed on the display screen.

4. The method of claim 2 or claim 3, further comprising:

generating a map of the current hole with an indication of the determined device location on the device in accordance GPS information describing the device location and GPS information describing hole location information, wherein the map is displayed in the user interface screen displayed on the display screen.

5. The method of any one of claims 1 to 4, wherein the stroke counter is reset in response to a determination that the current hole has changed.

6. The method of any one of claims 1 to 5, wherein the value of the stroke counter is displayed with an indication of a current hole in the user interface screen displayed on the display screen.

7. The method of claim 6, wherein the current hole is determined in accordance with the value of a hole counter, wherein the hole counter is incremented in response to a determination that the current hole has changed.

8. The method of claim 7, wherein the determination that the current hole has changed is based on a corresponding input or a determination that the device is within a predetermined distance of the teeing ground of a next hole in accordance with a number of the current hole, global positioning system (GPS) information describing the device location and GPS information describing hole location information.

9. The method of any one of claims 6 to 8, further comprising:

after incrementing the stroke counter and prior to incrementing the hole counter, storing the value of the stroke counter for each hole ("stroke count") in association with the value of the hole counter ("hole count") in a scoring table in a memory of the device.

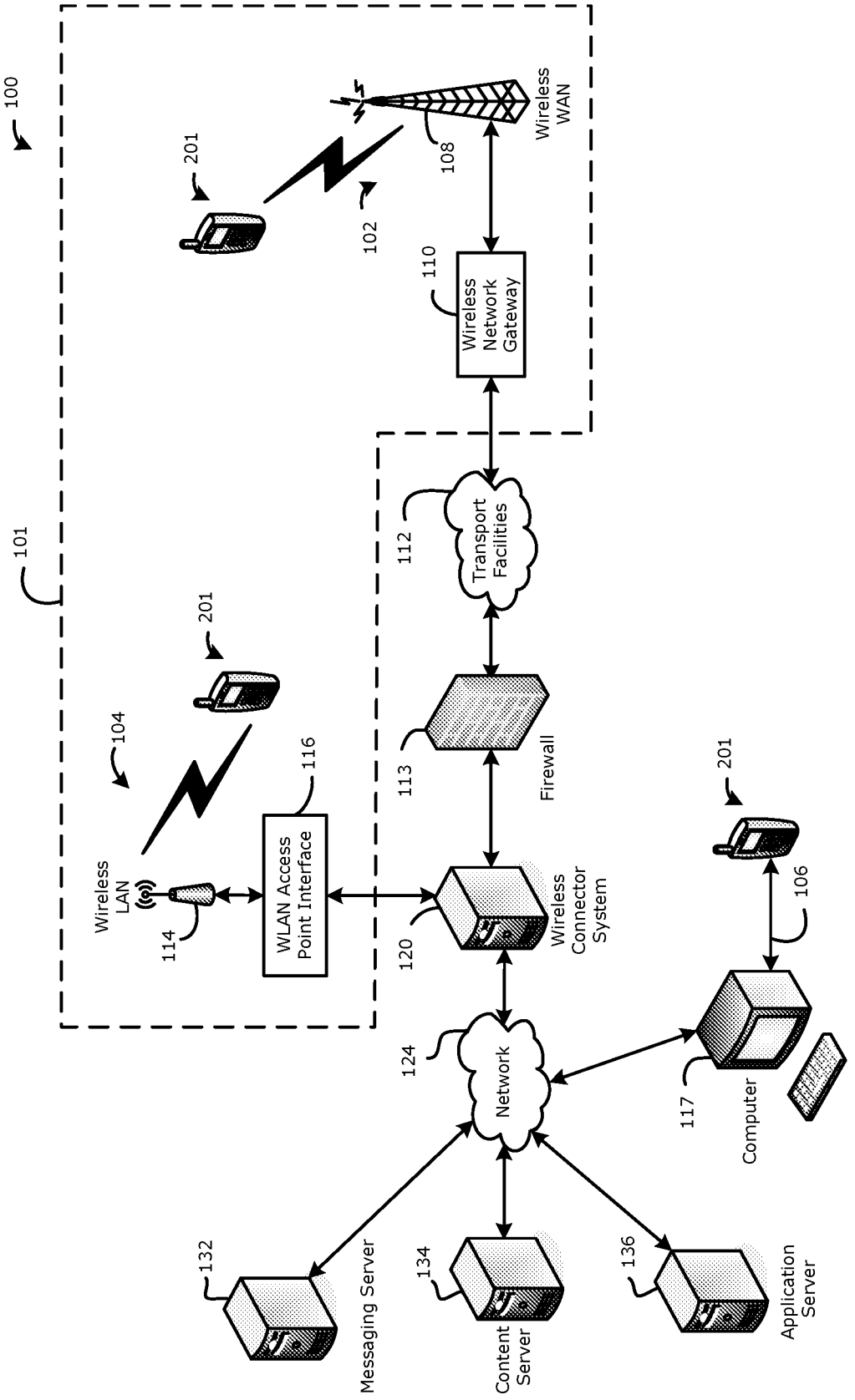
10. The method of claim 9, further comprising:

calculating a game score in accordance with the value of the stroke counter for each hole in the storing table; and displaying the game score in the user interface screen displayed on the display screen;
wherein the game score is calculated or recalculated when the stroke counter is incremented.

11. The method of any one of claims 1 to 10, further comprising: sending the stroke counts for each hole, game score, or stroke counts for each hole and game score to a remote database over a wireless communication link.

12. A portable electronic device, comprising:

a controller for controlling the operation of the device;
an accelerometer connected to the controller;
a memory connected to the controller;
a display screen connected to the controller;
the controller being configured for performing the method of any one of claims 1 to 11.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201
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112
Transport Facilities
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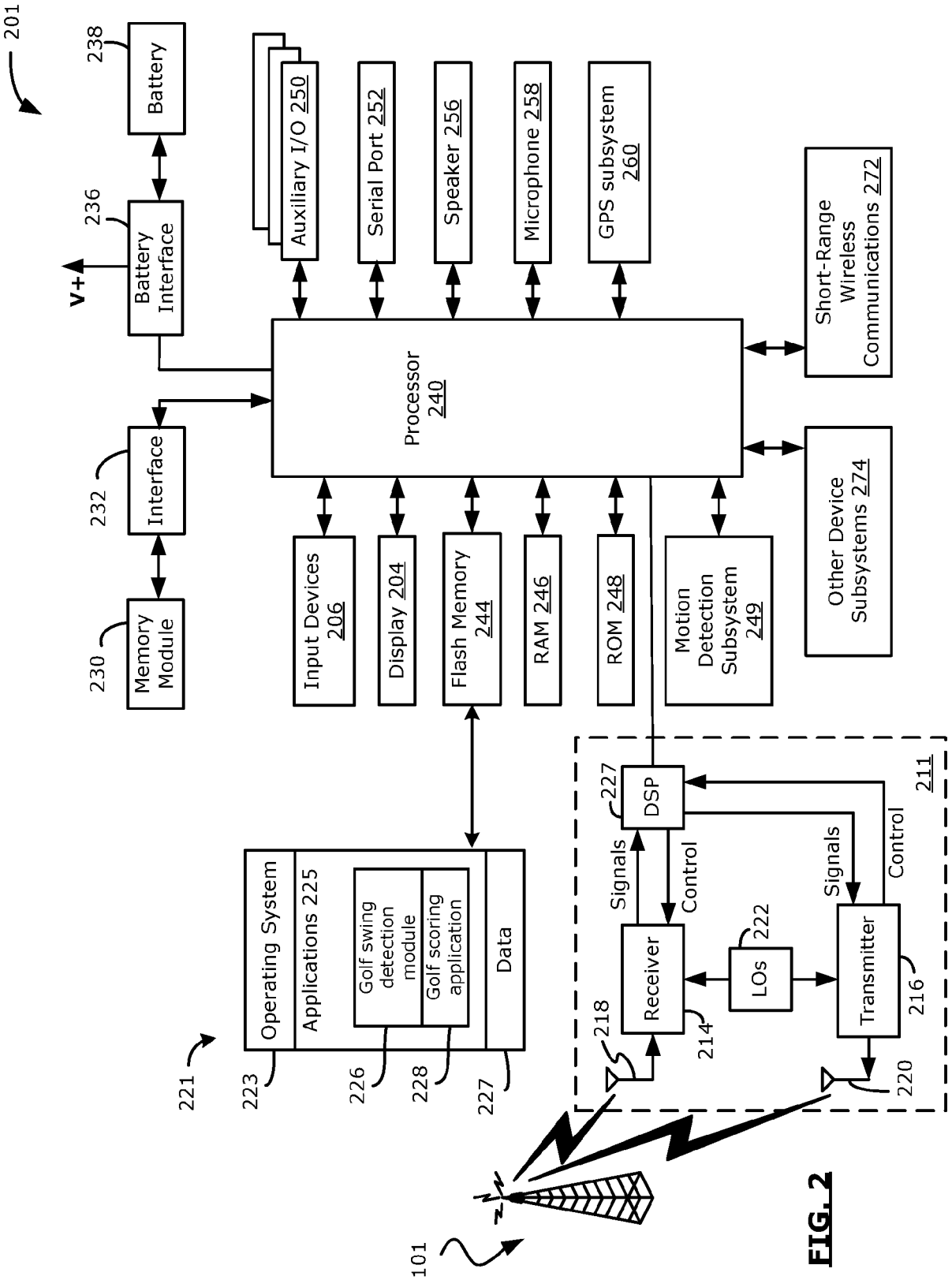
Firewall
104
Wireless LAN
114
116
WLAN Access Point Interface
120
Wireless Connector System
124
Network
106
117
Computer
132
Messaging Server
134
Content Server
136
Application Server

FIG. 1


201
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236
Battery Interface
V+
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Serial Port 252
Speaker 256
Microphone 258
GPS subsystem 260
Short-Range Wireless Communications 272
Processor 240
232
Interface
230
Memory Module
Input Devices 206
Display 204
Flash Memory 244
RAM 246
ROM 248
Motion Detection Subsystem 249
Other Device Subsystems 274
Operating System
Applications 225
Golf swing detection module
Golf scoring application
Data
221
223
226
228
227
211
227
DSP
Signals
Control
Signals
Control
218
Receiver
214
222
LOs
Transmitter
216
220
101

FIG. 2

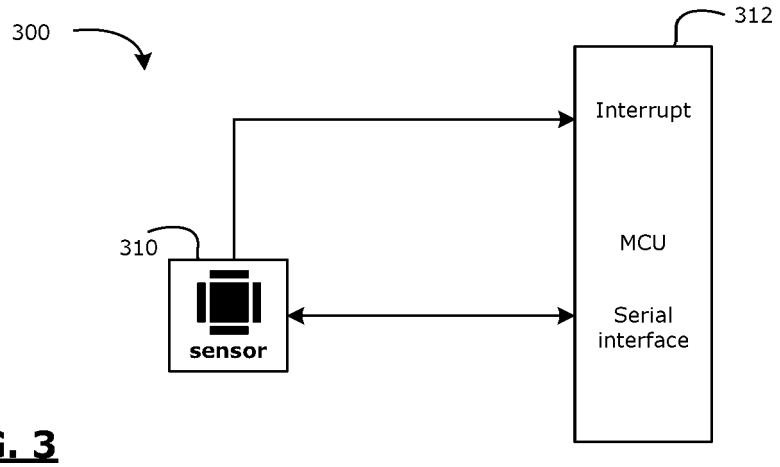

FIG. 3

Current Hole	Strokes
2	5

FIG. 4A

Current Hole	Strokes	Stroke Total
2	5	8

FIG. 4B

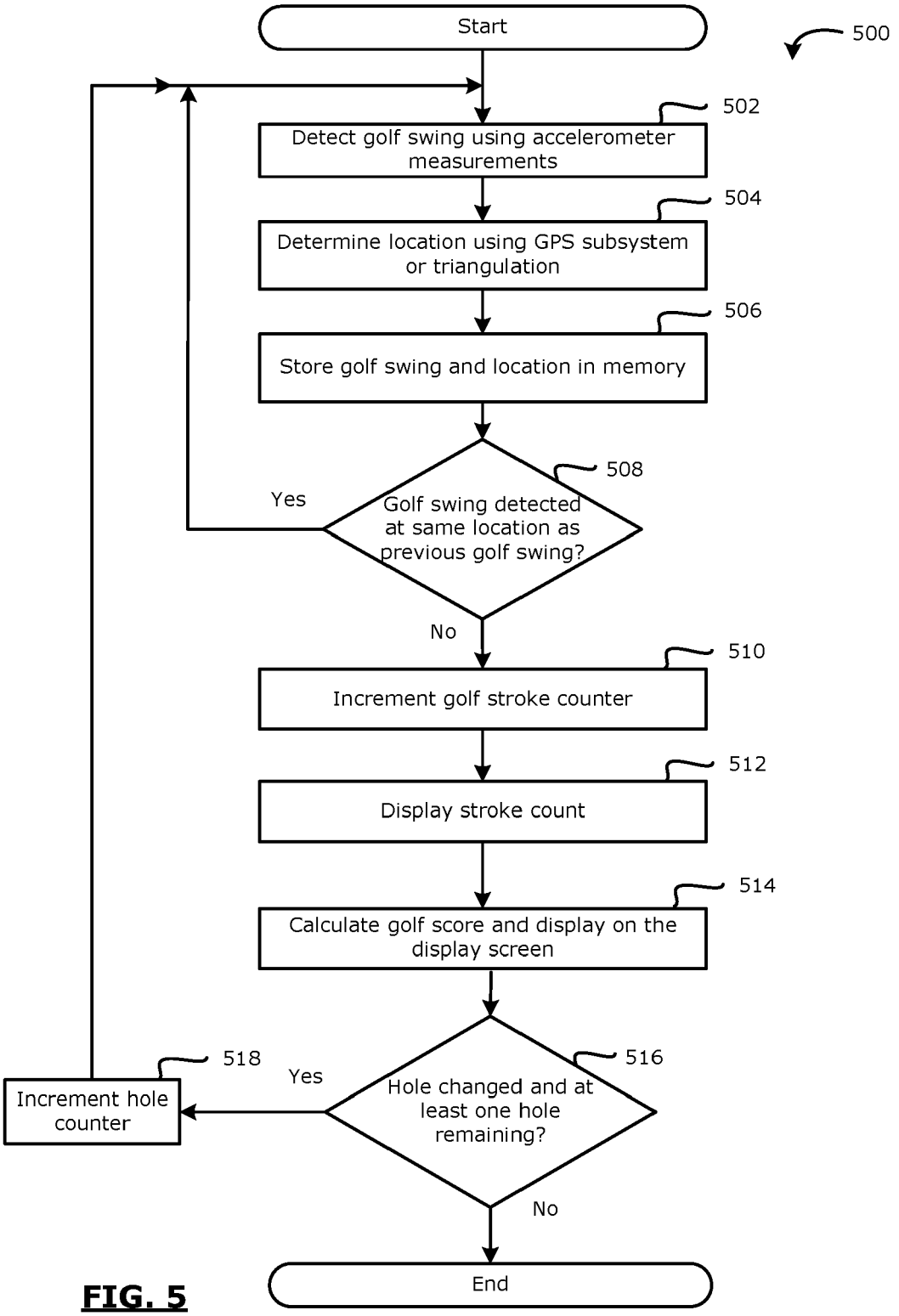
Start
500
502
Detect golf swing using accelerometer measurements
504
Determine location using GPS subsystem or triangulation
506
Store golf swing and location in memory
508
Golf swing detected at same location as previous golf swing?
Yes
No
510
Increment golf stroke counter
512
Display stroke count
514
Calculate golf score and display on the display screen
516
Hole changed and at least one hole remaining?
Yes
518
Increment hole counter
No
End

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 09 15 8509

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A	US 2006/178110 A1 (NURMINEN ET AL.) 10 August 2006 (2006-08-10) * paragraphs [0020] - [0073]; figures 1-5 *	1-15	
A	US 2004/073325 A1 (REEVES) 15 April 2004 (2004-04-15) * paragraphs [0020] - [0041]; figures 1-4 *	1-15	TECHNICAL FIELDS SEARCHED (IPC) A63B
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	18 September 2009	Williams, Mark

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