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(54) **Play simulator and method of calculating an actual quality-value**

(57) A play simulator is provided which comprises a first determination unit adapted to determine an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player, a receiving unit adapted to receive parameters of an action of the player, a second determination unit adapted to determine at least one actual value of the action depending on the received parameters, and a calculation unit adapted to calculate an actual quality-value by associating the index value of quality and the at least one actual value of the action. In particular, the play simulator may be a golf play simulator.

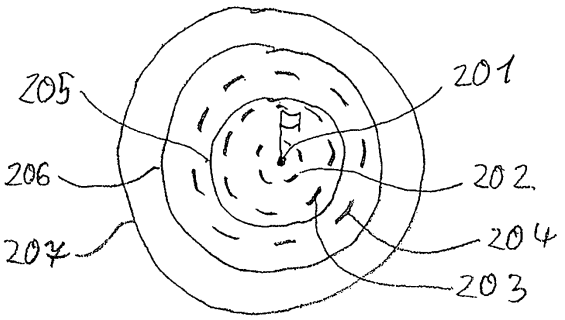


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Fig 2

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## Description

**[0001]** The invention relates to a play simulator, a method of calculating an actual quality-value in a play simulator, a program element, and a computer-readable medium.

**[0002]** In the technical field of golf simulators or golf simulations game devices are commonly known that generate a natural interest in golf without taking up a large amount of space. In some of these common devices a player swings a grip which is shaped like the grip of a golf club in order to simulate a real golf stroke. To further simulate a real golf play on a first monitor of some of the common golf simulation games, a virtual club head moving in accordance with the movement of the grip is displayed. An imaginary shaft extends from the grip, and the virtual club head is displayed as if it were attached to the end of the shaft. In such simulations the player takes aim at his target direction (to which a ball is to be hit) by viewing scenery displayed on a second monitor, and hits a ball displayed in his underfoot view on the first monitor. In these common devices the front view and underfoot view change according to the position where a virtual player stands in the game space. Accordingly, the player can play with the sense that he is actually playing a golf course. Prior to beginning the game, it may be possible to select the number of players who will join the game and may also select the difficulty level of the courses. In general common golf simulations allow games which are imitating a real golf course, which may lead to the fact that a player having lower playing ability will need more strokes which consequently leads to the fact that alternative playing of the players is not possible.

**[0003]** US 6,176,789 discloses a method and apparatus for scoring a golf shot, such as a golf shot at a practice range, in order to provide a golfer with a meaningful index to measure their improvement and/or to compare their performanece to the performance of other golfers at the practice range. The scoring method and apparatus determines the final position of the golf ball following the golf shot and generates a signal representative of the final position. The scoring method and apparatus also includes a signal processor for determining the score of the golf shot. The signal processor determines the score based upon a predetermined difficulty function and a dispersion distance between the final position of the golf ball and a predetermined target toward which the golf ball was driven.

**[0004]** It is an object of the invention to provide a play simulator including a scoring system which may allow a rotational playing for players having different playing ability.

**[0005]** In order to achieve the object defined above, a play simulator, a method of calculating an actual quality-value in a play simulator, a program element, and a computer-readable medium according to the independent claims are provided.

**[0006]** According to an exemplary embodiment a play simulator is provided which comprises a first determination unit adapted to determine an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player, a receiving unit adapted to receive parameters of an action of the player, a second determination unit adapted to determine at least one actual value of the action depending on the received parameters, and a calculation unit adapted to calculate an actual quality-value by associating the index value of quality and the at least one actual value of the action. In particular, the play simulator may be a golf play simulator, while the action may be in particular a stroke or putt of a golf ball. In this case the stroke of a golf ball may be performed by using a real golf club and a real golf ball. However, the action may be also a throw of a dart, a kick of a soccer ball, or similar actions of a player, in the corresponding games, like dart, or a soccer simulation.

**[0007]** According to an exemplary embodiment a method of calculating an actual quality-value in a play simulator is provided, wherein the method comprises determining an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player and receiving parameters of an action of the player. Further the method comprises determining at least one actual value of the action depending on the received parameters, and calculating an actual quality-value by associating the index value of quality and the at least one actual value of the action.

**[0008]** According to an exemplary embodiment a program element is provided, which, when being executed by a processor, is adapted to control or carry out a method of calculating an actual quality-value in a play simulator, wherein the method comprises determining an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player, and receiving parameters of an action of the player. Furthermore the method comprises determining at least one actual value of the action depending on the received parameters, and calculating an actual quality-value by associating the index value of quality and the at least one actual value of the action.

**[0009]** According to an exemplary embodiment a computer-readable medium is provided, in which a computer program is stored which, when being executed by a processor, is adapted to control or carry out a method of calculating an actual quality-value in a play simulator, wherein the method comprises determining an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player, and receiving parameters of an action of the player. Furthermore, the method comprises determining at least one actual value of the action depending on the received parameters, and calculating an actual quality-value by associating the index value of quality and the at least one actual value of the action.

**[0010]** The method of calculating an actual quality-value in a play simulator according to embodiments of the invention may be realized by a computer program, that

is by software, or by using one or more special electronic optimization circuits, that is in hardware, or in hybrid form, that is by software components and hardware components.

**[0011]** In the context of this application, the term "action" may particularly denote a stroke of a ball, e.g. a golf ball, a soccer ball or a billiard ball, in particular it may relate to the entire procedure or a part of the procedure or the result of the action, including a swing with the real golf club, a hit between real golf club and real golf ball, and the flight of the real golf ball until the ball rests, for example.

**[0012]** In the context of this application, the term "target difficulty level" may particularly denote a degree of difficulty of a task or problem, i.e. may relate to the complexity or challenge a specific task or problem impose on a player.

**[0013]** In the context of this application, the term "level of playing ability" may particularly denote a value characterizing the play of a player, e.g. the handicap in case the play simulation is a golf simulation. Thus, the level of playing ability may be used in order to distinguish the playing ability of one person from the playing ability of another person.

**[0014]** In the context of this application, the term "index value" may particularly denote a reference value, a specified value, a set value or a target value, i.e. a value which represents a target value a player of a given playing ability should achieve on a target. Such an index value may be in particular depending on the target difficulty level, i.e. the challenging of a task or problem, and the playing ability of the respective player trying to solve the respective task. In other words the term "index value" may represent the expectation value for a respective player trying to solve a specific task. The index value may be calculated according to a predetermined function each time a new target difficulty level is provided, or the index values may be stored in form of a look-up-table, e.g. a look-up-table in which for each combination of target difficulty level and playing ability the respective index value is stored. The index value may also be called a "potential" which can be characterized by so-called isoline, wherein each isoline relates to points representing the same difficulty level for a specific player. That is, from each point of an isoline a player has on average the same probability to reach the target by performing the same number of strokes. For example, a first isoline may represent all points starting from which a first player needs on average one more stroke, a second isoline may represent all points starting from which the first player needs on average two more stroke, an so on. Thus, for an average stroke the difference of the values of the potential field before and after the stroke should be one, while for an above-average stroke the difference should be greater than one and for an lower than average stroke the difference should be lower than one.

**[0015]** In the context of this application, the term "parameters of an action" may particularly denote parameters of an action which describe the effect of an action. For example, parameters of an action may relate to the velocity and/or the direction of a flight (horizontal and/or vertical to the direction of the aimed goal) and/or the spin of the ball in case the action is a stroke in a golf play. Thus, the parameters of an action may be usable to characterize the effect a specific action performed by the player as well as to calculate the resting position of the struck ball.

**[0016]** In the context of this application, the term "actual value of the action" may particularly denote a specific value characterizing the action, e.g. the actual value may relate to the distance of a balls flight after being hit and/or to the resting position the hit ball come to rest after being hit by the player. Thus, the actual value of the action may relate to actual values of an action of a player and may be compared to the index value of the action of a player, i.e. to the value which the player should achieve with the respective action.

**[0017]** In the context of this application, the term "actual quality-value" may particularly denote a value characterizing the quality of the actual action of the player. This actual quality-value may thus be a value characterizing a rating of the actual action, e.g. relating to a quality of an actual stroke of a golf player, when using a golf play simulator. In particular, the actual quality-value may be depending whether a given stroke was a stroke which was above average for a specific player or whether the stroke was an lower than average stroke. Thus, it may be possible to determine the actual quality-value based on the potential field representing the isolines of probabilities.

**[0018]** It may be seen as a gist of an exemplary embodiment that a play simulator is provided which is adapted to provide a task or problem to a player having a determinable or predetermined difficulty level. Based on this difficulty level of the task and a specific playing ability of a player an index value may be calculated which may represent a target value or a difficulty level for the specific player. This calculation of the index value may be performed for each virtual playing field, e.g. for a golf, soccer, billiard or dart simulation. For calculating the index value empirical values may be used which characterizing the expectation value for a player of a given playing ability to solve the given task or object, e.g. in the field of a golf simulator or golf simulation the index value may be associated to the expectation value of the number of further strokes a player of the given playing ability needs to hit the target, e.g. the hole or cup.

**[0019]** By using such an index value it may be possible to evaluate whether a specific action, e.g. a stroke in case of a golf simulation, has to be counted as a good, average or lower than average stroke. This may be done by comparing the determined or calculated actual value of the action, e.g. a distance of traveling of a golf ball, and the index value of quality for the specific player. For example, the comparison may be normalized such that for an average stroke, for the specific player, the calculated actual

quality-value is 1, while for a lower than average stroke the calculated actual quality-value is lower than 1 and higher than 1 for an above-average stroke. In case the playing of a hole of a virtual golf course is the chosen task with every stroke of the player the expectation value, which may be also called a potential value, may on average decrease by 1, when the expectation value is normalized relative to the average number of strokes. In this case the difference of the potential before and after the stroke is lower than 1 in case of a stroke having a quality which is lower than average for the specific player. In case the difference is higher than 1 the stroke has a quality which is above-average for the specific player. Thus, the calculated actual quality-value may be usable for the comparison of two players and may be used to base a decision which player of a given number of players wins the virtual game the play simulator is used for.

**[0020]** Next, further exemplary embodiments of the play simulator will be explained. However, these embodiments also apply for the method of calculating an actual quality-value in a play simulator, for the computer-readable medium, and for the program element.

**[0021]** According to another exemplary embodiment the play simulator further comprises a measuring unit adapted to measure the parameters of the action of the player.

**[0022]** Such a measuring unit may be adapted to measure flight parameter of a ball, e.g. a golf ball or a soccer ball, or a dart, wherein from this flight parameter, e.g. velocity, position and/or direction, the whole flight and in particular the resulting resting position may be deducible. Alternatively, the parameters may characterize the running of a billiard ball in case the play simulator is a simulator adapted to simulate a billiard game.

**[0023]** According to another exemplary embodiment of the play simulator the measuring unit is a launch monitor, which is adapted to determine the parameters of the action of the player based on a movement of a moveable object driven by the action.

**[0024]** In such a context, a launch monitor may measure flight parameters of an object, e.g. a golf ball, and optionally the motion parameters of the golf club. This measurement may be performed by taking a plurality of images at different time instants, e.g. at the moment of a collision of the golf club and the golf ball and a short time instant afterwards. Additionally a whole body image of the player may be taken. Thus, launch monitors estimating flight parameters can be combined with a video camera. Using the parameter measured by the launch monitor it may be possible to calculate the whole flight of a golf ball on parameters which only relate to a short distance which the golf ball travels, e.g. the first 50 cm or first 20 cm.

**[0025]** According to another exemplary embodiment of the play simulator the calculation unit is adapted to calculate the actual quality-value by comparing the index value of quality and the at least one actual value of the action.

**[0026]** Such a calculation unit may be formed by a processor and/or computer unit, which may be adapted to compare the index value of quality and the at least one actual value of the action. Such a comparison may be a simple comparison, e.g. a subtraction of the two values, but may be also a more complex comparison which may include the calculation of the ratio of the two values, or even may include a function which is more complex.

**[0027]** According to another exemplary embodiment the play simulator further comprises an input unit adapted to input the given level of playing ability of the player.

**[0028]** Such an input unit may be formed by a simple keyboard of a computer unit which may be used to input a value which characterize the playing ability of the player, e.g. the handicap of a golf player.

**[0029]** According to another exemplary embodiment of the play simulator the input unit is adapted to calculate the level of playing ability based on previous calculated actual quality-values of the user.

**[0030]** In particular, the playing ability may be calculated based on previous analyzed actions of the player, e.g. in case of a golf simulator a value, similar to the handicap may be calculated based on previous games on the golf simulator. The corresponding calculation may be performed using a processor or computer on which a corresponding software is stored.

**[0031]** According to another exemplary embodiment the play simulator further comprises a predetermining unit adapted to predetermine the target difficulty level. In particular, the predetermining unit may be adapted to generate targets or objects which may be solved by the player, the different targets may represent different level of difficulty, i.e. may be solved easier or more difficult by a player. Preferably, the predetermining unit may be adapted to generate a number of different targets to be solved by the player, which different targets, having different target difficulty level. By combining such a number of different targets it may be possible to simulate a whole play, like a billiard game or a golf play, i.e. one or more holes of a golf course. In case of a golf simulator, each of the different tasks may be determined such that each single task may be handled by only one action, i.e. one stroke of the player. That is, the tasks may be to strike one single stroke to a specified flag or cup, similar to a one shot hole. Examples for such tasks may be the object to drive the golf ball 220 m, 170 m, to strike the ball 50 m, which may be similar to a stroke to reach the green, a first putt having a distance of 15 m and a second putt having a distance of about 5 m. In general the task may relate to a golf stroke of about 300 m to a putt of 10 cm.

**[0032]** According to another exemplary embodiment the play simulator further comprises a third determination unit, the third determination unit is adapted to determine contour lines which represent lines of constant actual quality-values.

**[0033]** In this context it should be noted that the first, second and third determination units as well as the calculation unit and/or the predetermining unit may be real-

ized by different units or may be realized as a single unit, e.g. a single processor adapted to perform all necessary determinations and/or processing. These contour lines may also connect positions of equal difficulties, e.g. positions from which a player of a given playing ability on average needs the same amount of further shots, hits or tries to hit the target or solve the task. For example, one line may represent all positions at which a golf player of a handicap of 10 needs three further strokes and/or putts, on average, for putting the golf ball into the hole. The respective contour lines may represent rings around the predetermined target, e.g. the flag indicating the position of a golf cup and may represent isolines of a potential. In particular, the contour lines may be depending on the playing ability of each player and on the target or task. For example, for a first player of a given playing ability the contour lines may have a given distance, while for a second player having a higher playing ability the contour lines may have a greater distance. By choosing such a functional relation between the playing ability and distance between the single contour lines it may be possible to ease the play for the first player having the lower playing ability compared to the second player having the higher playing ability. Thus, it may be possible to provide a play or game for players of different playing ability which game still is interesting to play for all players, since the primary competition is to play on a good level compared to their normal playing level. In case of a golf play his may be similar to the so-called "net-score", i.e. a scoring in which the handicaps of the respective players are taken into account.

**[0034]** An alternative approach may be to define the isolines of a potential in a reversed way to the above described way. While above the isolines of the potential are defined by the fact that from each point on a single line the average number of further strokes to reach the cup is constant, the isolines may be also defined that each point on a single isoline has the same probability to be reached by a player with one stroke. That is, according to this approach a first isoline represents all points which are reached in at least 70% of all tries, while a second isoline represents all points which are reached in at least 80% of all tries, and so on. This may result in lines which are arranged similar to the lines on an archery target. In this approach the distance of one isoline to the next isoline will be greater for a player having lower playing ability than for a player having higher playing ability.

**[0035]** According to another exemplary embodiment the play simulator further comprises a module which comprises, a moveable object, a first fastening element adapted for being detachably and immovably fastened to a second fastening element of the practice device, and a flexible element connecting the moveable object to the first fastening element, wherein the moveable object is adapted to be affected by the action of the player.

**[0036]** Such a moveable object may be used to simulate a ball, e.g. a golf ball which may be hit by a club in order to determine the parameter of the action, e.g. the stroke of the golf ball. This moveable object is preferably fastened to a fixed base, so that it may be possible to use the play simulator in a house, e.g. at home, without the danger of hitting other objects in the house by the ball. Thus, a connectable ball-rope combination for a golf practice device may be provided. A golf ball securely fastened to a rope of a length of for instance 1 m has a fastening element at an end portion of the rope opposing the end portion at which the golf ball is fixed, and this fastening element may be connected to a golf simulator. This connection may be detachable, that is to say may be released by a user by simply clicking the first fastening element out of a corresponding second fastening element of the golf simulator. The ball connected to the rope may then be put on a tee-like portion or simply on a planar underground of the golf simulator, and the user may hit the ball with a golf club, thereby simulating a golf stroke. Optionally, such a golf stroke, more particularly the first decimeters of such a golf stroke, may be captured by a launch monitor. The launch monitor or the golf simulator may then perform calculations to calculate parameters such as a (virtual) stroke distance, a score indicative of the quality of the stroke, etc. If desired, this information may be output on a display device, for instance on a laptop. It is also possible that a golf simulation is performed showing a golf player in a realistic golf course environment and indicating how the golf shot would have looked like in reality.

**[0037]** In addition to this realistic simulation of a golf shot, the fixed connection between the fastening element of the module and the fastening element of the practice device may ensure that the motion of the golf ball is restricted to a (theoretically spherical) volume which is defined essentially by a sphere having a radius which corresponds to the length of the rope. However, as a further security feature, an energy absorbing or damping wall may be provided which extends vertically from the base element to receive the golf ball to stop its motion rapidly. Additionally, side walls may be provided for an even higher degree of security, also for the unlikely scenario that the golf ball is unintentionally released from the rope.

**[0038]** According to another exemplary embodiment the play simulator further comprises a display unit, and a fourth determination unit, wherein the fourth determination unit is adapted to determine images displayable on the display device. Preferably, the images are associated with the at least one actual value and/or the actual quality-value.

**[0039]** By providing a display unit it may be possible to display results of the action of the player, like the resting position of a ball relative to a given target position relating to the specific task. In particular, it may be possible to display contour lines surrounding a given target, e.g. a cup of a golf hole. The radii of the surrounding contour lines may be different for different players playing against each other, e.g. the radii may correspond to the playing ability or handicap of the respective player. By using such different radii a simple way may be provided to compare

two or more players with each other.

**[0040]** According to another exemplary embodiment of the play simulator the first determination unit is further adapted to determine a further index value of quality by combining the predetermined target difficulty level and a given further level of playing ability of a further player, and the receiving unit is further adapted to receive further parameters of an action of the further player. Furthermore, the second determination unit is further adapted to determine at least one further actual value of the further action depending on the received further parameters, and the calculation unit is further adapted to calculate a further actual quality-value by associating the further index value of quality and the at least one further actual value of the action. Preferably, the third determination unit is further adapted to determine the image in such a way that it is further associated with the at least one actual value and/or the further actual quality-value, i.e. a comparison between the two players is possible. That is, the respective units, which may be provided by a single processor or by several different processors, are adapted to perform their respective objects for more than one player. Thus, it may be possible that more than one player is playing a game using the play simulator, so that a competition between the different players is possible.

**[0041]** Next, further exemplary embodiments of the method of calculating an actual quality-value in a play simulator will be explained. However, these embodiments also apply for the play simulator, for the computer-readable medium, and for the program element.

**[0042]** According to another exemplary embodiment the method further comprises determining a further index value of quality by combining the predetermined target difficulty level and a given further level of playing ability of a further player, receiving further parameters of an action of the further player, determining at least one further actual value of the further action depending on the received further parameters, and calculating a further actual quality-value by associating the further index value of quality and the at least one further actual value of the action.

**[0043]** By providing such a method it may be possible to enable a game for two or more different players. In particular, by converting the results of the actual actions of the player by considering the actual playing abilities of the players a game may be possible in which players of different playing abilities are enabled to play a game without knowing the result of the game in advance.

**[0044]** According to another exemplary embodiment the method further comprises comparing the actual quality-value with the further actual quality-value.

**[0045]** According to another exemplary embodiment the method further comprises providing a task having the predetermined target difficulty level. In particular, a plurality of tasks are provided each having a predetermined target difficulty level.

**[0046]** Thus, it may be possible to provide a virtual game, e.g. to simulate a complete golf course.

**[0047]** According to another exemplary embodiment the method further comprises calculating an overall actual quality-value based on actual quality-values determined for each task of the plurality of tasks and/or calculating a further overall actual quality-value based on further actual quality-values determined for each task of the plurality of tasks. That is, in the course of a game several actual quality-values are calculated one for each task and/or player. After the last task has been performed by the players an overall actual quality-value may be calculated, which can be used as a basis for a decision which player has won the virtual match. The calculation of the overall actual-quality values may be done by summing up the actual quality-values for each player, i.e. a first overall actual quality-value is calculated for the first player by summing up the respective actual quality-values and a second overall actual quality-value is calculated for the second player by summing up the respective actual quality-values.

**[0048]** The aspects defined above and further aspects of the invention are apparent from the examples of embodiment to be described hereinafter and are explained with reference to these examples of embodiment.

**[0049]** The invention will be described in more detail hereinafter with reference to example of embodiment but to which the invention is not limited.

Figure 1 schematically shows a golf play simulator according to an exemplary embodiment of the invention.

Figure 2 schematically shows isolines of a potential for different players.

**[0050]** The illustration in the drawing is schematically. In different drawings, similar or identical elements are provided with the similar or same reference signs.

**[0051]** In the following, referring to Fig. 1, a golf simulator 100 according to an exemplary embodiment of the invention will be described.

**[0052]** As shown in Fig. 1, a golfer 101 carries a golf club 102 including a shaft 103 and a club head 104. A golf ball 105 is positioned on a tee (not shown). The golf ball 105 is fixed to a rope 160 which may in turn be fixed to the ground or a part of the golf simulator.

**[0053]** Furthermore, Fig. 1 shows a golf simulator 110. Embedded in the golf simulator 110 are a plurality of components as will be explained in the following.

**[0054]** The golf play simulator 110 comprises a central processing unit (CPU) 113 which includes processing resources and storage resources. The CPU 113 is the control system over the entire golf play simulator 110. The CPU 113 is electrically coupled to a first CCD camera 114 and to a second CCD camera 115. Instead of providing two CCD cameras 114, 115, it is also possible that only a single camera is provided, or a number of cameras which is larger than two. It may be particularly advantageous to provide only a single camera, since this may

allow to manufacture the device with low costs and in small size. The provision of two cameras in Fig. 1 is thus not to be understood as a limiting feature for the invention. Particularly, the second camera 115 is merely optional, and a performance with only the first camera 114 is sufficient. The CCD cameras 114, 115 are adapted to monitor the golf player 101 and/or the flight of a golf ball struck by the golf player 101 from different views and/or at different time instants and/or different positions so as to derive complementary information for measuring flight or rolling parameters of the golf ball.

**[0055]** Furthermore, a first flash 116 and a second flash 117 are provided. The flashes 116, 117 can be positioned at any desired position of the golf play simulator 110, particularly attached to a casing of the golf play simulator 110. The flashes 116, 117 may emit light flashes so as to define points of time at which images of the golf club 102, of the golf ball 105 and/or of the golf player 101 are captured by the cameras 114, 115. As an alternative for the flashes 116, 117, strobes may be provided. It is possible to implement such light flash sources using LEDs, particularly OLEDs. Instead of using two flashes, it is possible to use only one flash or at least three flashes. For example, each of the two flashes 116, 117 can emit a single flash, or a single flash may emit two flashes. Also the number of light pulses may vary, and can be larger or smaller than two.

**[0056]** Moreover, the CPU 113 is coupled to an LCD display 118 as an optical output unit or optical display unit for displaying results of the golf play simulator.

**[0057]** Furthermore, the CPU 113 is coupled to a graphical user interface 119 like a keypad, a joystick, a touch screen so as to provide the CPU 113 with control information. Particularly, the user may input, via the input/output device 119,values characterizing his playing ability. Furthermore, the golfer may input, via the input/output device 119, golf equipment information like information with respect to the club 102 which shall be used for the strike, so as to provide the system 110 with the required information needed to evaluate the stroke.

**[0058]** Each of the components 114 to 119 may be connected to interfaces of the golf play simulator 110 so that individual components may be retrofitted, substituted, or replaced. Thus, a modular system may be provided.

**[0059]** Although not shown in Fig. 1, a battery may be housed in the golf play simulator 110 so as to supply the various components of the golf diagnosis apparatus 110 with electrical energy. However, the golf play simulator 110 may also be powered by solar cells or the like or may be powered by a common power line.

**[0060]** As further shown in Fig. 1, a microphone 124 is provided for detecting acoustic waves resulting from a hit between the golf club head 104 and the ball 105.

**[0061]** Furthermore, a Bluetooth communication interface 125 is provided at the golf play simulator 110 and is coupled to the CPU 113. Via the Bluetooth communication interface 125, wireless communication with a sensor 130 provided in the golf club head 104 and with a sensor 131 provided in the golf ball 105 is possible.

**[0062]** In the following, referring to Fig. 2, isolines of a potential for two players having different playing ability. Fig. 2 shows a tee 200 of a golf hole and the respective cup 201 indicated by a flag. Surrounding the cup 201 isolines are shown, wherein the dashed lines 202, 203 and 203 relates to a first player and the drawn trough lines 205, 206 and 207 relate to a second player. The isolines are shown having a substantially circular shape, however, depending on difficulties beyond the distance, e.g. a gradient, or hazards like lakes or bunkers, the shape may be depart from a circle. In the embodiment shown in Fig. 2 the isolines of the potential correspond to points having the same "stroke distance" to the cup, i.e. from each point on a single line a player needs the same amount of further strokes to reach the target. In this embodiment of the potential, the dashed lines 202, 203, and 204 relate to a player having lower playing ability, while the drawn trough lines 205, 206 and 207 relate to the player having higher player ability. Furthermore, the line 202 represents the same stroke distance to the cup as the line 205, the line 203 represents the same stroke distance to the cup as line 206, and the line 204 represents the same stroke distance to the cup as the line 207.

**[0063]** It should be noted that the term "comprising" does not exclude other elements or features and the "a" or "an" does not exclude a plurality. Also elements described in association with different embodiments may be combined. It should also be noted that reference signs in the claims shall not be construed as limiting the scope of the claims.

## Claims

**1.** A play simulator comprising:

a first determination unit adapted to determine an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player,
a receiving unit adapted to receive parameters of an action of the player,
a second determination unit adapted to determine at least one actual value of the action depending on the received parameters, and
a calculation unit adapted to calculate an actual quality-value by associating the index value of quality and the at least one actual value of the action.

**2.** The play simulator according to claim 1, further comprising:

a measuring unit adapted to measure the parameters of the action of the player.

3. The play simulator according to claim 2, wherein the measuring unit is a launch monitor, which is adapted to determine the parameters of the action of the player based on a movement of a moveable object driven by the action.

4. The play simulator according to any one of the claims 1 to 3, wherein the calculation unit is adapted to calculate the actual quality-value by comparing the index value of quality and the at least one actual value of the action.

5. The play simulator according to any one of the claims 1 to 4, further comprising:

an input unit adapted to input the given level of playing ability of the player.

6. The play simulator according to claim 5, wherein the input unit is adapted to calculate the level of playing ability based on previous calculated actual quality-values of the user.

7. The play simulator according to any one of the claims 1 to 6, further comprising:

a predetermining unit adapted to predetermine the target difficulty level.

8. The play simulator according to any one of the claims 1 to 7, further comprising:

a third determination unit,

wherein the third determination unit is adapted to determine contour lines which represent lines of constant actual quality-values.

9. The play simulator according to any one of the claims 1 to 8, further comprising:

a module which comprises:

a moveable object,
a first fastening element adapted for being detachably and immovably fastened to a second fastening element of the practice device, and
a flexible element connecting the moveable object to the first fastening element,

wherein the moveable object is adapted to be affected by the action of the player.

10. The play simulator according any one of the claims 1 to 9, further comprising:

a display unit, and
a fourth determination unit,

wherein the fourth determination unit is adapted to determine images displayable on the display device.

11. The play simulator according claim 10, wherein the images are associated with the at least one actual value and/or the actual quality-value.

12. The play simulator according to any one of the claims 1 to 11, wherein the first determination unit is further adapted to determine a further index value of quality by combining the predetermined target difficulty level and a given further level of playing ability of a further player, wherein the receiving unit further adapted to receive further parameters of an action of the further player, wherein the second determination unit is further adapted to determine at least one further actual value of the further action depending on the received further parameters, and wherein the calculation unit is further adapted to calculate a further actual quality-value by associating the further index value of quality and the at least one further actual value of the action.

13. A method of calculating an actual quality-value in a play simulator, the method comprising:

determining an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player,
receiving parameters of an action of the player,
determining at least one actual value of the action depending on the received parameters, and
calculating an actual quality-value by associating the index value of quality and the at least one actual value of the action.

14. The method according to claim 13, further comprising:

determining a further index value of quality by combining the predetermined target difficulty level and a given further level of playing ability of a further player,
receiving further parameters of an action of the further player,
determining at least one further actual value of the further action depending on the received further parameters, and
calculating a further actual quality-value by associating the further index value of quality and the at least one further actual value of the action.

15. The method according to claim 14, further comprising:

comparing the actual quality-value with the further actual quality-value.

**16.** The method according to any one of the claims 13 to 15, further comprising:

providing a task having the predetermined target difficulty level.

**17.** The method according claim 16, wherein a plurality of tasks are provided each having a predetermined target difficulty level.

**18.** The method according claim 17, further comprising:

calculating an overall actual quality-value based on actual quality-values determined for each task of the plurality of tasks, and/or
calculating a further overall actual quality-value based on further actual quality-values determined for each task of the plurality of tasks.

**19.** A program element, which, when being executed by a processor, is adapted to control or carry out a method of calculating an actual quality-value in a play simulator, the method comprising:

determining an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player,
receiving parameters of an action of the player,
determining at least one actual value of the action depending on the received parameters, and
calculating an actual quality-value by associating the index value of quality and the at least one actual value of the action.

**20.** A computer-readable medium, in which a computer program is stored which, when being executed by a processor, is adapted to control or carry out a method of calculating an actual quality-value in a play simulator, the method comprising:

determining an index value of quality by combining a predetermined target difficulty level and a given level of playing ability of a player,
receiving parameters of an action of the player,
determining at least one actual value of the action depending on the received parameters, and
calculating an actual quality-value by associating the index value of quality and the at least one actual value of the action.

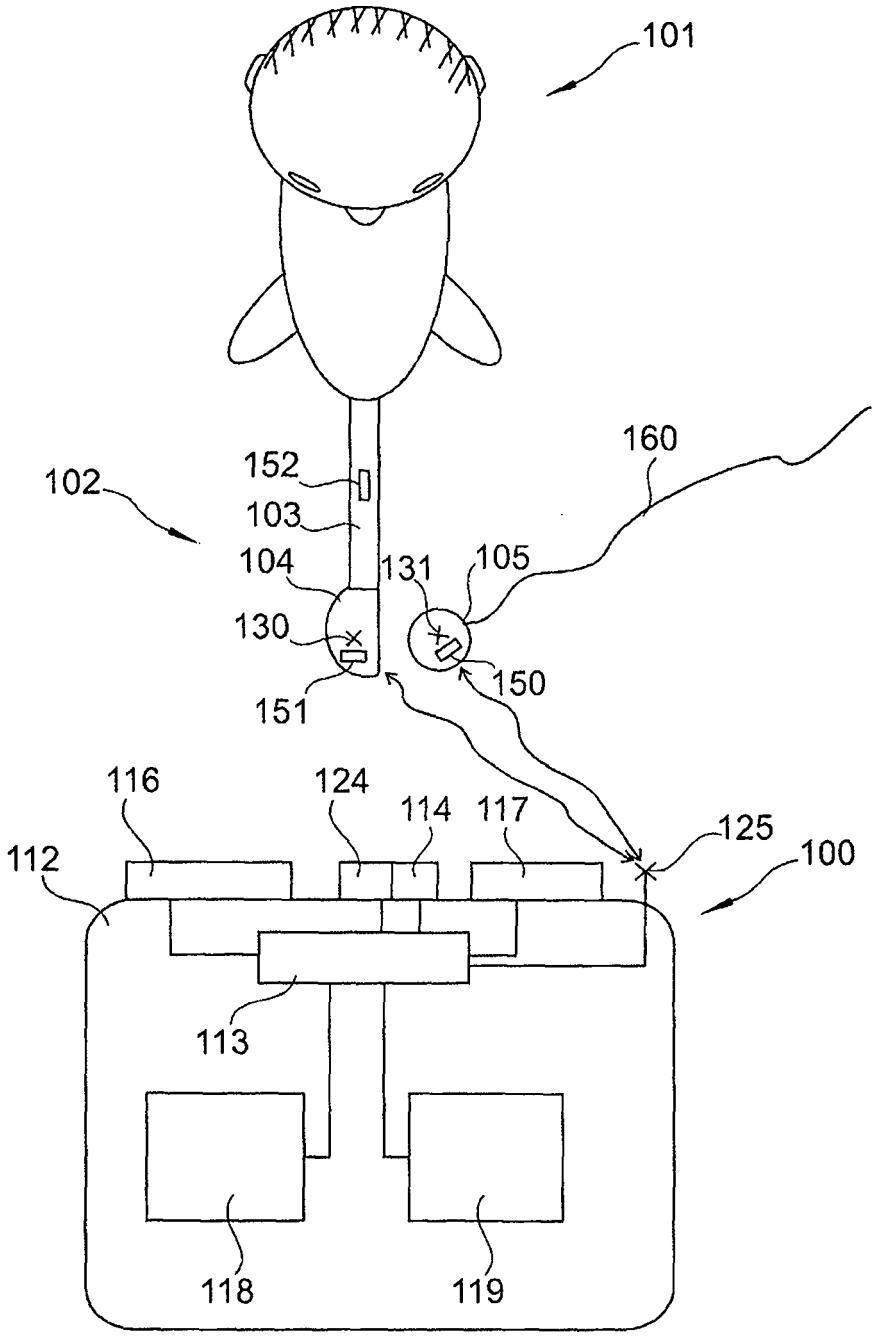
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Fig. 1

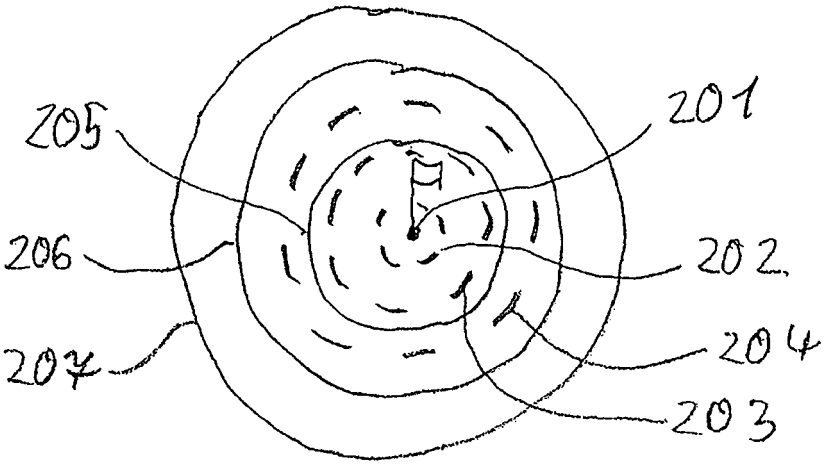


Fig 2

European Patent Office

# EUROPEAN SEARCH REPORT

Application Number
EP 07 00 1185

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X<br>Y | WO 97/01376 A (NATION)<br>16 January 1997 (1997-01-16)<br>* page 6, line 5 - page 13, line 21; figures 1-4 * | 1-5,7,8,<br>10-20<br>9 | INV.<br>A63F13/10<br>A63B69/36 |
| Y<br>A | EP 1 184 059 A (KONAMI CORP [JP])<br>6 March 2002 (2002-03-06)<br>* paragraph [0009] - paragraph [0060]; figures 1-19 * | 9<br>1-3 | ADD.<br>A63B69/00 |
| X | US 2005/023763 A1 (RICHARDSON)<br>3 February 2005 (2005-02-03)<br>* paragraph [0036] - paragraph [0067]; figures * | 1-5,7,<br>10-20 | |
| X | EP 1 202 236 A (MIDWAY AMUSEMENT GAMES)<br>2 May 2002 (2002-05-02)<br>* paragraph [0022] - paragraph [0026]; figures 1,2 * | 1,2,4-7,<br>10-20 | |
| D,X | US 6 176 789 B1 (KLUTTZ ET AL.)<br>23 January 2001 (2001-01-23)<br>* column 3, line 12 - column 8, line 20; figures 1-6 * | 1-5,7,8,<br>12-20 | TECHNICAL FIELDS SEARCHED (IPC)<br>A63F<br>A63B |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| The Hague | 23 October 2007 | Williams, Mark |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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23-10-2007

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| WO 9701376 A | 16-01-1997 | AU 696165 B2 | 03-09-1998 |
| | | AU 6141896 A | 30-01-1997 |
| | | GB 2318300 A | 22-04-1998 |
| | | JP 11508170 T | 21-07-1999 |
| | | US 6012987 A | 11-01-2000 |
| EP 1184059 A | 06-03-2002 | JP 2002052246 A | 19-02-2002 |
| | | KR 20020013792 A | 21-02-2002 |
| | | TW 233830 B | 11-06-2005 |
| US 2005023763 A1 | 03-02-2005 | CA 2476010 A1 | 30-01-2005 |
| | | US 2006063574 A1 | 23-03-2006 |
| EP 1202236 A | 02-05-2002 | CA 2357647 A1 | 27-03-2002 |
| | | US 6648760 B1 | 18-11-2003 |
| US 6176789 B1 | 23-01-2001 | NONE | |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION

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### Patent documents cited in the description


- US 6176789 B **[0003]**