



US 20250256192A1

(19) **United States**

(12) **Patent Application Publication**  
**SHIN et al.**

(10) **Pub. No.: US 2025/0256192 A1**

(43) **Pub. Date: Aug. 14, 2025**

(54) **SYSTEM FOR PROVIDING MOTION  
SENSOR-BASED SMART GOLF COURSE  
ROUND INFORMATION**

**Publication Classification**

(51) **Int. Cl.**  
*A63B 71/06* (2006.01)  
*A63B 102/32* (2015.01)  
(52) **U.S. Cl.**  
CPC ..... *A63B 71/0622* (2013.01); *A63B 71/0669*  
(2013.01); *A63B 2102/32* (2015.10); *A63B*  
*2220/12* (2013.01); *A63B 2220/803* (2013.01);  
*A63B 2220/836* (2013.01); *A63B 2225/02*  
(2013.01)

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(21) Appl. No.: **18/841,386**

(22) PCT Filed: **Jan. 10, 2023**

(86) PCT No.: **PCT/KR2023/000430**

§ 371 (c)(1),

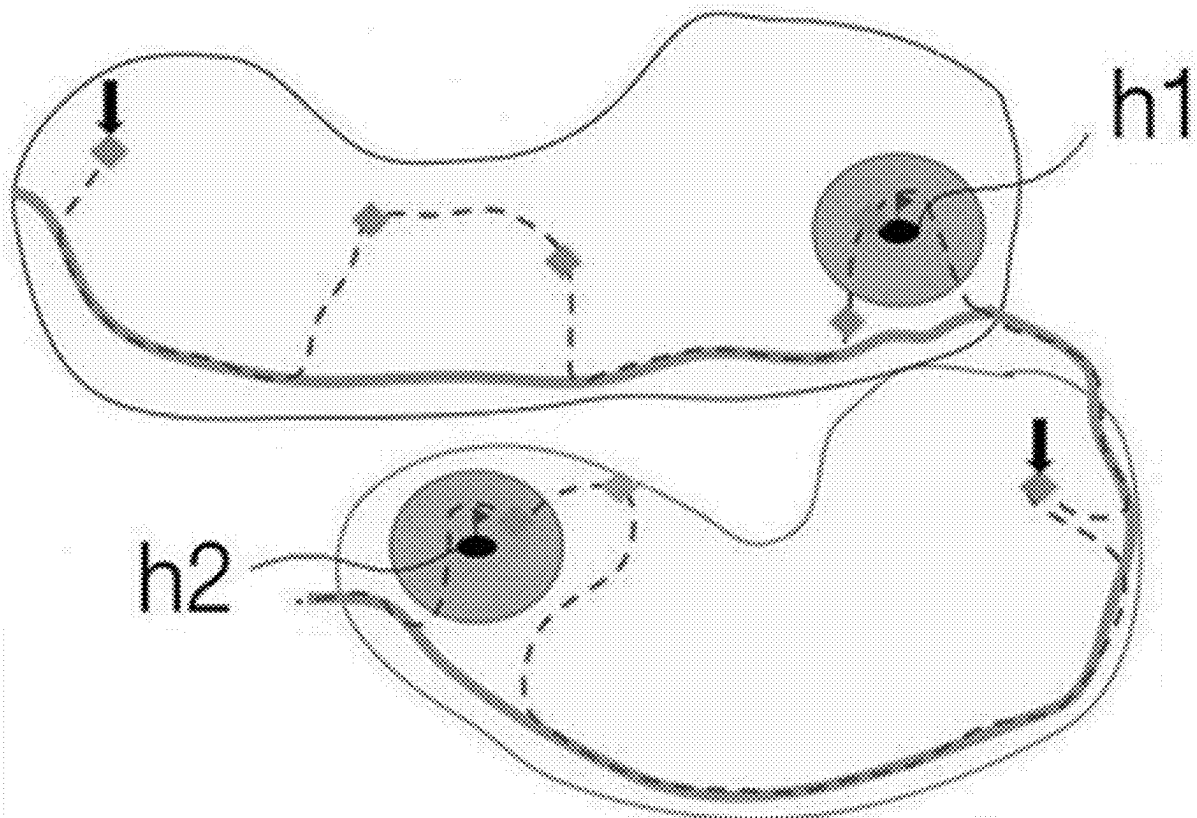
(2) Date: **Apr. 18, 2025**

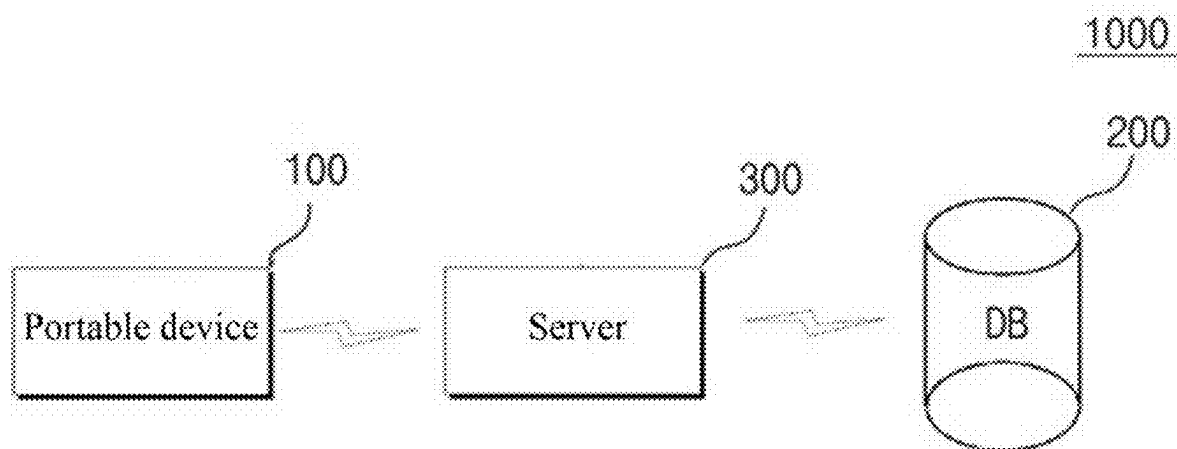
(30) **Foreign Application Priority Data**

Feb. 25, 2022 (KR) ..... 10-2022-0025485

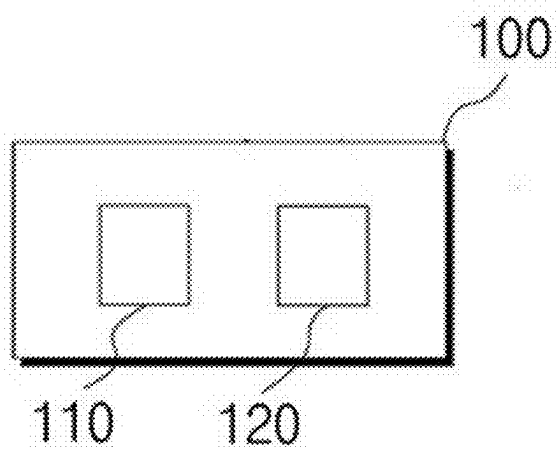
(57) **ABSTRACT**

A system for providing motion sensor-based smart golf course round information includes: a portable device; a database; and a server; wherein the portable device includes a motion sensor and a global positioning system (GPS); wherein the motion sensor detects a swing motion of the golfer; wherein the database stores geographic data of a given golf course; wherein the server (i) receives the swing motion from the motion sensor of the portable device in real time, (ii) receives the geographic data of the given golf course from the database, (iii) detects location of the portable device using GPS data received from the GPS, (iv) calibrates the location of the portable device using the geographic data and the GPS data, and (v) generates rounding information of the golfer at a given round of golf play and transmits the rounding information to the portable device.

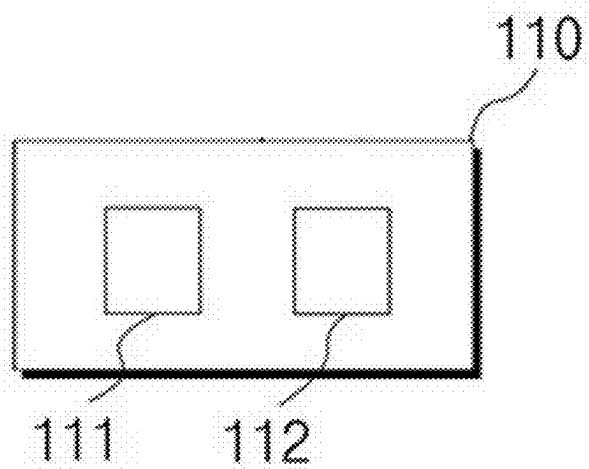




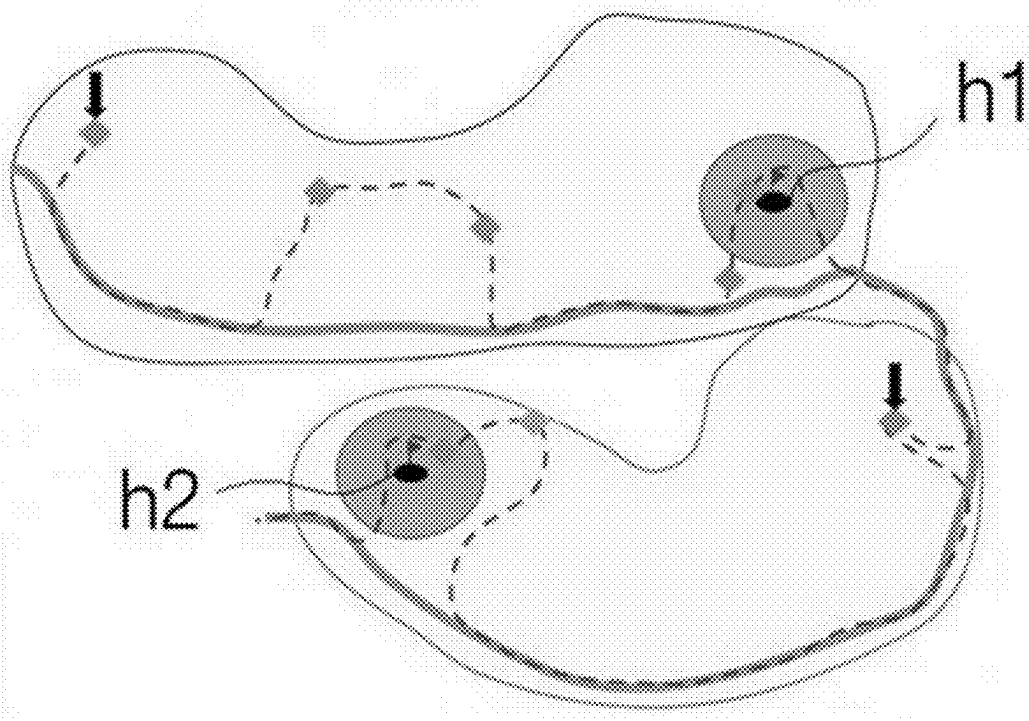
**FIG. 1**



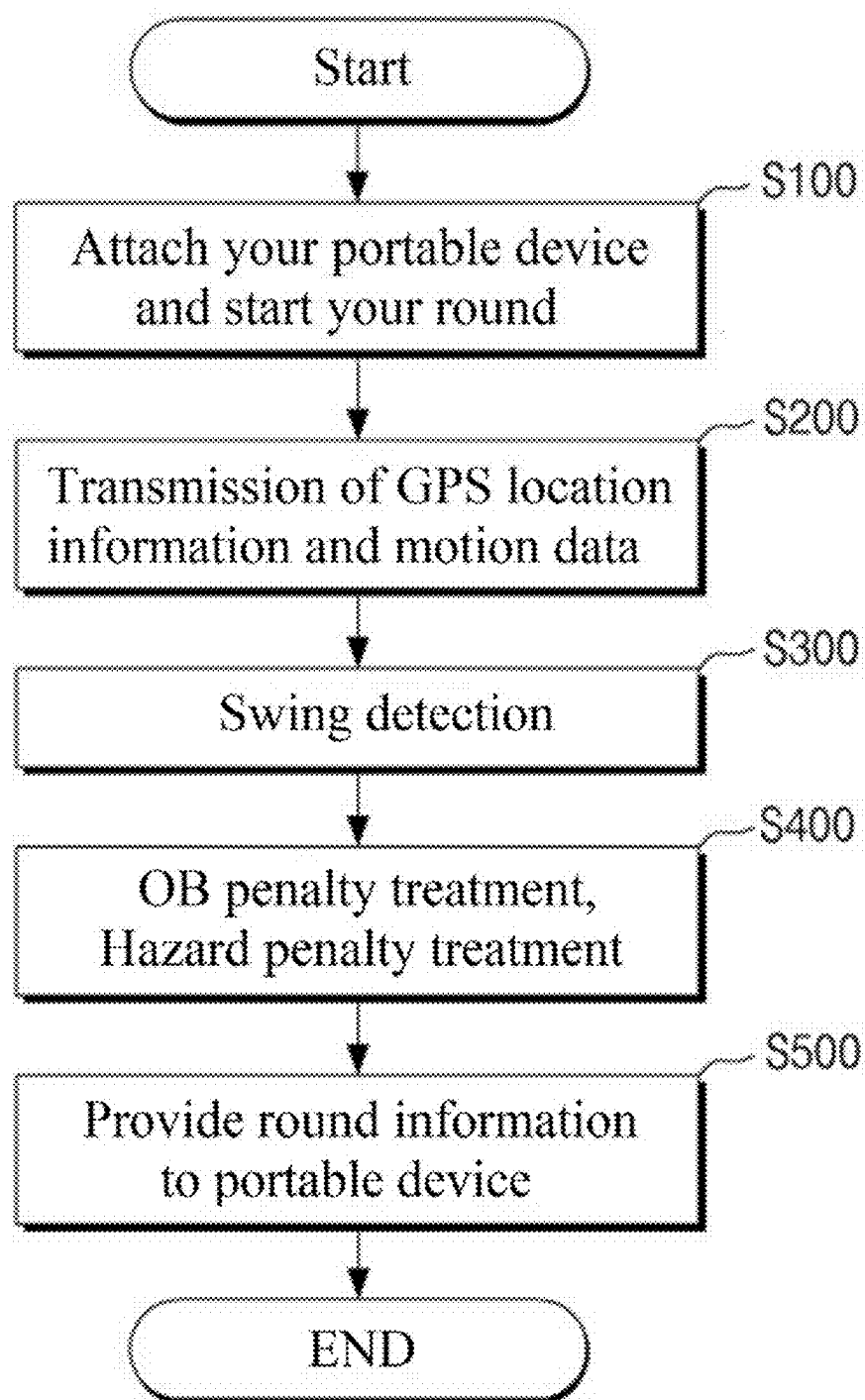
**FIG. 2**



**FIG. 3**



**FIG. 4**



**FIG. 5**

## SYSTEM FOR PROVIDING MOTION SENSOR-BASED SMART GOLF COURSE ROUND INFORMATION

### TECHNICAL FIELD

[0001] The present invention relates to a motion sensor-based smart golf course round information provision system. In particular, the present invention relates to a motion sensor-based smart golf course round information provision system which transmits rounding information to a golfer carrying a portable device using a motion sensor installed in the portable device.

### TECHNICAL BACKGROUND

[0002] The background of invention section is provided to improve understanding of the background of the present invention, and may include information that should not be considered as prior art already known to those skilled in the art in the field to which this technology belongs.

[0003] In general, golf is a sport that requires a skill of accurately hitting of a small golf ball. Golf swing posture is considered very important to golfers. Thus, people who enjoy golf tend to always spare a lot of effort and investment in improving their golf swing posture.

[0004] In particular, when a golfer made a good play at a golf field, the golfer wants to video record his or her plays and swing motions to commemorate his or her skill. Even when a golfer made a poor play, the golfer still wants to video record his or her plays and swing motions to find out his or her problems in play and correct them to improve his or her skill.

[0005] A conventional device or system captures a golf swing image using a sound sensor merely by detecting a hitting sound when the golfer hits a golf ball. That is, the conventional device starts videotaping a golfer's play at the time of detection of the hitting sound, i.e., at the point of impact. Then, the conventional device extracts swing images of the golfer from the video.

[0006] For example, Korean Patent Application No. 2000-0002408, Korean Patent Application No. 1994-7002515, and Korean Patent Application No. 2012-0131412 determine the point of impact using a sound sensor.

[0007] Upon repeated experiments, however, the present inventors found that golfer's swing image data is not obtainable in a reliable manner by the conventional way, i.e., by the way of (i) determining the point of impact solely relying on a sound sensor, (ii) videotaping golfer's play at the time of impact as such determined, and (iii) extracting golfer's swing images from the video as such taken.

[0008] Prior Art References: Korean Patent Publication No. 10-1703858.

### DETAILED DESCRIPTION

#### Problems to be Solved

[0009] In order to solve the problems of the conventional art described above, the present invention provides a motion sensor-based smart golf course round information system. According to an embodiment of the present invention, rounding information of a golfer is transmitted from a server to a portable device carried by the golfer so that the golfer can improve his/her golf skill using the rounding information.

### SUMMARY OF INVENTION

[0010] According to an embodiment of the present invention, a system for providing motion sensor-based smart golf course rounding information includes a portable device; a database; and a server. The portable device includes a motion sensor and a global positioning system (GPS). The portable device is attachable to a body of a golfer. The motion sensor detects a swing motion of the golfer. The database stores geographic data of a given golf course. The server (i) receives the swing motion from the motion sensor of the portable device in real time, (ii) receives the geographic data of the given golf course from the database, (iii) detects location of the portable device using GPS data received from the GPS, (iv) calibrates the location of the portable device using the geographic data and the GPS data, and (v) generates rounding information of the golfer at a given round of golf play and transmits the rounding information to the portable device. The rounding information is generated based on the swing motion.

[0011] Upon end of play at a given hole, the portable device calculates a play score of the golfer at the given hole and transmits the play score to the server. The play score is obtained based on the swing motion of the golfer at the given hole. The server further determines, based on the play score, whether a penalty stroke occurred at the given hole. When a penalty stroke occurs, the server further determines a penalty location where the penalty stroke happens at the given hole and stores the penalty location.

[0012] The server determines that an OB penalty stroke occurred when the swing motion is detected twice at a given location within a preset time period.

[0013] The server determines that a hazard penalty stroke occurred when the golfer moves towards a golf cart to retrieve a ball or bends down toward the ground to place a ball on the ground.

[0014] The rounding information is a play score of the golfer at a given round of golf play. The rounding information includes a tee shot distance, an out-of bounds (OB) stroke ratio, a hazard stroke ratio, an approach accuracy, and a putting accuracy, or a combination thereof.

[0015] Based on the geographic data and the GPS data, the server provides first strategy information and second strategy information. The first strategy information includes a distance and a height from a current location of the golfer to a hole cup of a given hole. The second strategy information includes how to play on a green of the given hole based on a slope of the green and a hole cup location of the green.

[0016] The play score of the golfer is obtained based on (i) the number of swing motion of the golfer, and (ii) the number of a penalty stroke of the golfer.

#### Advantages of Invention

[0017] According to the present invention, the rounding information is transmitted from a server to a portable device carried by a golfer so that the golfer can easily determine his/her golf performance based on the rounding information and improve his/her golf skill.

### BRIEF DESCRIPTION OF DRAWINGS

[0018] FIG. 1 is a schematic configuration diagram of a motion sensor-based smart golf course round information provision system according to an embodiment of the present invention.

[0019] FIG. 2 is a schematic configuration diagram of GPS according to an embodiment of the present invention.

[0020] FIG. 3 is a schematic configuration diagram of a motion sensor according to an embodiment of the present invention.

[0021] FIG. 4 is a layout of a golf course for explaining rounding information according to an embodiment of the present invention.

[0022] FIG. 5 is a flowchart of providing smart golf course round information based on a motion sensor according to an embodiment of the present invention.

#### LEGENDS OF REFERENCE NUMERALS

- [0023] 100: portable device
- [0024] 110: motion sensor
- [0025] 111: acceleration sensor
- [0026] 112: gyroscope sensor
- [0027] 120: GPS
- [0028] 200: golf course geographic database
- [0029] 300: server
- [0030] 1000: smart golf course round information provision system

#### Embodiments

[0031] The advantages and features of the present invention and methods for achieving them will become clear with reference to the embodiments described below along with the accompanying drawings. However, the scope of the present invention is not limited to the embodiments disclosed below and may be implemented in various different forms. The embodiments presented below are mere examples to help those skilled in the art to which the present invention pertains better understand the present invention. The scope of the present invention is defined by the accompanying claims.

[0032] FIG. 1 is a schematic configuration diagram of a motion sensor-based smart golf course round information provision system according to an embodiment of the present invention; FIG. 2 is a schematic configuration diagram of GPS according to an embodiment of the present invention; and FIG. 3 is a schematic configuration diagram of a motion sensor according to an embodiment of the present invention.

[0033] Referring to FIGS. 1 and 2, the motion sensor-based smart golf course round information provision system (1000) (also referred to as, in the shorthand form, “smart golf course round information provision system”) includes a portable device (100), a golf course geographic database (200), and a server (300).

[0034] The portable device (100), the golf course geographic database (200), and the server (300) are connected to each other through a communication network.

[0035] Here, the communication network refers to a wired and wireless communication network such as the Internet, or a combination thereof. The network is not limited to a particular system and can be interpreted to include both a conventional internet and a mobile communication networks.

[0036] For example, the portable device (100), the golf course geographic database (200), and the server (300) may be connected to each other through a combination of various conventional communication networks, such as an internet

network or a mobile communication network. The way how they are connected to each other is not limited to a particular way.

[0037] The golfer downloads a smart golf course round information provision application; installs it on the portable device (100); runs it to get an access to the smart golf course round information provision system (1000); and can receive a smart golf course round information provision service.

[0038] Hereinafter, the golf course round information provision system (1000) according to an embodiment is described.

[0039] The portable device (100) is attached to a body of a golfer. For example, the portable device (100) is accommodated in a carrier and the carrier is attached to the golfer's body. The portable device (100) may include a motion sensor (110) and a global positioning system (GPS) (120). The portable device (100) may further include additional components performing various functions. The motion sensor (110) may include an acceleration sensor (111) and a gyroscope sensor (112). The carrier may be a strap or a bag.

[0040] The golf course geographic database (200) stores geographic data of a golf course where a golfer is playing. The golf course geographic data includes golf course topography data, layouts, locations of hole cups, etc.

[0041] The server (300) receives motion data from the motion sensor (110) of the portable device (100) in real time, detects a golfer's swing motion, and extracts golf course geographic data from the golf course geographic database (200).

[0042] The server (300) receives the GPS location information from the GPS (120) of the portable device (100), and calibrates the location of the portable device (100) using the golf course topography data and the GPS location information.

[0043] After play in a given hole ends, the portable device (i) calculates a play score of the golfer based on the number of swing motion of the golfer which is detected by the motion sensor (100), and (ii) transmits the score to the server (300). The server determines (i) whether and where a penalty stroke occurs, and (ii) where the penalty stroke (i.e., a penalty location) occurred. Then, the server stores the penalty location.

[0044] The server (300) determines that an OB penalty stroke occurred when the swing motion is detected twice at a given location within a preset time period.

[0045] The server determines that a hazard penalty stroke occurred when the golfer moves towards a golf cart to retrieve a ball or bends down toward the ground to place a ball on the ground.

[0046] How to define a penalty stroke or how to score the penalty stroke is not limited to the way mentioned above. Instead, how to define a penalty stroke or how to score the penalty stroke can be modified in various ways.

[0047] The server (300) generates rounding information of the golfer and transmits the rounding information to the portable device (100). The rounding information is generated based on the swing motion of the golfer.

[0048] The rounding information may includes a tee shot distance, an out-of bounds (OB) stroke ratio, a hazard stroke ratio, an approach accuracy, and a putting accuracy, or a combination thereof.

[0049] Based on the geographic data and the GPS data, the server (300) provides first strategy information and second strategy information. The first strategy information includes

a distance and a height from a current location of the golfer to a hole cup of a given hole. The second strategy information includes how to play on a green of the given hole based on a slope of the green and a hole cup location of the green.

**[0050]** The rounding information may be a play score of the golfer at the given round of golf play. The rounding information may include a score at a uphill slope hole, a score at a hazard-prone hole, a score at a dog-leg hole, or a combination thereof. Here, the dog-leg hole refers to a hole in such a shape that bends like a dog's hind leg.

**[0051]** The play score of the golfer may be calculated based on the number of swing motion and the number of penalty stroke of the golfer. FIG. 4 shows how to calculate the play score based on the number of swing motion and the number of penalty stroke of the golfer.

**[0052]** FIG. 4 is a layout of a golf course for explaining rounding information according to an embodiment of the present invention.

**[0053]** Referring to FIGS. 1 and 4, the points indicated by the black arrows pointing downward represent the tee points, and the broken lines represent the golfer's movement line. Additionally, the points indicated by the black-colored diamond dots indicates the positions where swing motions were detected, and the points indicated by the gray-colored diamond dot indicates the position where both of a ball releasing motion and a swing were detected. Additionally, black circles represent hole cups.

**[0054]** Referring to FIG. 4, the first hole (h1) is a par 4 hole, and the golfer scores 5 strokes, which is a bogey play. A bogey play means the golfer made one more stroke than the standard par to put the ball into the hole cup.

**[0055]** The 2nd hole (h2) is a par 3 hole. 3 swing motions were detected. 1 movement of bending golfer's waist toward the ground was detected to set up the golf ball. Such movement is counted as a hazard penalty. Combining the 3 swing motions and the 1 hazard penalty, the play score at the 2nd hole is counted as a bogey.

**[0056]** In this way, the server (300) transmits the rounding information to the portable device (100) carried by the golfer. Based on the round information, the golfer can easily figure out his/her golf score at a given hole and at a given round of golf play and improve his/her golf skill.

**[0057]** FIG. 5 is a flowchart showing a method for providing smart golf course round information based on a motion sensor according to an embodiment of the present invention. More detailed description of S100 to S500 is provided below referring to FIGS. 1 to 3.

**[0058]** First, the golfer carries the portable device (100) to his/her body and starts playing a golf rounding (S100). The location where the portable device (100) can be attached to the golfer's waist, but the location of the the portable device (100) is not limited thereto. It can be attached to anywhere of the golfer's body.

**[0059]** After S100, the portable device (100) transmits GPS data and motion data to the server (300) (S200). The server (300) may be installed anywhere, e.g., in the golf course. Preferably, it is can be installed at a golf shop management office that manages golf course facilities.

**[0060]** After S200, the portable device (100) detects the golfer's swing motion based on the motion data (S300). Through S200 to S300, the server (300) tracks golfer's movement and golfer's swing motion over time. The golfer's movement can be obtained from the GPS location

information. The moment of the golfer's swing motion can be obtained from the motion data.

**[0061]** After S300, the server (300) processes an OB (Out of bounds) penalty stroke or a hazard penalty stroke (S400). For example, the server (300) processes a golfer's movement as an OB (Out of bounds) penalty stroke when the golfer's swing is detected twice within a preset time period at the same location. The preset time period may be 5 seconds, 10 seconds, etc., but is not limited thereto. Additionally, the server (300) processes a golfer's movement as a hazard penalty stroke when it detects that the golfer moves in the direction where a golf cart is located to retrieve a golf ball or that the golfer bends his or her waist to the ground to place a golf ball on the ground.

**[0062]** Here, OB refers to an area beyond a predetermined boundary of a given golf course or an area marked as such by an entity hosting a given golf game. A hazard refers to a bunker or a natural obstacle area where a level of difficult of golf play is high or impossible. The hazard may be intentionally build in the golf course to enhance difficulty or landscaping of the golf course.

**[0063]** In addition, for accurate score counting, video information can be used which is obtained using cameras. The cameras can be installed in at least one location within the golf course. The location where the cameras are installed is not specifically limited.

**[0064]** After S400, the server (300) provides rounding information to the golfer's portable device (100) (S500). Here, the rounding information may include at least one of a tee shot distance, an OB ratio, a hazard ratio, an approach accuracy, a putting accuracy, or a combination thereof.

**[0065]** The rounding information is a play score of the golfer at the given round of golf play. The rounding information may include a score at a uphill slope hole, a score at a hazard-prone hole, a score at a dog-leg hole, or a combination thereof. The play score of the golfer can be obtained based on (i) the number of swing motion of the golfer, and (ii) the number of a penalty stroke of the golfer.

**[0066]** The above-described embodiments are provided along with drawings to help understanding the present invention. It should be noted that the embodiments are provided merely for an exemplary purpose. It is apparent that, to a person having an ordinary skill in the art, various other modifications and equivalent embodiments are available from the present invention. It should be noted that the scope of the present invention should be determined by the appended claims.

What is claimed is:

1. A system for providing motion sensor-based smart golf course round information, comprising:

- a portable device; a database; and a server,
- wherein the portable device includes a motion sensor and a global positioning system (GPS),
- wherein the portable device is attachable to a body of a golfer,
- wherein the motion sensor detects a swing motion of the golfer,
- wherein the database stores geographic data of a given golf course,
- wherein the server (i) receives the swing motion from the motion sensor of the portable device in real time, (ii) receives the geographic data of the given golf course from the database, (iii) detects location of the portable device using GPS data received from the GPS, (iv)

calibrates the location of the portable device using the geographic data and the GPS data, and (v) generates rounding information of the golfer at a given round of golf play and transmits the rounding information to the portable device,

wherein the rounding information is generated based on the swing motion.

**2. The system of claim 1,**

wherein, upon end of play at a given hole, the portable device calculates a play score of the golfer at the given hole and transmits the play score to the server,

wherein the play score is obtained based on the swing motion of the golfer at the given hole,

wherein the server further determines, based on the play score, whether a penalty stroke occurred at the given hole,

wherein, when a penalty stroke occurs, the server further determines a penalty location where the penalty stroke happens at the given hole and stores the penalty location.

**3. The system of claim 1,**

wherein the server determines that an OB penalty stroke occurred when the swing motion is detected twice at a given location within a preset time period.

**4. The system of claim 1,**

wherein the server determines that a hazard penalty stroke occurred when the golfer moves towards a golf cart to

retrieve a ball or bends down toward the ground to place a ball on the ground.

**5. The system of claim 1,**

wherein the rounding information is a play score of the golfer at a given round of golf play, wherein the rounding information includes a tee shot distance, an out-of bounds (OB) stroke ratio, a hazard stroke ratio, an approach accuracy, and a putting accuracy, or a combination thereof.

**6. The system of claim 1,**

wherein the rounding information is a play score of the golfer at the given round of golf play,

wherein the rounding information includes a score at a uphill slope hole, a score at a hazard-prone hole, a score at a dog-leg hole, or a combination thereof.

**7. The system of claim 6,**

wherein, based on the geographic data and the GPS data, the server provides first strategy information and second strategy information,

wherein the first strategy information includes a distance and a height from a current location of the golfer to a hole cup of a given hole,

wherein the second strategy information includes how to play on a green of the given hole based on a slope of the green and a hole cup location of the green.

**8. The system of claim 6,**

wherein the play score of the golfer is obtained based on (i) the number of swing motion of the golfer, and (ii) the number of a penalty stroke of the golfer.

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