A caddy system and method of providing a shot recommendation to a golfer is disclosed wherein real-time shot information, including the current location of a golf ball on a golf course, as well as golf course information, are used to provide a recommended golf shot to the golfer. According to another aspect of the invention, a golfer's shot history is used, in addition to the current location of the golf ball and the golf course information, to provide a shot recommendation to the golfer. According to yet another aspect of the invention, a caddy system and method of providing real-time shot information are disclosed, wherein the real-time information may be displayed alone or in conjunction with certain information about a golf course being played, including the display of the golf ball location in relation to a digital course map.
FIG. 2

200
Obtain Course Map

210
Define Positions

220
Determine Conditional Areas and Flag as Conditional

230
Record Shot & Club Recommendations Per Handicap Per Course Position

240
Record Shot & Club Recommendations for Conditional Areas Per Handicap
FIG. 3

1. Obtain Real Time Ball Information
2. Retrieve Golf Course Information
3. Perform any Applicable Statistical Analyses on Information Using Golf Course Information if Needed
4. Display Real-Time Ball Information
5. Display Statistical Analyses
FIG. 4

400 Retrieve Golf Course Information

410 Display Digital Course Map

420 Retrieve Real-Time Ball Information Including Ball Location

430 Retrieve Applicable Ball Trajectory

440 Determine Initial and Current Ball Location Within Golf Course Map

450 Display Ball Position and/or Trajectory as an Overlay to Digital Course Map
FIG. 5

500 Obtain Golf Course Information

510 Obtain Ball Location Information

540 Is Ball at a Pin Location?

550 Set x=0

555 Obtain Ball Location Information

570 Has Ball Location Changed?

590 Yes

600 Set x=x+1

610 Is New Location a Cup Location?

630 Yes

640 Set Score = x and Store Score

650 Compare Score with Course Par Value

660 Calculate Handicap
FIG. 7

1. Obtain Golf Course Data
2. Obtain Golfer I.D. and Golfer Data
3. Handicap Known?
   - Yes: Store Handicap in Golfer Data
   - No: Manually Enter Handicap

4. Obtain Real-Time Ball Information Including Current Ball Location
5. Determine Putt Shot for Current Location
   - Display Shot Recommendation
6. Determine Golfers Longest Shot Distance & Club Type
VIRTUAL CADDY SYSTEM AND METHOD

FIELD OF THE INVENTION

[0001] The present invention is directed to a virtual caddy system and method, and more specifically to a system that uses real-time shot information, including the current location of a golf ball on a golf course, as well as golf course information, to provide a suggested golf shot or golf strategies to a user. Additionally, the system can display various real-time information to the user, including shot location relative to a golf course and shot trajectory.

BACKGROUND OF THE INVENTION

[0002] Various types of electronic scoring and caddy systems are presently known in the art. All suffer from various limitations that make them impractical or unduly limiting for use by golfers. Many of these systems do not provide any shot or strategy advice at all, and, at best, they provide generic shot advice that is not tailored to the individual user or the particular situation being faced. At best, some track only a golfer standing near a ball, rather than the ball itself. None of these systems provide suggested shot advice based on real-time ball information. Real-time information about a golf ball includes information that is obtained from a golf ball itself. Importantly, this information does not immediately need to be relayed, and can be stored in a memory for later use, and still be considered real-time information. Real-time information may include, for example, information such as the initial and final location of the ball, ball distance, ball speed, initial and average ball spin, maximum height, distance bouncing or rolling, launch angle, trajectory curvature and deflection from a straight line trajectory, etc. The prior art systems, and their limitations are described below.

[0003] Electronic Scorecard Systems

[0004] These type of systems are low priced and widely available. These systems are typically portable so that they can be carried around by golfers during play. They include a keypad or touch screen for data entry so that shot, club, distance and related information can be manually entered by the user for one or more golfers. Some electronic scorecard systems not only keep track of a player’s score during the game, they can calculate and provide various statistical information based on the data entered. Many also include a link so that they can be connected to a home computer. Data can then be analyzed after being downloaded to the computer. While some of these systems are capable of providing generic shot suggestions, these suggestions are independent of the ball location on a golf course being played and independent of a particular golfer’s shot history. Moreover, none of these systems are capable of independently monitoring ball location or other real-time shot information, other than through manual entry by the golfer.

[0005] One more advanced electronic scorecard system is the Lappgolf software, which can be used with Palm handheld devices. Using this system, a user enters his shot information (including type of stroke, chosen club, distance), either before or after each shot, and the system provides various caddy and advice functions. The system alleges to provide various summary statistics, statistics for each club and limited shot suggestions based on the user’s estimate of the distance to the hole. While the suggestions may be specific to various situations on the golf course, they are not specific to a particular user or a particular course and are more along the lines of proper foot position and grip for a particular type of shot.

[0006] Golf Performance Monitors

[0007] These systems include video based tracking systems, which are typically used for training at driving ranges and other golf centers, and radar or laser based systems, which can be used on a golf course. Video based systems generally record all aspects of a particular swing, and are used as a visual reference to correct a swing (such as noticing that an arm is bent, or that legs are unstable). More advanced video systems can automatically determine swing parameters, such as degree of swing and club-head speed. Being focused on the golfer, these video systems provide no information about an actual shot trajectory.

[0008] In contrast, radar based systems not only provide speed information on the golf swing (club-head speed), they can also provide various information on the actual golf shot itself and are used to determine ball velocity and estimated shot distance. These systems can be used to calculate and display information such as average distance per club and other shot characteristics broken down by club type. These systems are generally bulky and very expensive, and can be used only in fixed positions (e.g., at a driving range), rather than during regular play on a golf course. They also fail to provide actual ball trajectory information, and instead give only an estimated shot distance information based on the calculated parameters. These systems also require extensive interaction with the monitoring system so that the information is accurately captured and recorded.

[0009] Ball Location Systems

[0010] One type of ball location system is a laser finder within a pair of binoculars, such as the Bushnell laser rangefinder distance measuring equipment. By focusing the binoculars on the ball once it stops moving, the distance from the golfer to the ball (and thereby from the ball to the hole) can be determined. Such systems do not provide real-time location information as these systems cannot measure the distance to or track a moving ball, nor do they provide any real-time flight information on the ball itself. A larger scale version of this system is the ShotLink laser based system used by the PGA in partnership with IBM. ShotLink uses a series of gimbled laser ranging systems to determine the start and stop positions for each shot during tournament play. Distance and angle from a known, fixed measuring position where the laser is based allow a non-moving ball’s location to be accurately measured. This distance and angle information is then superimposed on a digital map of the course, giving a linear description of each shot. However, this system cannot track the trajectory of the ball, cannot collect real-time data, and is only useful for determining the distance and start/stop positions.

[0011] Another type of ball location system has been developed by a company called RadarGolf. Their system allows to use an embedded radio frequency identification tag in a golf ball. The custom-made and tagged balls would be used with a handheld tracking unit that could provide the user with relative distance information in order to locate a lost ball. The tracking unit allegedly emits a radar signal and then listens for the echo-like response from the electronic
tag in the ball. The handheld unit allegedly beeps when pointed at the ball, and beeps faster when the ball is close (beeping speed is related to received signal strength, which varies with distance). This system is useful only for golfers wanting to find lost balls, not those looking to obtain any real-time ball or location information. Also, the system does not discriminate between balls as balls are not uniquely identified and the system only has a maximum effective range of approximately ten meters.

[0012] Yet another type of ball location system is described in U.S. Patent Publication 2002/0091017 A1, the disclosure of which is incorporated herein by reference. This U.S. patent publication discloses a golf ball locator system including a golf ball having an electromagnetic signal transmitter, at least two electromagnetic signal receivers configured to receive the signal transmitted by the golf ball, and a processor coupled to the receivers to determine a location of the golf ball using triangulation calculations. Similarly, U.S. Patent Publication 2002/0098913 A1, the disclosure of which is also incorporated herein by reference, discloses a system for locating a golf ball including a signal generator, a microchip and an amplifier. The signal generator is connected to a portable computer on a golf cart and generates a first signal. The microchip is disposed in the golf ball and receives the first signal and generates a second signal in response thereto that is received by the base computer. The computer triangulates the location of the golf ball off the location of fixed objects on the course and generates a third signal in response thereto that is received by a portable computer which displays the location of the golf ball relative to the golf cart. While this type of system is capable of providing the resting ball location, it does not provide any real-time ball information.

[0013] Another system is disclosed in U.S. Pat. No. 5,626,531, the disclosure of which is incorporated herein by reference, which discloses a golf ball having a passive tag at a selected capacitance embedded therein so that the ball can be detected using an electronic detecting system. Similar, is the system disclosed in U.S. Pat. No. 3,782,730, the disclosure of which is incorporated herein by reference, which discloses an electronic golf ball which includes an embedded oscillator circuit, battery, and transmitting coil. A detector unit, which can be a radio receiver tuned to the oscillator circuit frequency, can receive and filter transmitted oscillation bursts to identify the location of golf balls. These types of systems, which operate much like a metal detector, require a user to be in close relation to the ball before any indication is given to the user. Again, much like the others, they provide no real-time information.

[0014] Other ball location systems include GPS based systems. These systems do not require any transmitter in the ball itself and instead track the location of a hand-held unit carried by the golfer (or a vehicle on which the unit is mounted). Thus, once the golfer hits the ball, the golfer walks over to the resting location of the ball and a GPS system can inform the user of the distance between the present golf ball position and known positions on the course, such as the estimated pin (hole) position or the previous ball position. Because holes around the golf course are moved around the green regularly, precise to-the-pin distances cannot be provided. One such system is disclosed in U.S. Pat. No. 5,434,789. Other GPS based systems, which also provide certain caddy and advice functions, are described below.

[0015] GPS Based Caddy Systems

[0016] Several GPS equipped systems are currently on the market. For example, StarCaddy from LinksPoint includes a digital map of a golf course which can be downloaded and displayed on a PDA and uses a GPS module to provide the exact distance from the PDA to the green or any other course feature. SG2 Personal Digital Caddie from SkyGolf GPS is a similar handheld, satellite-based range finder. This system automatically calculates distances to the hole and is available as a stand-alone device or as a module for the Palm and Handspring Visor PDA’s. The Inforemer GPS from Inforotech Wireless is a stand-alone Windows based portable GPS device that provides a high-resolution map of each hole, along with details ranging from the topography of each green to distance measurements to the pin, to the location of bunkers and water hazards. Many of these systems are capable of tracking scores, using manually entered information, as well as performing handicap calculations, based on manually entered handicaps. Many of these systems are also capable of providing generic shot advice based on the determined distances. Importantly, all of these systems track the location of the handset, not the ball. Thus, none of them are capable of providing real-time ball information.

[0017] Monitoring and Tracking Systems for Other Sports Equipment

[0018] A system for real-time tracking of a soccer ball has allegedly been developed by Cairo & Fraunhofer, used in an Adidas soccer ball. A soccer ball having an embedded pulsed microwave transmitter in the 2.45 GHz ISM band is utilized, in connection with a series of receivers around the field, to track the ball and to determine if the ball has crossed the goal line. The system will allegedly be in trials in March 2005 with scheduled match use in the subsequent World Cup soccer match.

[0019] A system for providing real-time information on a hockey puck is described in Embedded Systems’ website (www.embedded.com). The website indicates that the company has commercially developed a hockey puck tracking system including a puck having an embedded battery, circuit board, and infrared emitters, and sensors surrounding the rink which can be used to relay information regarding the puck, such as puck speed and direction, to a monitoring station. This system uses infrared emitters and receivers to provide the tracking function. Similarly, U.S. Pat. No. 5,564,698, the disclosure of which is incorporated herein by reference, discloses a hockey puck with an electromagnetic transmitter, which could include an infrared transmitter, ultraviolet transmitter, radar repeater, RF transmitter or other device, for transmitting information to a receiver.

[0020] U.S. Patent Publication 2003/0071733 A1, the disclosure of which is incorporated herein by reference, discloses a system and method for using impulse radio technology (ultra-wideband signals "UWB") to track the movement of athletes (as well as to enable secure communication between the athletes and their teammates, fans or coaches). The system uses the positioning capabilities of UWB to track the current position and movement of one or more moving athletes having a transmitter on his or her jersey or equipment.
U.S. Pat. No. 6,157,898, the disclosure of which is incorporated herein by reference, discloses a device for measuring a moveable object, such as a hockey puck or a golf ball. A network of acceleration sensors, an electronic processor circuit and a radio transmitter are attached to, or embodied within the ball or puck and interact with a monitor unit having a radio receiver, processor, input keypad and output display. The display can show various measured motion characteristics of the object such as the distance, time of flight, speed, trajectory height, spin rate or curve.

SUMMARY OF THE INVENTION

One embodiment of the present invention is directed to a portable electronic virtual caddy device for presenting information to a golfer who is using a trackable golf ball on a golf course, the device comprising: a receiver configured to receive real-time shot information concerning any movement of the golf ball; a processor configured to process the received shot information; a memory connected to the processor to store at least the shot information; and a display operatively coupled so as to display the shot information to the golfer.

Another embodiment of the present invention is directed to a portable electronic virtual caddy device for presenting a recommended golf shot to a golfer who is using a trackable golf ball on a golf course, the device comprising: a receiver configured to receive real-time shot information concerning any movement of the golf ball; a data file including information on the golf course, including a coordinate map of the golf course; a memory to store at least the shot information and the golf course information; a processor connected to the memory, the processor configured to process the shot information and to coordinate any movement of the golf ball with the coordinate map to determine a current ball location, the processor further configured to compare the current location with the map to determine the recommended shot; and a display operatively coupled to the processor so as to display the recommended shot to the golfer.

Another embodiment of the present invention is directed to a method for presenting a recommended shot to a golfer who is using a trackable golf ball on a golf course, the method comprising the steps of: providing the golfer with a portable electronic device which includes a receiver, a processor, a memory and a display; receiving real-time shot information at the receiver concerning any movement of the golf ball; storing at least the received shot information and the golf course information in the memory; processing the received shot information and the golf course information using the processor; and displaying the shot information and the golf course information to the golfer over the display.

Another embodiment of the present invention is directed to a method for presenting a recommended shot to a golfer who is using a trackable golf ball on a golf course, the method comprising the steps of: providing the golfer with a portable electronic device which includes a receiver, a processor, a memory and a display; accessing course information, including a coordinate map on the golf course; receiving real-time shot information at the receiver concerning any movement of the golf ball; storing at least the received shot information and the golf course information in the memory; processing the received shot information using the processor so as to coordinate any movement of the golf ball with the map to determine a current ball location; comparing the current ball location with the map using the processor so as to determine a recommended shot; and displaying the recommended shot to the golfer over the display.

A preferred embodiment of the invention as well as alternate embodiments are described by way of example with reference to the accompanying drawings in which like numbers correspond to like elements, and in which:

FIG. 1a is a front view of a golf course map according to one aspect of the present invention;

FIG. 1b is a section of the course shown in FIG. 1a;

FIG. 1c is the course section shown in FIG. 1b, further broken down into location sections;

FIG. 1d is a chart according to one aspect of the present invention, illustrating shot recommendations for the location sections shown in FIG. 1c;

FIG. 2 is a flow chart illustrating the creation of a generic shot suggestion library according to one aspect of the present invention;
FIG. 3 is a flow chart illustrating the real-time shot information display feature according to one aspect of the present invention;

FIG. 4 is a flow chart illustrating the ball location display feature according to one aspect of the present invention;

FIG. 5 is a flow chart illustrating the automatic scoring and handicap features according to one aspect of the present invention;

FIG. 6 is a flow chart illustrating a generic shot recommendation process according to an aspect of the present invention;

FIG. 7 is a flow chart illustrating a personalized shot recommendation process according to an aspect of the present invention;

FIG. 8 is a front view of a preferred handset/display for use with the present invention;

FIG. 9 is an internal perspective view of a sample golf ball for use with the present invention; and

FIG. 10 is a perspective view of a sample sensor/receiver for use with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following description is provided to enable those skilled in the art to make and use the present invention and sets forth the best mode contemplated by the inventors for carrying out their invention. Various modifications will be readily apparent to those skilled in the art and this invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Thus, these embodiments are provided by way of example only.

Core Equipment:

The virtual caddy system and method utilizes real-time information on a golf ball hit by a golfer, as well as information on a golf course being played, to provide electronic scoring and information display, as well as shot suggestions. The real-time information collected for use in the system can be obtained using a variety of different technologies. Regardless of which type of technology is utilized, the preferred system preferably includes the following components: (1) transmitting ball; (2) sensors/receivers; (3) handset/display unit; (4) server/processor (which may include the sensor/receiver); and (5) golf course information.

The present invention can be used with golf balls having an embedded active transmitter or an embedded dual transmitter/receiver. With the latter, balls can receive as well as transmit information. A sample ball is shown in FIG. 9. As shown, the ball 2700 includes a outer soft surlin or balata cover 2600 having multiple dimples 2610 to provide better flight performance. The outer cover 2600 surrounds a second layer 2620 of polybutadiene rubber or TPE, which is preferably mixed with stiffeners such as tungsten and other metal powders. The second layer 2620 surrounds a third inner core layer 2630 that includes polybutadiene or another polymer doped to alter the compression characteristics and the elastic modulus, which dopants preferably include metals such as titanium powder or low density polymers. The third layer 2630 surrounds a polymer core 2640 that preferably includes the components of the present system. While the components are preferably contained within the inner core 2640, one or more components may be embedded within the other layers. Additionally, while the ball has been described having four layers, balls having any number of layers may be used herewith.

The embedded components may include one or more counter weights 2690 or low density spaces to help balance the weight and moment in the core and to ensure proper flight characteristics, a transmit antennae 2680, a secondary antennae 2650, a control stack including the electronic circuitry 2670 and one or more power sources 2660. The power sources 2660 may be rechargeable lithium cells, any type of non-rechargeable batteries, capacitors, or part of an impact powered piezoelectric system. Additional components, such as an accelerometer or gyroscope (not shown), may also be included within the ball. The ball may be designed to transmit information constantly, or it may be activated so that it only transmits for shorter, discrete periods of times (e.g., for only 10 seconds after being hit).

The balls are preferably used in conjunction with one or more sensors/receivers such that real-time data about the position and flight characteristics of the ball can be determined. The transmissions from the ball are passed to sensors, which can be used individually or in a network, and can receive either a directional or a time differential signal from the balls. According to one aspect of the invention, a single sensors/receiver can be incorporated into the handset/display or the server/processor (discussed below). Possible transmitter/receiver technologies include active transmitters of any frequency and power, such as microwave ISM, infrared, GPRS, Bluetooth, WiMAX, WiFi and ultra-wideband. Additional possibilities include passive or indirect transmissions and position determining systems, such as RFID, GPS, etc. While a variety of technologies can be used to track the ball in real-time, it is important that each ball can be uniquely identified so that its position can be individually tracked over time. For example, if the ball uses an active broadcast technology (such as UWB) each ball can broadcast a unique identification number or code.

Depending upon the technology selected, the sensors can be used to broadcast as well as receive information. For example, if a UWB system is employed, the sensor/antenna system can be used both to track the ball position, but also to transmit data, while in play, e.g. to a handset or display carried by the golfer.

Preferably, numerous sensors/receivers are utilized across each hole of a golf course. Multiple sensors may be used with each hole. Additionally, sensors could be included in the cup itself, as the position of the cup is typically changed frequently on many golf courses, making a static reference to pin distance unreliable. A sample complex sensor is shown in FIG. 10. The sensor 3070 can include an outer framework 3030 that houses an antennae 3020 for receiving the transmissions, control electronics 3000 and a power cell 3010. Instead of using a battery 3010, the sensors can alternatively be wired for power. The framework 3030 can be connected to a support leg 3040, which can be connected to a threaded base post 3060 using a weather seal 3050. In this way, the sensor 3070 can be firmly and securely...
mounted in the ground along the golf course. Alternatively, a much simpler antenna, such as a standard dipole, can be used for the sensor. In any event, the choice and complexity of the sensor is primarily defined by the choice of the particular transmitting technology.

[0050] Using the signals transmitted from the ball 2700 to the sensor 3070, the ball’s position and/or flight characteristics can be determined. This can be accomplished using a server/processor (not shown) (which can be local to the golf course, remotely located, or within the handset/display) which determines ball position/attitude/trajectory from the raw data transmitted by the transmitter in the ball. However, it is also possible to have a “self-determining” ball where one or more aspects of the ball’s flight information is determined in the ball itself, and that information is passed to the server/processor. One way the position or trajectory can be obtained is through the use of the inventive methods disclosed in applicants’ co-Pending application entitled Method of Determining Flight Trajectory and Extracting Flight Data for a Trackable Golf Ball, the disclosure of which is incorporated herein by reference.

[0051] A directional signal can use differentials in lobe power to determine the ball’s location, such as is common in mobile telephone masts, or it can use a phased array or rotating antennas that selects the angle of maximum flux through the antennas to determine position. The server/processor can use that directional information from two or more antennas to triangulate the ball’s position in space, using either fixed lobe or a phased array detection scheme. In a time differential system (such as could be used with UWB or microwave ISM), signals from a ball would arrive at the sensors/antennae at different times, allowing the position of the ball to be calculated by a server/processor. Whichever configuration is used for the server/processor, one purpose of the server/processor is to process data from the sensors and balls so that ball position and flight characteristics can be determined. Data from the sensors and balls can include raw information about ball acceleration, compression, temperature, spin, angle or distance to sensor and the like. This raw data can be processed by the server/processor to determine position and various flight characteristics at a given time. Once that data is obtained, it can be passed onto the user for viewing over the handset/display unit.

[0052] The term “handset” is used herein to describe generally any type of data display device. One preferred example is shown in FIG. 8. The illustrated handset 2500 includes a display 2510, one or more keys 2520 and a UWB transmit/receive antenna 2530. The handset 2500 can be portable, but, despite the name, is not necessarily a handheld device, so long as it can capture and display information for the user. It can also include a transmitter and be integrated with the sensor so that handset position can be determined. If handset position is being tracked, this information does not necessarily need to be transmitted in the same way as the ball information. For example, if the ball and handset position is determined using a UWB signal, the handset does not necessarily have to receive the display data using a UWB signal. Instead, an alternate method such as WiFi, WiMAX or a standard mobile telephone signal could be used. If handset position is being tracked, each handset can be uniquely identified by an identification number, code or other broadcast label just as the balls are identified. The handset may allow the user to manually input additional data using the keypad 2520, such as the club used for any given shot, or even enter and store notes on wind, weather, ground conditions and other play variables.

[0053] An additional core component of the system is information on a golf course being played. This information preferably includes a digital map of the course so that information about the ball position and user position (via the handsets or another position tag carried by the user) can be superimposed on a map of the course, and the combined image can be displayed on the handset along with other data from the server/processor. The map may include topographical (ground level) information. The golf course information preferably includes information about features along the course (i.e., hazards such as sand traps, tee and cup locations, etc.) as well as distance information for each hole of the course. Preferably, golf course information for multiple golf courses can be obtained and utilized within the system. This information may be pre-loaded onto the handset by the manufacturer, it may be purchased and downloaded by the user, or it may be uploaded into a handset directly by a particular golf course.

[0054] Generic Shot Recommendation System:

[0055] A first aspect of the present invention is directed to a generic shot recommendation system and method. The generic shot recommendation engine uses the real-time ball location information and the golf course information, and, according to one aspect of the invention, the player’s handicap level, to provide stroke/club selection advice for a golf player. Additionally, substantially real-time weather information may be obtained and utilized in providing this advice. The real-time ball location is preferably determined using the applicable tracking technology and the golf course information. For example, before a ball is hit by the golfer, the ball may transmit a signal which is received by the sensor/receiver. Using the golf course information, the server/processor (which may be in the ball itself) can determine the exact location on the golf course that the ball is located. Similarly, after the ball is hit (and during flight), the ball can transmit a signal which is received by the sensor/receiver and which can be used to determine the exact location of the ball at all times during its flight and after it comes to rest. In this manner, a trajectory of the ball’s flight can also be created.

[0056] Additional ball information may also be determined based on calculations using the transmitted data. For example, calculated information may include ball speed and acceleration, flight time, distance in the air, distance rolling, overall distance, average speed, number of bounces, distance bouncing, distance rolling, shot type, etc. Other information may also be manually entered into the handset/display by the golfer either before or after the shot. Such information may include date, ball type, club used, weather conditions, etc.

[0057] The building block of the generic shot recommendation engine is the generic shot-per-position library for each hole at a course where the system is to operate. A preferred process for creating such a library is shown in FIG. 2. Alternatively, such a library may be provided in connection with the system itself. The first step in this process S200 is to obtain a digital course map for the course being played. One example of such a map is shown in FIG.
which illustrates a particular hole 100 on the course, and a further section 110 of that hole (shown in more detail in FIG. 1b).

[0058] The second step in the process is to define the positional coordinates of the hole S210. As shown in FIG. 1c, the system utilizes the golf course map 100 and preferably creates a positioning grid 120 for multiple sections 110 of each hole on the course. The positioning grid 120 is preferably a pattern of horizontal X-Y coordinates which is applied to divide every hole into an array of rectangular sections. For example, the course can be divided into 1 meter by 1 meter squares, or 2 cm by 5 cm rectangles, or any shape or size area that is practical. As shown in FIG. 1c, the section 110 of the golf course shown in FIG. 1b is divided into rectangular sections 130, 140. The shape and size may be practically limited by the spatial resolution achievable by the tracking technologies used at a particular course, any constraints in data file size by the server/processor, or bandwidth concerns that may result in passing the information to the handset/display. While the grid has been described above in connection with a rectangular array, the golf course can be divided into an array of sections having any desired shape.

[0059] The third step in the process S220 is to determine which of the defined positions are to be flagged as conditional positions 150. A conditional position is a section of the course for which no single recommendation is preferably provided. Conditional areas may include sections under bushes, areas of deep grass or scrub growth, positions near the edges of sand traps and water hazards, and other spots where the ability to play the ball is uncertain.

[0060] The fourth step in the process S230 is to obtain shot and club recommendations for each defined course position. For each grid position 130, 140 one or more shot recommendations can be provided. A sample table showing a series of shot recommendations for various grid positions is illustrated in FIG. 1d. According to one aspect of the invention, one or more recommendations are made for each location based on the particular skill level, or handicap, of the golfer. Thus, high, medium and low handicap golfers (skilled, semi-skilled and unskilled) can be given different advice for the same ball location. In this way, FIG. 1d illustrates for various locations 160 and handicaps 170, a club recommendation 180 and a shot recommendation 190.

[0061] The club recommendations 180 may include all clubs that can be used to obtain the desired shot for the particular location in light of the player’s handicap. The shot recommendations 190 may include both quantitative and qualitative elements. For example, quantitative elements may include statistics such as club speed, ball speed, distance, spin and height. Qualitative elements may include simple text, such as “A soft, lifting approach shot to clear the bushes,” or could include a video or audio clip.

[0062] The fifth step in the process S240 is to provide shot and club recommendations for the defined conditional areas 150. Once again, different shot and club recommendations are preferably provided for different handicaps. Preferably, when the ball lies in a conditional area, the generic shot recommendation engine can provide one or more shot recommendations to the golfer using a conditional logical statement. One example of such a statement may read “IF <condition> then <action>, ELSE <shot recommendation>.

For example, a conditional area shot recommendation for a ball lying underneath a bush might include “IF the ball cannot be played from under the bush, THEN it should be retrieved and a stroke penalty taken, ELSE try a 50 yard seven-iron shot to make the green.”

[0063] Once the generic shot recommendation library is created, it can be used to provide stroke/club advice for a golfer faced with a particular real-world situation. A preferred embodiment of the generic shot recommendation process is illustrated in FIG. 6. The first step in the process at S1000 is to obtain the golf course information. This may include, not only a golf course map, as described above, but also additional information on each hole of the course, such as hole features and distance information. The second step in the process at S1100 is to obtain the information contained in the shot recommendation library for the particular course. This information may be stored in the handset/display or may be downloaded as necessary to the handset/display using a wireless communications link. At step S1020, the system then determines the player’s handicap. This may be determined by retrieving this information directly from a user data file (described below), it may be manually entered by the golfer, or it may be automatically determined by the virtual caddy system using the golfer’s personalized shot history (also as described below). Alternatively, if no handicap is desired, the system can use a default handicap setting, such as “medium.”

[0064] The next step in the process S1030 is to obtain real-time ball information, including the ball’s present location. This information can be obtained using the applicable tracking technology within the ball. At step S1040, the system then uses the current ball location and the golf course information to determine the ball’s location within the hole being played. The ball may be on the putting green (S1050), in a conditional course area (S1090) or in some other area of the course (S1080). Alternatively, the course may be broken down into additional areas and shot recommendations may be provided for each of those additional areas as well.

[0065] If the ball’s current location is on the putting green (S1050), the system then determines the putt information from the shot library for the current location at S1060. This shot suggestion is then displayed to the golfer at S1070 over the handset/display. Preferably, one shot suggestion is given to golfers at all handicap levels when the current ball location is on the putting green and shot suggestions are not weighted by handicap. This is typically preferable because a golfer’s particular skill level would be less relevant at this close distance to the cup. Alternatively, different shot suggestions may be stored for different handicap levels even when on the putting green. Once the shot suggestion is displayed at S1070, the process re-starts and awaits a new current ball location (S1030).

[0066] If the ball’s current location is in a conditional area (S1090), the conditional response for the current ball location is then determined from the shot library at S1100 and the conditional response is displayed at S1110 to the user over the handset/display. Once the conditional response is displayed at S1110, the golfer’s handicap is determined at S1120. Where the ball location is not on the putting green or in a conditional area (S1080), the system proceeds directly to this step S1120. Preferably, shot suggestions are stored in
the shot library for three handicap types—low, medium, high. Alternatively, fewer or additional handicap levels may be utilized.

[0067] Where the golfer has a low handicap (S1130), the system determines the low handicap shot recommendation at S1140. Where the golfer has a medium handicap (S1170), the system determines the medium handicap shot recommendation at S1180, and where the golfer has a high handicap (S1150), the system determines the high handicap shot recommendation at S1160. In any event, one or more shot recommendations may be stored in the shot library for each handicap level. Once the shot recommendation is determined (S1140, S1160, S1180), the shot recommendation is displayed to the user over the handset/display at S1190. Subsequently, the process re-starts and awaits a new current ball location (S1030).

[0068] As discussed above, one or more shot suggestions may be stored for each location and for each handicap. Additionally, shot suggestions may include quantitative and qualitative shot suggestions.

[0069] Personalized Shot Recommendation System:

[0070] A second aspect of the present invention is directed to a personalized shot recommendation system and method. This aspect of the invention is similar to the generic shot recommendation system and method, in that it uses the real-time ball location information and the golf course information to provide stroke/club selection advice for a golfer. Additionally, substantially real-time weather information can be accounted for when providing this advice. However, this aspect of the invention also uses a golfer’s personal shot history to provide a more personalized stroke/club suggestion. Preferably, the golfer’s personal shot history is stored in a user data file based on prior games played by the golfer. This data file may be stored remotely and downloaded into the handset/display, or it may be stored in the handset/display and revised each time the golfer plays. Preferably, the data file includes one or more of the following pieces of information: ball type, course, date, hole, club used, shot type (drive, putt, etc.), weather conditions, overall distance, distance in air, initial speed, average speed, number of bounces, distance bouncing, distance rolling, and initial shot location.

[0071] This user data file can then be searched and sorted by field. This data can then be used to make various types of recommendations including, according to one aspect of the invention, the best combination of shots (type, distance, and club) to the hole based on player consistency. According to another aspect of the invention, the personalized shot recommendation system and method can also recommend the best combination of shots (type, distance, and club) to the hole based on player’s past peak performance, or, for all shots with a recommended club type, to determine the probability of success, based on maximum, median and mode shot distance.

[0072] A preferred embodiment of the personalized shot recommendation process is illustrated in FIG. 7. The initial steps are similar to the steps utilized in the generic shot recommendation process shown in FIG. 6. For example, initially at S2000, the golf course information is obtained. Next, the golfer’s identification is obtained and the golfer data is retrieved from the user data file at S2010. The golfer’s identification may be manually entered by the user to identify the particular golfer for whom the recommendation is being made. Next, the player’s handicap is determined at S2020. If the handicap is not known (S2030), the handicap may be manually entered by the user at S2040 and stored by the system at S2050. Alternatively, the handicap may be retrieved from the golfer data or automatically calculated (as described below). If the handicap is known (S2060) or has been entered (S2040), real-time ball information is obtained, including the current ball location at S2070. Using the golf course data and the current ball location, it is determined at S2080 whether the ball is currently on a putting green, in a conditional area, or otherwise located along the course.

[0073] If the ball is on a putting green (S2090), a suggested shot for the current location is determined at S2100 and displayed to the user at S2110 over the handset/display. According to a preferred aspect of the invention, no personalized shot recommendation is made when the ball is located on the putting green and the suggested shot is a single suggested putt recommendation. According to another aspect of the invention, the golfer data can be utilized to create a personalized putt shot recommendation. Once the recommended shot is displayed to the user at S2110, the process re-starts at S2070 and awaits a new current ball location.

[0074] If the ball is in a conditional area (S2130), a conditional response for the current location is determined at S2140 and the conditional response is displayed at S2150. The process for this is the same as described above in connection with the generic shot recommendation engine.

[0075] If the ball is not on the putting green or in a conditional area (S2120), or if the conditional response has been displayed to the user (S2150), a shot recommendation is generated based on the record of shots stored in the user data file.

[0076] At S2160, the golfer data is used and the club type used for the longest shot the golfer has achieved in the past is identified (typically, but not necessarily the 1-wood). At S2170, the mean distance of all shots taken by the golfer using that club is determined. At S2180, it is determined if the distance from the current ball location to the cup is more than some fraction (e.g., 15% or any other appropriate fraction specified by the system logic) greater than the mean distance achieved with the club used by the golfer to make his longest shot in the past. If the current ball-cup distance is not greater than the mean distance (S2190), an expected number of shots to the green parameter (n) is set to 1 at S2200. In this situation, where only one shot is required, the mean distance to the cup is used and it is determined at S2210 which club type should be used based on the golfer data. The mean distances for all club types are calculated and it is determined which club types have an average mean distance which is greater than the current location-cup distance. The club with the minimum mean distance for the shot is selected. Alternatively, the club with the history of the longest shots is selected. At S2220 this shot recommendation is displayed to the user and then the process re-starts at S2070.

[0077] Where the current location-cup distance is greater than the mean distance (S2230), such that more than one shot is required, the expected number of strokes to the hole
is calculated. The expected number of shots to the green parameter ("n") is set to the nearest integer obtained by taking the current location-cup distance and dividing by the mean shot distance for the club with which the user has achieved his longest shot. Next, at S2250, the distance per shot is determined by taking the current location-cup distance and dividing by "n". At S2260, the mean shot distances per club is obtained from the golfer data.

[0078] At S2270, the shot variability around the mean distance for each club type is determined. At S2280, all permutations are calculated for the sum of all mean shot distances per club less than or equal to the current location-cup distance plus or minus a pre-determined error margin. One such error margin for a typical golfer might be ten percent. This determines a minimum stroke recommendation—or the combination of shots that provides the fewest number of strokes without exceeding the mean shot distance for any club by more than 10%. At S2290, the system sorts the shot permutation sums by the number of elements in the sum (equal to the number of shots), from low to high. At S2300, starting at the permutation with the minimum shot number, the system moves up the list to the permutation with the lowest variability.

[0079] At S2310, a first shot option, which is the minimum strokes option, is displayed, including the number of shots, the club type per shot, the distance per shot, and the speed per shot. At S2320, a second shot option, which is the lowest overall variability or highest probability of success option, is displayed, again including number of shots, club type per shot, distance per shot, and speed per shot. While the highest probability option may result in a greater number of strokes than the minimum strokes option, it also implies a safer option with a higher probability of success. Following the display of the various shot recommendations at S2310 and S2320, the process re-starts at S2070.

[0080] Weather Effects on Shot Recommendations

[0081] Using either the generic or personalized shot recommendation systems and methods, the effects of weather can be accounted for when providing the recommended shots. Preferably, real-time or near real-time wind and atmospheric data are utilized. This can be gathered from weather equipment on the golf course itself, or equipment which is provided through a nearby weather station. Preferably, the equipment includes standard anemometer for recording wind speed and direction, a barometer to measure pressure, a thermometer to measure temperature, a hygrometer (sometimes referred to as a humidity sensor or a relative humidity indicator) to measure humidity, and a precipitation counter.

[0082] The collection of such weather information is well known in the art. Regardless of how it is collected, the real time weather information can be passed from the monitoring equipment to the virtual caddy system described herein. This information is preferably passed through the server/processor. In addition to being utilized for shot recommendations, the weather information can also be displayed directly to the golfer over the display 2500. In this way, the golfer can see in real time atmospheric conditions that will affect his shot, such as temperature, wind speed and direction.

[0083] In addition to being utilized in providing a suggested shot, various generic shot information can also be provided to the golfer based on the measured wind speed, temperature, and pressures. This is preferably accomplished by providing a data library in a memory location accessible by the processor, which data library includes data for various types of balls being used.

[0084] Temperature is one variable that can preferably be accounted for as temperature can significantly affect initial ball speed, and therefore the ball’s carry distance. Temperature is known to change the elasticity of the ball’s core by changing the amount of distortion, the compression, and the “rebound” of the ball as it is struck. These combine to significantly alter the initial velocity of the ball with temperature for any given club head speed. As temperature increases, for a constant golf club head speed, the initial ball velocity increases, thereby achieving a greater expected ball distance. If a particular ball type is known (either directly identified using the core technology, or manually entered by the golfer), the expected change in initial velocity for a given club head speed can be displayed for the current temperature. If the ball type is not known, or if that particular ball type is not in the database, then standard curves for wound ball cores and the various multilayer cores can be displayed to the golfer.

[0085] Wind speed and direction are two other variables that can be accounted for. For a current wind speed, the maximum deflection for that wind speed in both the forward and backwards directions (headwind and tailwind) can be given. This output can be a generic lookup function that reads the expected deflections for a given ball type at set distances. To do this, a generic initial velocity, launch angle and spin rate are preferably assumed, such that a possible output might include: “wind=10 mph, therefore a typical 200 m shot is +12 m (tail wind) or -15 m (head wind), a typical 100 m shot is +7 m or -6 m . . . etc.”

[0086] Precipitation and humidity are two additional variables which can be accounted for. These variables can be used to determine the impact on the ball’s roll distance, including the possible impact on putting distance. The library can include a table of the expected percentage decrease in roll distance for a given ground moisture (which is a function of precipitation). This can be displayed to a golfer as a warning or a recommendation, rather than a definitive suggestion, e.g. “Wet grass will reduce rolling distance by up to 20%.”

[0087] In addition to the aforementioned generic weather advice, the substantially real-time weather information can also be utilized within (or in conjunction with) the generic or personal shot recommendation engines to determine a recommended shot. Preferably, the shot recommendation engine first identifies the distance and direction required for the next shot, and then calculates the initial speed, initial angle and expected spin for that shot. This shot can be considered a zero-weather shot. Next, the effect of wind speed, temperature, humidity and precipitation can be applied to this shot to determine a weather-affected shot. This weather-affected shot can then be output to the golfer as the recommended shot.

[0088] Preferably, this is done by modeling the ball trajectory through the air. The base trajectory is preferably a zero wind, over the ground model. The frame of reference as a constant velocity can be moved, thereby allowing for deflection of the base shot as a consequence. The calculation
for this can be done by taking the time of flight for the base shot, and applying a vector to the base shot calculation such that the shot moves in the direction of the wind at the speed of the wind for the duration of the shot (ignoring possible differences in ground level). The result and the net wind vector (direction and speed) can then be passed back to the shot recommendation engine. A new shot recommendation can then be determined from the corollary of this data, where a solution and a new shot recommendation can be formed such that the wind deflection put the ball in the same position as the original base shot end-point.

[0089] Simple calculations can be utilized to obtain these vectors. Vector addition can be used, where \( \mathbf{V}_{\text{base}} \) is the resultant (net) velocity vector of the base shot (or the zero-wind shot) and \( \mathbf{V}_{\text{wind}} \) is the net wind velocity. This can be determined by noting the distance traveled by the base shot over the flight time of the base shot. Preferably, only the “in air” portion of the shot is considered. The wind velocity vector components can then be added to this, yielding a net velocity vector. To determine the desired shot vector that would result in the ball landing with the wind in the same coordinates that the base (zero-wind) shot would land without the wind, the wind velocity vector components can be subtracted from the base vector. The result of this vector subtraction is the “actual” velocity vector required for the golf ball to land at the desired coordinates (\( \mathbf{V}_{\text{actual}} \)). Mathematically, this can be represented by: \( \mathbf{V}_{\text{actual}} = \mathbf{V}_{\text{base}} - \mathbf{V}_{\text{wind}} \). This equation would hold true for both the horizontal and vertical components, such that: \( V(x)_{\text{actual}} = V(x)_{\text{base}} - V(x)_{\text{wind}} \) and \( V(y)_{\text{actual}} = V(y)_{\text{base}} - V(y)_{\text{wind}} \).

[0090] The resultant \( \mathbf{V}_{\text{actual}} \) can then be used with the original time of flight for the ball to determine the desired actual distance and direction. The resultant distance and direction data can be passed to the shot recommendation engine so that a check can be made that (1) the golfer can make the new shot, (2) if the shot cannot be made, what modifications are needed, i.e., longer shots to hole or more shots to hole, and (3) what club should be used for the shot.

[0091] The above process can be treated as a recursive solution. It is preferably a single iteration. Should a greater degree of accuracy be required, this process can be run through a second and third time using a root finding method such as Newton-Raphson to determine the best solution.

[0092] Automatic Scoring and Handicapping and Real-Time Information Display Functions:

[0093] In addition to providing shot recommendations, certain aspects of the present invention allow for the provision and display of the real-time ball information and automatic scoring and handicapping functions. A preferred process for the display of real-time ball information and golf course information is shown in FIG. 3. A preferred process for the display of a digital golf course map and ball location information is shown in FIG. 4.

[0094] As shown in FIG. 3, the system first retrieves various golf course information at S300. This information may include a digital map of the golf course as well as information on the features of the course. At S310, the system obtains real-time ball information using the core tracking equipment. At S320, the system may also perform various calculation and/or statistical analyses on the real time ball information, using the golf course information as needed. At S330 and S340 the real-time ball information and any statistical analyses or calculations are displayed to the user over the handset/display.

[0095] As shown in FIG. 4, the system again retrieves the golf course information at S400, including a digital course map which is displayed at S410. At S420, real-time ball information is obtained using the core tracking equipment, including the ball location. At S430 and S440, the previous and current ball locations within the golf course are determined using the golf course information and the ball trajectory is determined. At S450, the previous and current ball locations, as well as the ball trajectory, can be displayed as an overlay to the digital course map.

[0096] A preferred process for the automatic scoring and handicapping function is illustrated in FIG. 5. At S500 and S510, the system obtain golf course information and a current ball location. At S520, the system analyzes the current location and the golf course information to determine if the ball is currently located at a pin location. If not (S530), the system awaits a new ball location. If the ball is currently at a pin location (S540), the system sets a counter (x)=0. The system then obtains a new ball location at S560. The system compares the new location and the old location at S570 to determine if the location has changed. If not (S580), the system awaits a change in the ball location. Once the ball location has changed (S590), the system increases the counter (x) to X+1. At S610, the system then awaits a new ball location and determines if that new location is a cup location. If not (S620), the system returns to step S560. If the new location is a cup location (S630), at S640, the system sets the counter (x) to the score parameter and saves the score parameter for that hole. This score can then be displayed to the user via the handset/display. Once one or more score values are determined, the system, at S650, can compare the scores with the golf course par values (obtained in the golf course information) and, at S660, calculate the golfer's handicap. This handicap can be updated as the golfer plays additional games of golf. Once again, during or after the game, the handicap can be displayed to the user over the handset/display.

[0097] While the invention has been described above with respect to certain embodiments thereof, it will be apparent to those skilled in the art that variations and modifications may be made without departing from the spirit and scope of the invention.

What is claimed is:

1. A portable electronic virtual caddy device for presenting information to a golfer who is using a trackable golf ball on a golf course, comprising:
   a receiver configured to receive real-time shot information concerning any movement of the golf ball;
   a processor configured to process the received shot information;
   a memory connected to the processor to store at least the shot information; and
   a display operatively coupled so as to display the shot information to the golfer.

2. The portable caddy device of claim 1, wherein the memory includes a coordinate map concerning at least the golf course, wherein the processor is further configured to
coordinate any movement of the golf ball with coordinates on the map and display the shot information in relation to the coordinate map.

3. The portable caddy device of claim 1, wherein the processor is further configured to perform at least one statistical computation on the shot information and display the at least one statistical computation on the display.

4. The portable caddy device of claim 1, wherein the receiver receives shot information for a plurality of golfers and wherein the display further displays real-time shot information for the plurality of golfers.

5. The portable caddy device of claim 2, wherein the processor is further programmed to determine a ball trajectory and wherein the display further displays the ball trajectory in relation to the coordinate map.

6. The portable caddy device of claim 2, wherein the shot information includes a location of the golf ball on the golf course and wherein the processor is further programmed to determine when the golf ball is on a tee and when the golf ball is in a cup for a particular hole of play.

7. The portable caddy device of claim 6, wherein the processor is further programmed to determine a shot number for the golfer for the particular hole and calculate a total number of shots needed by the golfer to reach the cup from the tee for the particular hole.

8. The portable caddy device of claim 7, wherein the processor is further programmed to calculate a golf score using the total number of shots and wherein the display further displays the golf score.

9. The portable caddy device of claim 8, wherein the processor is further programmed to calculate a handicap for the golfer and wherein the display further displays the handicap.

10. The portable caddy device of claim 1, wherein the real-time information includes one or more of the following: ball type, course identification, shot date, hole identification, club used, shot type, weather conditions, overall shot distance, shot distance in air, initial shot speed, average shot speed, number of bounces, distance bouncing, distance rolling, and initial shot position.

11. The portable caddy device of claim 1, wherein the processor is further configured to receive substantially real-time weather information and wherein the display displays the weather information to the golfer.

12. A method for presenting information to a golfer who is using a trackable golf ball on a golf course, comprising:

- providing the golfer with a portable electronic device which includes a receiver, a processor, a memory and a display;
- receiving real-time shot information at the receiver concerning any movement of the golf ball;
- storing at least the received shot information and the golf course information in the memory;
- processing the received shot information and the golf course information using the processor; and
- displaying the shot information and the golf course information to the golfer over the display.

13. The method of claim 12, including the additional steps of:

- accessing course information on a golf course being played by the golfer, including a coordinate map of the course;
- coordinating any movement of the golf ball with the map; and
- displaying the shot information in relation to the map.

14. The method of claim 12, further comprising obtaining substantially real-time weather information and displaying the weather information to the golfer on the display.

15. The method of claim 12, further comprising performing one or more statistical computations on the real-time data and displaying the one or more statistical computations using the display.

16. The method of claim 12, further comprising receiving and displaying shot information for a plurality of golfers.

17. The method of claim 12, further comprising determining a ball trajectory using the shot information and displaying the ball trajectory using the display.

18. The method of claim 13, further comprising:

- determining a total number of shots needed by the golfer to reach a cup from a tee on a particular golf hole, calculating a golf score using the total number of shots, and
- displaying the golf score using the display.

19. The method of claim 18, further comprising determining a handicap for the golfer using the shot information and displaying the handicap using the display.

20. A portable electronic virtual caddy device for presenting a recommended golf shot to a golfer who is using a trackable golf ball on a golf course, comprising:

- a receiver configured to receive real-time shot information concerning any movement of the golf ball;
- a data file including information on the golf course, including a coordinate map of the golf course;
- a memory to store at least the shot information and the golf course information;
- a processor connected to the memory, the processor configured to process the shot information and to coordinate any movement of the golf ball with the coordinate map to determine a current ball location, the processor further configured to compare the current location with the map to determine the recommended shot; and
- a display operatively coupled to the processor so as to display the recommended shot to the golfer.

21. The portable caddy device of claim 20, wherein the processor is further configured to receive substantially real-time weather information and wherein the display displays the weather information to the golfer.

22. The portable caddy device of claim 20, wherein the processor is further configured to analyze a skill level of the golfer to determine the recommended shot.

23. The portable caddy device of claim 20, wherein the recommended shot includes at least a conditional recommended shot.

24. The portable caddy device of claim 20, wherein the recommended shot includes one or more of text information, audio and video.
25. The portable caddy device of claim 20, wherein the real-time information includes one or more of the following: ball type, course identification, shot date, hole identification, club used, shot type, weather conditions, overall shot distance, shot distance in air, initial shot speed, average shot speed, number of bounces, distance bouncing, distance rolling, and initial shot position.

26. The portable caddy device of claim 20, wherein the processor is further configured to determine a plurality of recommended shots for the current ball location, and wherein the display displays the plurality of recommended shots.

27. A portable electronic virtual caddy device for presenting a recommended golf shot to a golfer who is using a trackable golf ball on a golf course, comprising:

a receiver configured to receive real-time shot information concerning any movement of the golf ball;

a data file including information on the golf course, including a coordinate map of the golf course;

a data file including user information;

a memory to store at least the shot information, the user information, and the golf course information;

a processor connected to the memory, the processor configured to process the shot information and to coordinate any movement of the golf ball with coordinates on the map to determine a current ball location, the processor further configured to compare the current location with the map and the user information to determine the recommended shot; and

a display operatively coupled to the processor so as to display the recommended shot to the golfer.

28. The portable caddy device of claim 27, wherein the processor is further configured to receive substantially real-time weather information and wherein the display displays the weather information to the golfer.

29. The portable caddy device of claim 27, wherein the processor is further configured to analyze a skill level of the golfer to determine the recommended shot.

30. The portable caddy device of claim 27, wherein the recommended shot includes one or more of text information, audio and video.

31. The portable caddy device of claim 27, wherein the recommended shot comprises a plurality of recommended shots and wherein the plurality of recommended shots includes at least one of a lowest score shot and a highest chance of success shot.

32. The portable caddy device of claim 27, wherein the real-time information includes one or more of the following: ball type, course identification, shot date, hole identification, club used, shot type, weather conditions, overall shot distance, shot distance in air, initial shot speed, average shot speed, number of bounces, distance bouncing, distance rolling, and initial shot position.

33. A method for presenting a recommended shot to a golfer who is using a trackable golf ball on a golf course, comprising:

providing the golfer with a portable electronic device which includes a receiver, a processor, a memory and a display;

providing course information, including a coordinate map on the golf course;

receiving real-time shot information at the receiver concerning any movement of the golf ball;

storing at least the received shot information and the golf course information in the memory;

processing the received shot information using the processor so as to coordinate any movement of the golf ball with the map to determine a current ball location;

comparing the current ball location with the map using the processor so as to determine a recommended shot; and

displaying the recommended shot to the golfer over the display.

34. The method of claim 33, further comprising obtaining substantially real-time weather information and processing the weather information using the processor to determine the recommended shot.

35. The method of claim 33, further comprising analyzing a skill level of the golfer to determine a recommended shot.

36. The method of claim 35, further comprising calculating a golfer's handicap using the golf course information and the shot information and displaying the handicap to the user over the display.

37. The method of claim 33, wherein the recommended shot comprises a plurality of recommended shots, and wherein the plurality of recommended shots includes at least a conditional recommended shot.

38. The method of claim 33, wherein the recommended shot includes one or more of text information, audio and video.

39. A method for presenting a recommended shot to a golfer who is using a trackable golf ball on a golf course, comprising:

providing the golfer with a portable electronic device which includes a receiver, a processor, a memory and a display;

providing course information, including a coordinate map on the golf course;

receiving a data file including user information;

receiving real-time shot information at the receiver concerning any movement of the golf ball;

storing at least the received shot information, the user information and the golf course information in the memory;

processing the received shot information using the processor so as to coordinate any movement of the golf ball with the map to determine a current ball location;

comparing the current ball location with the map and the user information using the processor so as to determine a recommended shot; and

displaying the recommended shot to the golfer over the display.

40. The method of claim 39, further comprising receiving a signal transmitted from an ultra-wideband transmitter.

41. The method of claim 39, further comprising analyzing a skill level of the golfer to determine a recommended shot.

42. The method of claim 39, wherein the recommended shot comprises a plurality of recommended shots, and
wherein the plurality of recommended shots includes at least one of a lowest score shot, a highest chance of success shot, and a conditional shot.

43. The method of claim 39, wherein the recommended shot includes one or more of text information, audio and video.

44. The method of claim 39, further comprising obtaining substantially real-time weather information and processing the weather information using the processor to determine the recommended shot.