Title: GAME DEVICE SWING DETECTOR

Abstract: Analysis of a swing of a game device such as a golf club is carried out by a first component shaped and arranged to be attached to the club by sliding a slot portion along the tapered shaft to a friction fit at a wider position. The component includes accelerometers and gyroscopic devices the output of which is stored in memory only when an impact characteristic of a golf swing is detected. The raw data on the swing is communicated by wireless to a smart phone carrying an "app" or a program to process the information to generate data relating to the golf swing for showing on the display.
GAME DEVICE SWING DETECTOR

This application claims the benefit under 35 USC 119 from Provisional Application 61/294237 filed January 12th 2010.

This invention relates to an apparatus for use in detecting and analyzing a swing of a game device such as a golf club, tennis racket, baseball bat or the like.

SUMMARY OF THE INVENTION

It is one object of the invention to provide an improved device for analysis of a swing of a game device of a user.

According to one aspect of the invention there is provided an Apparatus for use in detecting and analyzing a swing of a game device comprising:

- a first component shaped and arranged to be attached to the game device, the component including:
  - a plurality of accelerometers for measuring linear movement in different directions;
  - a plurality of gyroscopic devices for measuring angular movement in different planes;
  - a power supply;
  - a memory for recording output signals from the accelerometers and the gyroscopic devices;
  - a communication system for wireless communication with an exterior device;
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and a program for implementation in a mobile smart phone device of
the type including arrangements therein for two way text and voice communication
and for internet communication and a display, the smart phone device being
arranged by the program to receive information relating to the signals from the
memory and to process the information to generate data relating to the golf swing for
showing on the display.

Preferably the device is a golf club. However the same arrangement,
on optionally in different designs and arrangements can be applied to other game
devices such as rackets, base ball bats, cricket bats and other such devices
intended to impact a game element such as a ball. The component can be inserted
as a sliding fit into the open end of a shaft of the game device or it can be attached
to any other location which allows it to move with the device.

Preferably the program is arranged to calculate Club Head Speed and
G at impact.

Preferably the program is arranged to display a Full Swing Plane
effected during the golf swing back, to and through impact up to follow through.

in another option, there can be provided a sensor strip that is attached
to the handle of the golf club to monitor grip pressure, the sensor strip including a
communication device for communicating grip pressures monitored to the memory
for storage and transmission to be processed.

Preferably the pressure sensor strip comprises a capacitive sensor
using a strip of metal and a mesh both placed underneath the grip or between the
grip and the hands of the user to detect changes in capacitance generated by the squeezing of the components.

Preferably the gyroscopic devices include MEMS gyros in three planes.

Preferably the accelerometers include MEMS accelerometers in three axes.

Preferably the gyroscopic devices and the accelerometers include a first chip providing MEMS gyros in three planes, a second chip defining MEMS accelerometers in two axes and a third chip defining a MEMS accelerometer in one axis.

Preferably there is provided a plurality of magnetometers for measuring the direction of the earth's magnetic field as the device is moved during a golf swing.

Preferably this data is used in conjunction with the data from the other sensors to provide a more accurate analysis of the location and orientation of the handle during the swing thus allowing a more accurate analysis of the movement of the club head.

Preferably there is provided an arrangement for detecting the timing of an impact and wherein the processor is arranged to record the signals within a window on each side of the sensing of an impact.

Preferably of the raw data from the sensors, only data in the windows is retained for transmission to the external smart phone.
Preferably the first component is arranged to be replaceable in different handles.

Preferably the wireless communication is effected by Bluetooth.

Preferably the smart phone includes a touch screen.

Preferably the raw data from sensors is recorded in the memory and transmitted to the smart phone for processing.

Preferably the program and display are arranged to display the swing in a 3-dimensional image.

Preferably the image displayed includes color change information which is indicative of variations in tempo or speed of the swing, that is significant acceleration or deceleration during the swing.

Preferably there is provided an arrangement for detecting an impact and wherein the processor is arranged to record in the memory the signals from the accelerometers and the gyroscopic devices within a window on each side of the sensing of an impact.

Preferably, of the signals from the sensors, only data in the windows is retained for transmission to the external smart phone device.

Preferably the signals from the sensors are recorded in the memory and transmitted to the smart phone for all processing.

Preferably the program and display are arranged to display the swing in a 3-dimensional image.
Preferably the image displayed includes color change information which is indicative of significant acceleration or deceleration during the swing.

Preferably the first component includes a housing which is easily removable from the game device and is transportable.

Preferably the housing includes a slot portion which engages around the game device.

Preferably the slot portion is arranged to engage over a tapered shaft of the game device at a narrower location on the game device and to slide along the game device to a wider location on the game device where the slot portion is held in place by its engagement with the wider location.

Preferably the housing is located at different positions on different game devices.

Preferably there is provided an arrangement for inputting information concerning the distance of the housing from a specific location in the game device, for example, either by inputting the type of game device concerned or by inputting a measurement of the distance and wherein the program is arranged to effect calculations using the information.

Preferably the first component includes elements arranged to automatically determine its orientation on the game device at an initial position of the game device.
Preferably the elements use the gyroscopic devices to determine the direction of gravity at an initial position of the game device to automatically determine the orientation of the housing on the game device.

Preferably the program is arranged to provide an input of the type of club

Preferably the Software is split into two parts: firmware that runs on the first component and a software application running on the smart phone.

Preferably the firmware is responsible for reading raw data from the sensors, detecting swings in the raw data, saving these swings to the memory, and transferring the swing data to the smart phone and the smart phone software is responsible for all the analysis and display of the raw data. This division of labour allows the apparatus to perform very involved analysis on the swing, but still maintain an acceptable battery life on the hardware unit.

Preferably the software uses predetermined characteristics of a swing of the game device to correct errors in its calculations.

Preferably the software uses as one of the predetermined characteristics the detecting of the pivot point of the swing.

Preferably the software uses as one of the predetermined characteristics the fact that the game device is in a similar location at impact and initial address.

Preferably the software is capable of calculating or estimating one or more of the following parameters from a timeline of a golf club's position and
orientation: swing speed; swing tempo; swing plane angles; dynamic face, lie, and loft angles; angle of attack and club path at impact; arm length; time and location of wrist release; swing time; transition factor; ball launch direction, speed, and spin.

Preferably the software is capable of determining and diagnosing general characteristics of the ball flight path.

Preferably the device is arranged to look for impacts which may or may not constitute an impact with a ball by the game device and to distinguish possible impacts by subsequently examining the surrounding data, both before and after the possible impact, for data characteristic of a swing by the game device and only stores in the memory data recognized as a swing.

Preferably the process includes identifying swing markers in the data, such as the top of the backswing, the start of the swing, rotation rates after impact, and checking that the relative times of each marker fall within acceptable boundaries.

Preferably the device uses physical location data to associate each swing with its geographical location.

Preferably there is provided a sensor strip that is attached to the handle of the game device to monitor grip pressure, the sensor strip including a communication device for communicating grip pressures monitored to the memory for storage and transmission to be processed.

Preferably the pressure sensor strip comprises a capacitive sensor using a strip of metal and a mesh both placed underneath the grip or between the
grip and the hands of the user to detect changes in capacitance generated by the squeezing of the components.

According to a second aspect of the invention there is provided an apparatus for use in detecting and analyzing a swing of a game device comprising:

- a first component shaped and arranged to be attached to the game device, the component including:
  - a plurality of accelerometers for measuring linear movement in different directions;
  - a plurality of gyrosscopic devices for measuring angular movement in different planes;
  - a power supply;
  - a memory for recording output signals from the accelerometers and the gyroscopic devices;
  - a communication system for communication with an exterior device;
- and a program for implementation in the exterior device arranged by the program to receive information relating to the signals from the memory and to process the information to generate data relating to the swing for showing on the display;

  wherein the first component includes a housing which is easily removable from the game device and is transportable.

According to a third aspect of the invention there is provided an apparatus for use in detecting and analyzing a swing of a game device comprising:
a first component shaped and arranged to be attached to the game device, the component including:

- a plurality of accelerometers for measuring linear movement in different directions;
- a plurality of gyroscopic devices for measuring angular movement in different planes;
- a power supply;
- a memory for recording output signals from the accelerometers and the gyroscopic devices;

and a program arranged by the program to receive information relating to the signals from the memory and to process the information to generate data relating to the swing for showing on the display;

wherein the software uses predetermined characteristics of a swing of the game device to correct errors in its calculations.

According to a fourth aspect of the invention there is provided an apparatus for use in detecting and analyzing a swing of a game device comprising:

- a first component shaped and arranged to be attached to the game device, the component including:
  - a plurality of accelerometers for measuring linear movement in different directions;
  - a plurality of gyroscopic devices for measuring angular movement in different planes;
a power supply;
a memory for recording output signals from the accelerometers and the
gyroscopic devices;
and a program arranged by the program to receive information relating
to the signals from the memory and to process the information to generate data
relating to the swing for showing on the display;
wherein the device is arranged to look for impacts which may or may
not constitute an impact with a ball by the game device and to distinguish possible
impacts by subsequently examining the surrounding data, both before and after the
possible impact, for data characteristic of a swing by the game device and only
stores in the memory data recognized as a swing.

According to a fifth aspect of the invention there is provided an
apparatus for use in detecting and analyzing a golf swing comprising:

a first component shaped and arranged to be mounted in the shaft of a
go!f club at the open end of the handle, the component including:
a plurality of accelerometers for measuring linear movement in
different directions;
a plurality of gyroscopic devices for measuring angular movement in
different planes;
a power supply;
a memory for recording output signals from the accelerometers and the
gyroscopic devices;
a sensor to monitor grip pressure, the sensor including a communication device for communicating grip pressures monitored to the memory for storage and transmission to be processed;

and a program arranged to receive information relating to the signals from the memory and to process the information to generate data relating to the golf swing for showing on the display.

Preferably the pressure sensor strip comprises a capacitive sensor using a strip of metal and a mesh both placed underneath the grip or between the grip and the hands of the user to detect changes in capacitance generated by the squeezing of the components.

**BRIEF DESCRIPTION OF THE DRAWINGS**

One embodiment of the invention will now be described in conjunction with the accompanying drawings in which:

Figure 1 is a schematic illustration of a golf club including the apparatus of the present invention.

Figures 2, 3 and 4 are isometric views of a first embodiment of the first component of the apparatus for insertion into the club handle at the open end.

Figure 5 is a side elevational view of the first component.

Figure 6 is a cross-sectional view of the first component inserted into the handle and showing the components of the circuit board container within the handle.

Figure 7 is an isometric view of a second embodiment of the first
component of the apparatus for mounting onto the club handle at the open end.

Figure 8 is a bottom plan view of the second embodiment of Figure 7.
Figure 9 is a top plan view of the second embodiment of Figure 7.
Figure 10 is an view of the second embodiment of Figure 7 showing the housing mounted on a tapered shaft of a game device.

In the drawings like characters of reference indicate corresponding parts in the different figures.

DETAILED DESCRIPTION

The apparatus as shown in the Figures is for use in detecting and analyzing a golf swing and includes a first component 10 shaped and arranged to be mounted in the shaft 11 of a golf club 12 at the open end 13 of the handle.

Thus the device includes a cylindrical housing portion 10A defined by a lower half cylindrical shell 10B and a top separate cover 10C which closes an upper edge 10D to enclose the circuit of the component on a suitable circuit board 17.

At the end of the cylindrical portion 10A is a disk portion 10E which is arranged to butt against the end of the shaft of the club with an outer cylindrical knurled surface to allow the device to be grasped and pulled from the sliding fit inside the hollow interior of the shaft. And end piece 10F projects outwardly beyond the disk 10E.

The component comprises a circuit board 17 which carries a first chip 18 defining a plurality of MEMS accelerometers for measuring lineal movement in
three different directions. Such a chip is commercially available such as from ANALOG DEVICES.

A second chip 19 includes a plurality of MEMS gyroscopes for measuring angular movement about two different axes with a third chip 20 including a third gyroscope for measuring the third axis at right angles to the first two. Such a chip is commercially available such as from ST MICROELECTRONICS.

In addition to the accelerometers and the gyroscope sensors there can be provided a plurality of magnetometers on a chip 33 for measuring the direction of the earth's magnetic field as the device is moved during a golf swing. This data can be used in conjunction with the data from the other sensors to provide a more accurate analysis of the location and orientation of the handle during the swing thus allowing a more accurate analysis of the movement of the club head.

A power supply 22 and a processor 21 are carried on the board with a memory 23 for recording output signals from the accelerometers and the gyroscopic devices. A commercially available Bluetooth communication system 24 is provided for wireless communication with an exterior device.

The system is used in conjunction with a mobile smart phone device 25 arranged for wireless communication with the first component and including arrangements therein for two way text and voice communication and for internet communication and a display with a touch screen 25A and a keyboard 25B. Such a smart phone is available under the trademark i-phone.
The phone is programmed with a program for implementation in the smart phone device arranged to receive information relating to the signals from the memory and to process the information to generate data relating to the golf swing for showing on the display.

The smart phone is programmed with an Application (APP) for the processing of the program to calculate and display from the raw data received a number of items including but not limited to:

Club Head Speed at impact;
G's at impact;
a Full Swing Plane effected during the golf swing back, to and through impact up to follow through.

The graph displayed can include color change information which is indicative of variations in tempo or speed of the swing, that is significant acceleration or deceleration during the swing.

In addition on the handle of the golf club there is provided a sensor strip 26 that is attached to the handle of the golf club to monitor grip pressure, the sensor strip including a communication device in the form of a wire for communicating grip pressures monitored to the memory via the processor for storage and transmission to be processed in the exterior device 25. The strip again generates raw data in a stream of data defining grip pressures so that these can be correlated with the data from the other sensors during a swing. The pressure sensor strip is preferably of the type including a capacitive sensor using a strip of metal and
a mesh both placed underneath the grip or between the grip and the hands of the user to detect changes in capacitance generated by the squeezing of the components.

The processor is arranged to record the signals within a window on each side of the sensing of an impact. In this way only data in the windows is retained for transmission to the external smart phone and all the other continual data can be discarded. The impact sensor is a component part of the programming of the processor which analyzes the data sufficiently to detect changes in acceleration or angle over a predetermined threshold.

The first component in its housing is arranged to be replaceable in different handles.

The golf insert is of a tubular construction divided into halves with one half to house the circuitry and the other half to seal against the first half. The sealed tubular insert fits into the inside of the butt end of the golf shaft and is transferable by removing and reinsertion from one club to another.

The information retrieved is sent via the Bluetooth protocol after separation into data packets, each containing measurements taken from each of the sensors together with a time stamp.

The program comprises an algorithm to convert the raw data from the sensors to the path of a golf swing together with a second algorithm which enhances the accuracy of the first calculation to provide the display of the pattern of the golf swing.
Turning now to Figures 7 to 10, there is shown a new mounting arrangement for the circuit board 17. In this case the sensors and circuitry are now housed in an easily removable, transportable clip rather than being disposed within the hollow interior of the shaft.

The clip does not have to be in an exact location or orientation on the club. The calculations use a modifiable distance to club head parameter, and can automatically determine its orientation on the club shaft at address. The clip uses the taper in a club shaft to facilitate quick and easy fastening.

The sensors and circuitry are encased in a transportable housing capable of being clipped to the exterior of a golf club shaft in a secure, but non-permanent manner. The housing does not need to be placed at an exact location or orientation on the club. This flexibility is facilitated by the use of a modifiable distance to club head parameter in the calculations, and the direction of gravity at address. The housing may use the taper in a golf club shaft to assist quick and easy fastening of the housing to the club.

Thus as shown in Figures 7 to 10, the first component includes a housing 40 which is easily removable from the game device and is transportable. The housing includes a slot portion 41 with a surface 42 which engages around the shaft 43 of the golf club 44. The slot portion 41 includes an open mouth 45 defined by side edges 45A and 45B which is arranged to engage over the tapered shaft 44 at a narrower location 44A on the game device and to slide along the game device to a wider location on the game device where the slot portion is held in place by its
engagement with the wider location. The slot portion includes two generally cylindrical surfaces 44C and 44D for engaging around the shaft at respective ends of the housing and an arched center section 44E containing the board 17.

In use the housing is located at different positions on the golf club and there is provided in the program an entry an arrangement for inputting information concerning the distance of the housing from a specific location on the game device. This can be done by measuring the actual distance from the specific location, which can be the butt end or the club head, and/or by entering information defining the club type. The orientation of the housing on the game device is automatically detected by the program by detecting the direction of gravity at the address position to the ball of the club. The program is arranged to effect calculations of the swing using the information. Thus the program uses the gyroscopic devices to determine the direction of gravity at an initial position of the game device such as the ball address position of the golf club or an intended impact position of a racket or base ball bat to automatically determine the orientation of the housing on the game device.

The software is split into two parts: firmware that runs on the embedded microprocessor 21, and a software application running on the smart phone as a downloaded program or "App". The firmware is responsible for reading raw data from the sensors, detecting swings in the raw data, saving these swings to persistent flash memory, and transferring the swing data to the smart phone. The smart phone software is responsible for all the analysis and display of the raw data.
This division of labour allows us to perform very involved analysis on the swing, but still maintain an acceptable battery life on the hardware unit.

The smart phone software uses general characteristics of a golf swing to correct errors in its calculations. For example, it is capable of detecting the pivot point of the swing, and ensuring that the club head is in a similar location at impact and initial address.

The smart phone software is capable of calculating or estimating the following parameters from a timeline of a golf club's position and orientation: swing speed; swing tempo; swing plane angles; dynamic face, lie, and loft angles; angle of attack and club path at impact; arm length; time and location of wrist release; swing time; transition factor; ball launch direction, speed, and spin. It also is capable of estimating ball dynamics, including ball launch direction, speed, spin, carry, and of determining and diagnosing the resulting ball flight path. The software is capable of determining and diagnosing general characteristics of the ball flight path.

The firmware is capable of detecting golf swings in the raw data by determining possible impacts and subsequently examining the surrounding data, both before and after the possible impact, for a golf swing signature. It will be appreciated that impacts can arise from dropping, throwing the club or by merely returning the club to the bag. These impacts are distinguished from actual impacts with the bail, not by any characteristic of the impact itself, but by identifying swing
markers in the data, such as the top of the backswing, the start of the swing, rotation rates after impact, and checking that the relative times of each marker fall within acceptable boundaries.

The firmware only stores segments of data recognized as a golf swing into the onboard persistent flash memory.

The application's software tasks are split between the hardware's embedded processor and a software application running on the smartphone. The division of software responsibilities is designed to allow computationally intensive swing analysis, while maintaining acceptable battery life on the hardware unit.

The embedded processor's firmware is responsible for reading raw data from the sensors, detecting swings in the raw data, saving these swings to persistent flash memory, and later transferring them to the smartphone.

The firmware employs a circular buffer to store the past few seconds of sensor data. Golf swings are detected in this raw data by considering large changes in acceleration and rotation rate as indicators of possible club-ball impact. If a possible impact is found, the surrounding sensor data is subsequently examining the orientation of the club at address and impact is also considered before a the data is recorded as a golf swing.

Once a swing is detected, the surrounding data size is cropped to maximize the usage of persistent flash storage space, and to decrease the wireless data transfer times. Only sequences of data recognized as a golf swing are stored to persistent flash memory.
The smart phone software uses the short interval of time at swing address in which the club is relatively still to initialize its orientation, position, and velocity parameters. It may use general characteristics of a golf swing to correct errors in its calculations. For example, the pivot point of the swing or the knowledge that the golf club head is in a similar location at impact and initial address, are used to correct errors in the position and velocity calculations. That is the software uses predetermined characteristics of a swing of the game device to correct errors in its calculations due to slight deviations due to inaccuracies in the measuring devices. The software uses as one of the predetermined characteristics the detecting of the pivot point of the swing. The software uses as one of the predetermined characteristics the fact that the game device is in a similar location at impact and initial address. Thus an initial calculation of the swing is determined and then is corrected using the above data.

The smart phone software may use a combination of numbers, graphs, and 3D animations to graphically display its calculated swing parameters, and use an existing data connection to transfer the parameters to a third party. It may also use any available physical location data to identify the location on a map or representation of a golf course of each swing.

The display 25A is arranged by the program to display the swing in a 3-dimensional image and to include color change information which is indicative of significant acceleration or deceleration during the swing.

Since various modifications can be made in my invention as herein
above described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without department from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.
CLAIMS:

1. Apparatus for use in detecting and analyzing a swing of a game device comprising:
   a first component shaped and arranged to be attached to the game device, the component including:
   a plurality of accelerometers for measuring linear movement in different directions;
   a plurality of gyroscopic devices for measuring angular movement in different planes;
   a power supply;
   a memory for recording output signals from the accelerometers and the gyroscopic devices;
   a communication system for wireless communication with an exterior device;
   and a program for implementation in a mobile smart phone device of the type including arrangements therein for two way text and voice communication and for internet communication and a display, the smart phone device being arranged by the program to receive information relating to the signals from the memory and to process the information to generate data relating to the golf swing for showing on the display.

2. The apparatus according to claim 1 wherein there is provided an arrangement for detecting an impact and wherein the processor is arranged to
record in the memory the signals from the accelerometers and the gyroscopic devices within a window on each side of the sensing of an impact.

3. The apparatus according to claim 2 wherein of the signals from the sensors, only data in the windows is retained for transmission to the external smart phone device.

4. The apparatus according to any preceding claim wherein the signals from the sensors are recorded in the memory and transmitted to the smart phone for all processing.

5. The apparatus according to any preceding claim wherein the program and display are arranged to display the swing in a 3-dimensional image.

6. The apparatus according to any preceding claim wherein the image displayed includes color change information which is indicative of significant acceleration or deceleration during the swing.

7. The apparatus according to any preceding claim wherein the first component includes a housing which is easily removable from the game device and is transportable.

8. The apparatus according to claim 7 wherein the housing includes a slot portion which engages around the game device.

9. The apparatus according to claim 8 wherein the slot portion is arranged to engage over a tapered shaft of the game device at a narrower location on the game device and to slide along the game device to a wider location on the
game device where the slot portion is held in place by its engagement with the wider location.

10. The apparatus according to claim 9 wherein the housing is located at different positions on different game devices.

11. The apparatus according to claim 10 wherein there is provided an arrangement for inputting information concerning the distance of the housing from a specific location in the game device, for example, either by inputting the type of game device concerned or by inputting a measurement of the distance and wherein the program is arranged to effect calculations using the information.

12. The apparatus according to claim 10 or 11 wherein the first component includes elements arranged to automatically determine its orientation on the game device at an initial position of the game device.

13. The apparatus according to claim 12 wherein the elements use the gyroscopic devices to determine the direction of gravity at an initial position of the game device to automatically determine the orientation of the housing on the game device.

14. The apparatus according to any preceding claim wherein the program is arranged to provide an input of the type of club

15. The apparatus according to any preceding claim wherein the Software is split into two parts: firmware that runs on the first component and a software application running on the smart phone.
16. The apparatus according to claim 15 wherein the firmware is responsible for reading raw data from the sensors, detecting swings in the raw data, saving these swings to the memory, and transferring the swing data to the smartphone and the smartphone software is responsible for all the analysis and display of the raw data.

17. The apparatus according to claim 1 wherein the software uses predetermined characteristics of a swing of the game device to correct errors in its calculations.

18. The apparatus according to claim 17 wherein the software uses as one of the predetermined characteristics the detecting of the pivot point of the swing.

19. The apparatus according to claim 17 or 18 wherein the software uses as one of the predetermined characteristics the fact that the game device is in a similar location at impact and initial address.

20. The apparatus according to any preceding claim wherein the software is capable of calculating or estimating one or more of the following parameters from a timeline of a golf club's position and orientation: swing speed; swing tempo; swing plane angles; dynamic face, lie, and loft angles; angle of attack and club path at impact; arm length; time and location of wrist release; swing time; transition factor; ball launch direction, speed, and spin.
21. The apparatus according to any preceding claim wherein the software is capable of determining and diagnosing general characteristics of the ball flight path.

22. The apparatus according to any preceding claim wherein the device is arranged to look for impacts which may or may not constitute an impact with a bail by the game device and to distinguish possible impacts by subsequently examining the surrounding data, both before and after the possible impact, for data characteristic of a swing by the game device and only stores in the memory data recognized as a swing.

23. The apparatus according to claim 22 wherein the process includes identifying swing markers in the data, such as the top of the backswing, the start of the swing, rotation rates after impact, and checking that the relative times of each marker fall within acceptable boundaries.

24. The apparatus according to any preceding claim wherein the device uses physical location data to associate each swing with its geographical location.

25. The apparatus according to any preceding claim wherein there is provided a sensor strip that is attached to the handle of the game device to monitor grip pressure, the sensor strip including a communication device for communicating grip pressures monitored to the memory for storage and transmission to be processed.
26. The apparatus according to claim 25 wherein the pressure sensor strip comprises a capacitive sensor using a strip of metal and a mesh both placed underneath the grip or between the grip and the hands of the user to detect changes in capacitance generated by the squeezing of the components.

27. Apparatus for use in detecting and analyzing a swing of a game device comprising:
   a first component shaped and arranged to be attached to the game device, the component including:
   a plurality of accelerometers for measuring linear movement in different directions;
   a plurality of gyroscopic devices for measuring angular movement in different planes;
   a power supply;
   a memory for recording output signals from the accelerometers and the gyroscopic devices;
   a communication system for communication with an exterior device;
   and a program for implementation in the exterior device arranged by the program to receive information relating to the signals from the memory and to process the information to generate data relating to the swing for showing on the display;
   wherein the first component includes a housing which is easily removable from the game device and is transportable.
28. The apparatus according to claim 27 wherein the housing includes a slot portion which engages around the game device.

29. The apparatus according to claim 28 wherein the slot portion is arranged to engage over a tapered shaft of the game device at a narrower location on the game device and to slide along the game device to a wider location on the game device where the slot portion is held in place by its engagement with the wider location.

30. The apparatus according to claim 27 wherein the housing is located at different positions on different game devices and there is provided an arrangement for inputting information concerning the distance of the housing from a specific location in the game device and the orientation of the housing on the game device and wherein the program is arranged to effect calculations using the information.

31. Apparatus for use in detecting and analyzing a swing of a game device comprising:

   a first component shaped and arranged to be attached to the game device, the component including:

   a plurality of accelerometers for measuring linear movement in different directions;

   a plurality of gyroscopic devices for measuring angular movement in different planes;

   a power supply;
a memory for recording output signals from the accelerometers and the
gyroscopic devices;

and a program arranged by the program to receive information relating
to the signals from the memory and to process the information to generate data
relating to the swing for showing on the display;

wherein the software uses predetermined characteristics of a swing of the game device to correct errors in its calculations.

32. The apparatus according to claim 31 wherein the program uses as one of the predetermined characteristics the detecting of the pivot point of the swing.

33. The apparatus according to claim 31 or 32 wherein the program uses as one of the predetermined characteristics the fact that the game device is in a similar location at impact and initial address.

34. Apparatus for use in detecting and analyzing a swing of a game device comprising:

a first component shaped and arranged to be attached to the game device, the component including:

a plurality of accelerometers for measuring linear movement in different directions;

a plurality of gyroscopic devices for measuring angular movement in different planes;

a power supply;
a memory for recording output signals from the accelerometers and the gyroscopic devices;

and a program arranged by the program to receive information relating to the signals from the memory and to process the information to generate data relating to the swing for showing on the display;

wherein the device is arranged to look for impacts which may or may not constitute an impact with a ball by the game device and to distinguish possible impacts by subsequently examining the surrounding data, both before and after the possible impact, for data characteristic of a swing by the game device and only stores in the memory data recognized as a swing.

35. Apparatus for use in detecting and analyzing a golf swing comprising:

a first component shaped and arranged to be mounted in the shaft of a golf club at the open end of the handle, the component including:

a plurality of accelerometers for measuring linear movement in different directions;

a plurality of gyroscopic devices for measuring angular movement in different planes;

a power supply;

a memory for recording output signals from the accelerometers and the gyroscopic devices;
a sensor to monitor grip pressure, the sensor including a communication device for communicating grip pressures monitored to the memory for storage and transmission to be processed;

and a program arranged to receive information relating to the signals from the memory and to process the information to generate data relating to the golf swing for showing on the display.

36. The apparatus according to claim 35 wherein the pressure sensor strip comprises a capacitive sensor using a strip of metal and a mesh both placed underneath the grip or between the grip and the hands of the user to detect changes in capacitance generated by the squeezing of the components.