

Specification

Title of the Invention:

Darts Gaming Device, Darts Fraud Determining Method, and Program

Technical Field

5 [0001]

The present invention relates to a darts gaming device, darts fraud determining method, and program.

Background Technology

[0002]

10 A darts gaming device for competing for a score based on a position where a dart penetrates or hits is conventionally known. With a conventional darts gaming device, a plurality of business- or home-use darts gaming devices are mutually communicably connected, such that strangers can play a common or a competitive game one-on-one or as a team.

[0003]

15 On the other hand, with a conventional darts gaming device, distant players are communicably connected with each other to play, and therefore, a playing condition of an opponent could not be visually confirmed. Thus, there was a problem where a fraudulent act (for example, acts such as pushing a target segment of a dartboard with a finger, or directly inserting a dart by hand to make it illegally appear as though a targeted location on a target
20 was hit (Hereinafter, the acts are collectively referred to as "finger pressing".) by a player was easy to perform.

[0004]

With regard to this problem, Patent Document 1 discloses a darts gaming device that contains: a target for an dart launched by a player; hit detecting means that detects a hit based
25 on a rearward displacement of the target; and finger press determining means that determines that a finger press by a player has occurred when a duration of a hit detection signal from the hit detecting means is longer than a finger press determination reference time. With this configuration, a fraudulent act due to a finger press by a player can be determined.

Prior Technology Documents

30 Patent Documents

[0005]

Patent Document 1: JP 2010-187908 A

Summary of the Invention

Problem to be Solved by the Invention

35 [0006]

With the conventional darts gaming device, when a dart is inserted by hand to a depth where a hit in the target is not detected, and then inserted all the way by instantaneously pressing with great force by hand from behind the dart such that a hit is detected, duration of a hit detection signal can be made shorter than a determination reference time, and therefore, there were cases where a fraudulent act could not be appropriately determined.

[0007]

Therefore, an object of the present invention is to provide a darts gaming device, a darts fraud determining method, and a program that can detect an impact applied on a dartboard in order to determine a fraudulent act.

Means for Solving Problems

[0008]

A darts gaming device according to an aspect of the present invention is a darts gaming device providing a darts game where a player throws a dart towards a dartboard, containing: a hit detecting sensor that detects that an object has hit a target segment of the dartboard; an impact sensor that detects an impact applied on the dartboard; a fraud determining part that determines whether or not there is a possibility that the player committed a fraudulent act; and an output part that outputs a result of the determination; wherein the fraud determining part determines that there is a possibility that the player committed a fraudulent act when the hit detecting sensor detects that an object has hit the segment and when a first condition is satisfied where an impact value due to the impact detected by the impact sensor is smaller than a predetermined impact value.

[0009]

A darts game fraud determining method according to an aspect of the present invention is a darts game fraud determining method performed by a darts gaming device providing a darts game where a player throws a dart toward a dartboard, including: a hit detecting step of detecting that an object has hit a target segment of the dartboard; an impact detecting steps of detecting an impact applied on the dartboard; a determining step of determining whether or not there is a possibility that the player committed a fraudulent act; and an outputting step of outputting a result of the determination; wherein the determining step determines that there is a possibility that the player committed a fraudulent act when an object has been detected to have hit the segment and when a first condition is satisfied where an impact value due to the impact detected by the impact sensor is smaller than a predetermined impact value.

[0010]

A program providing a darts game where a player throws a dart at a dartboard, executed by a computer, provided with: a hit detecting function that detects that an object has hit a target segment of the dartboard; an impact detecting function of detecting an impact applied on the dartboard; a fraud determining function that determines whether or not there is a possibility that the player committed a fraudulent act; and an outputting function of outputting a result of the determination; wherein the fraud determining function determines that there is a possibility that the player committed a fraudulent act when the hit detecting function detects that an object has hit the segment and when a first condition is satisfied where an impact

value due to the impact detected by the impact sensor is smaller than a predetermined impact value.

Effect of the Invention

[0011]

- 5 The present invention can provide a darts gaming device, a darts fraud determining method, and a program that can detect an impact applied on a dartboard to determine a fraudulent act.

Brief Description of the Drawings

[0012]

FIG. 1 is an external perspective view of a darts gaming device according to an embodiment.

- 10 FIG. 2 is a front surface view of a dartboard.

FIG. 3 is a diagram illustrating an example of a hardware configuration of the darts gaming device.

FIG. 4 is a diagram illustrating an example of a functional block configuration of the darts gaming device.

- 15 FIG. 5 is a flowchart showing an example of an operation of the darts gaming device.

FIG. 6 is a flowchart showing an example of an operation after links A and B in FIG. 5.

FIG. 7 is a flowchart showing an example of an operation of the darts gaming device.

FIG. 8 is a flowchart showing an example of an operation after links A and B in FIG. 7.

Description of the Preferred Embodiments

- 20 [0013]

A preferred embodiment of the present invention will be described while referring to the attached drawings. Note that in the drawings, components with the same symbol have the same or a similar configuration.

[0014]

- 25 Overall Configuration

- FIG. 1 is an external perspective view of a darts gaming device according to an embodiment. As illustrated in FIG. 1, a darts gaming device 10 is formed of, for example, a vertical rectangular solid shape. The darts gaming device 10 provides to a player, for example, a dart game where one player continuously throws three darts in one round or the like. The darts are not particularly limited, and may be soft darts, hard darts, or the like.
- 30

[0015]

- The darts gaming device 10 is provided with a dartboard 12 and a displaying device 14. The dartboard 12 is configured at an essentially eye-level position of a player standing, on a front surface of the darts gaming device 10. The displaying device 14 displays a still image or a moving image.
- 35

[0016]

Furthermore, a coin insertion port, mode selecting switch, and the like are provided on the front surface of the darts gaming device 10. The player inserts a fee into the coin insertion port, presses the mode selecting switch to select a game mode, and plays the dart game. With this dart game, the player stands at a predetermined position in front of the darts gaming device 10 and throws a dart at a predetermined target on the dartboard 12. If a dart reaching the dartboard 12 is a hard dart and a tip end portion pierces the dartboard 12, or if the dart is a soft dart where a tip end portion thereof is made of resin and a plurality of holes not illustrated in the drawings are formed on a target 18 of the dartboard 12 for a dart to pierce and engage such that the dart engages in the hole (hereinafter, these events are collectively referred to as "dart pierced into the dartboard or the like"), a coordinate position of piercing or the like dart is detected, and a score is displayed on the displaying device 14 based on the position of the piercing or the like.

[0017]

FIG. 2 is a front surface view of the dartboard 12. A speed sensor 16 is attached on an upper left portion of the dartboard 12, which measures speed of a peripheral object, and then outputs speed data indicating a measured speed of the object. Note that an attachment position of the speed sensor 16 is not limited to the location in FIG. 2. Attaching at any position is possible so long as the speed of a dart can be measured.

[0018]

The target 18 is divided into a plurality of segments with different scores, and a displacement sensor 22 (segment sensor) that detects which segment of the plurality of segments is depressed is attached to a back surface of the target 18.

[0019]

An impact sensor 20 that detects an impact applied to the dartboard 12 is attached to the dartboard 12. For example, impact sensors 20 are attached to the dartboard 12 at four locations, which include essentially upper center, lower center, left center, and right center portions as illustrated in FIG. 2, but there is no restriction to these locations and number.

[0020]

A plurality of light sources 24A attached to a periphery of the dartboard 12 and a plurality of light sensors 24B that detect an intensity of light emitted from the light sources are attached as positional detecting sensors 24. For example, the light sources 24A and light sensors 24B are attached to the dartboard 12 near essentially upper center and lower center portions and four corners as illustrated in FIG. 2, but there is no restriction to these locations and number.

[0021]

Hardware Configuration

FIG. 3 is a diagram illustrating an example of a hardware configuration of the darts gaming device 10. The darts gaming device 10 is provided with the displaying device 14, the speed sensor 16, the impact sensor 20, the hit detecting sensors (displacement sensor 22 and

position detecting sensor 24), an operating device 26, a target camera 27, a player camera 28, an input/output interface 29, and a controlling device 30. Note that in the darts gaming device 10, for example, the speed sensor 16, target camera 27, player camera 28, or input/output interface 29 may be appropriately selected and provided. The controlling device 30 is provided with a CPU 32 and memory 34 that control an entire system.

[0022]

When a power source of the darts gaming device 10 is turned ON, the CPU 32 reads a game program in accordance with a boot program stored in the memory 34, and then outputs a game screen to the displaying device 14. Furthermore, a game mode desired by a player is advanced by a coin insertion signal from the operating device 26, an input signal from a selecting switch or starting switch, or the like.

[0023]

The speed sensor 16 is a sensor installed on the dartboard, that outputs speed data indicating speed of a measured object. Furthermore, the speed sensor 16 may, for example, also be a sensor that discretely outputs speed data indicating speed of an object detected by the speed sensor 16.

[0024]

The speed sensor 16 may, for example, be a Doppler sensor attached to the dartboard 12 such that microwaves are emitted toward a space between the player and darts gaming device 10. The speed sensor 16 detects speed of an object using a differential between a frequency of the emitted microwaves and a frequency of microwaves reflected from a moving object.

[0025]

The impact sensor 20 detects an impact applied on the dartboard. The impact sensor 20, for example, is used to detect that a dart has hit any location on the entire dartboard 12. The displacement sensor 22 cannot detect that a dart has hit unless the dart hits the target 18. However, the impact sensor 20 can detect that the dart has hit even if the dart has hit a location off of the target 18.

[0026]

The displacement sensor 22 is a sensor that detects that an object has hit by measuring rearward displacement of the target 18 of the dartboard. The displacement sensor 22 is, for example, a segment sensor provided for each segment and configured from a switch group. The segment sensor identifies a segment where a dart penetrates or the like by a force applied when the dart hits a segment or the like, pressing a switching corresponding to the segment. With this configuration, the displacement sensor 22 can detect which segment of the plurality of segments is pressed. The darts gaming device 10 can easily identify a position where a dart penetrates or the like in a segment unit by providing the displacement sensor 22.

[0027]

The position detecting sensor 24 detects that an object has hit by measuring light intensity in a periphery of the dartboard. The position detecting sensor 24 may be configured from a plurality of light sources 24A and a plurality of optical sensors 24B that detect light intensity

of light emitted from the light sources. The darts gaming device 10 can determine a position where a dart penetrates into the target 18 or the like in more detail than a segment unit by providing the position detecting sensor 24.

[0028]

5 Specifically, with the position detecting sensor 24, when a dart penetrates into the target 18, the dart shields the light from the light source 24A, and therefore, a light intensity towards the light sensor 24B changes. At least two light sensors 24B may detect the light intensity, and the detection signals may be transmitted to the controlling device 30. Then, the CPU 32 can identify the light intensity ("peak" or "dart shadow") based on the dart, can identify a
10 direction of the dart shadow, and then can use a triangulation technique to calculate a position where the dart is penetrating, based on the outputs of the two light sensors 24B.

[0029]

Note that the displacement sensor 22 and position detecting sensor 24 are both sensors that detect that an object has hit a segment of the dartboard. The displacement sensor 22 and
15 position detecting sensor 24 are collectively referred to as a hit detecting sensor. The hit detecting sensor may, for example, be the displacement sensor 22, the position detecting sensor 24, or both.

[0030]

The target camera 27 is a camera for capturing the target of the dartboard. The target
20 camera 27 is installed such that an image of a dart hitting the target can be captured. The target camera 27 outputs a captured still image or moving image to an image analyzing part 108.

[0031]

The player camera 28 is a camera for capturing at least a portion of a player. The player
25 camera 28 is installed such that an image of a player launching a dart can be captured. The player camera 28 outputs a captured still image or moving image to the image analyzing part 108.

[0032]

The input/output interface 29 has a function of mediating exchange of information
30 performed with an external device. The external device is, for, example, an inputting device such as a keyboard, mouse, or the like, an outputting device for presenting information to the user, or a network such as the Internet or the like. The darts gaming device 10 can communicate with various external devices via the input/output interface 29.

[0033]

35 Functional Block Configuration

FIG. 4 is a diagram illustrating an example of a functional block configuration of the darts gaming device 10. The darts gaming device 10 is provided with a game executing part 100, a speed detecting part 102, an outputting part 104, a fraud determining part 106, and an image

analyzing part 108. Note that in the darts gaming device 10, the speed detecting part 102 and image analyzing part 108 may be appropriately selected and provided.

[0034]

5 The game executing part 100, speed detecting part 102, outputting part 104, fraud determining part 106, and image analyzing part 108 can be implemented by a program stored in the memory 34 based on a process executed by the CPU 32. Furthermore, the program can be stored in a recording medium. The recording medium storing the program may be a non-transitory recording medium. The non-transitory recording medium is not particularly limited, and may be a recording medium such as a USB memory, CD-ROM, and the like, for
10 example.

[0035]

The game executing part 100 has a function of performing various processes for executing a darts game. The various processes include, for example, advancing a game mode selected by a player, determining that a dart has hit the dartboard 12, determining a position where a
15 dart penetrates in the target 18 or the like, calculating a score, displaying in animation for presenting a darts game, and the like.

[0036]

The game executing part 100 determines that timing when the displacement sensor 22 detects a rearward displacement of the target of the dartboard 12 (for example, timing when
20 any one of the plurality of segments included in the target is detected to be pressed) or timing when there is a notification from the position detecting sensor 24 that a dart is penetrating into the target 18 is timing when a dart hits the dartboard 12. Furthermore, the game executing part 100 may, for example, determine that timing when the impact sensor 20 detects an impact is timing when a dart hits the dartboard 12. When determining that a dart
25 has hit the dartboard 12, the game executing part 100 notifies the speed detecting part 102 that a dart has hit the dartboard 12.

[0037]

The speed detecting part 102 has a function of detecting speed of a dart thrown by a player toward the dartboard 12 using speed data indicating speed of an object, which is output and
30 received from the speed sensor 16. Furthermore, speed detecting part 102 may detect speed data received from the speed sensor 16 as a dart speed in a period from timing when the game executing part 100 determines that a dart hits the dartboard 12 to timing that is a predetermined period of time prior to that timing (hereinafter, referred to as "predetermined determination period").

35 [0038]

The speed sensor 16 also includes in the speed data output from the speed sensor 16, in addition to a dart speed, speed data detected by a movement of a player waving an arm, speed data detected by microwaves reflecting on a person walking in a periphery of the darts gaming device 10, and the like.

40 [0039]

In order to appropriately select speed data corresponding to speed of a dart from speed data received from the speed sensor 16, the speed detecting part 102 may make a selection based on timing when a dart hits the dartboard 12 of one or more speed data received from the speed sensor 16 within the predetermined determination period. The speed detecting part 102 may, for example, determine that the speed data received from the speed sensor 16 at timing closest to the determined timing is speed data corresponding to speed of a dart.

[0040]

The predetermined determination period is a period from timing when a dart is determined by the game executing part 100 to have hit the dartboard 12 to timing that is a predetermined period of time (for example, 1 second, 0.5 seconds, or the like) prior to this timing. Thereby, the speed detecting part 102 determines that measurement data measured immediately after a dart has hit the dartboard 12 is speed data corresponding to speed of the dart, and therefore, it is possible to prevent speed data that is not related to the speed of the dart, such as speed data detected by a movement of a player waving an arm, or the like from being erroneously determined to be speed data corresponding to the speed of the dart, and thus a dart speed can be detected with higher accuracy.

[0041]

The outputting part 104 has a function of outputting a determination result of the game executing part 100 or fraud determining part 106. The outputting part 104 may, for example, output a dart speed detected by the speed detecting part 102, a result analyzed by the image analyzing part 108, and the like in addition to the determination result. Herein, "output" includes all outputting modes such as outputting to each functioning part, outputting to the input/output interface 29, outputting to the memory 34, outputting (displaying) to the displaying device 14, and the like.

[0042]

The outputting part 104 may, for example, output fraud determination results of the fraud determining part 106 described later. Specifically, the outputting part 104 may output at least one determination result from (1) outputting a launching result by the game executing part 100 (For example, referred to as determination that a dart has hit the dartboard 12, determination of position where a dart penetrates in the target 18 or the like, a result of calculating a score, and the like. The same applies hereinafter), (2) outputting a fraud detection alert warning that a fraudulent act has been detected, (3) redoing the launch without reflecting anything on the launching result, and (4) outputting the launching result as "OUT" indicating that a dart has not hit the target 18 and a score was not achieved, where (1) to (4) were determined by the fraud determining part 106.

[0043]

The displaying part has a function of displaying speed of a dart detected by the speed detecting part 102 on the displaying part 14.

[0044]

The fraud determining part 106 has a function of determining whether or not there is a possibility that a player committed a fraudulent act. In other words, the fraud determining

part 106 has a function of determining whether or not a player has correctly thrown a dart. A fraudulent act committed by a player is, for example, an act that causes the gaming device 10 to erroneously determine that a dart has been thrown even though a dart has actually not been thrown, due to a player personally depressing a segment with a finger, a player launching an object other than a dart such as a blow dart, or the like. Furthermore, the fraudulent act may also include acts where a dart is actually thrown, but a player does not throw from a predetermined position (throw line) (hereinafter, referred to as "close throw").

[0045]

The fraud determining part 106 determines, for example, whether or not the impact sensor 20 is operating normally, and if the sensor is determined to not be operating normally, determination of whether or not a first condition is satisfied may be omitted. The fraud determining part 106 may, for example, determine that there is a possibility that the impact sensor 20 is not normally operating if an impact value has not been output from the impact sensor 20 within a normal determination threshold time or an output impact value is a default value (such as "0 (zero)" or the like). The normal determination threshold time refers to a normal time when an impact is detected to have been applied on the dartboard from timing when an object is detected to have hit a segment by the hit detecting sensor. With this configuration, when there is a possibility that the impact sensor 20 is not normally operating, the determining process can be omitted.

[0046]

The fraud determining part 106 may, for example, determine that there is a possibility that a player committed a fraudulent act if a condition where a time of a detection signal from the displacement sensor 22 is longer than a predetermined reaction time (hereinafter, referred to as "second condition") is satisfied. The predetermined reaction time is a value for determining whether or not a time of a detection signal to be determined is a time of a detection signal based on an object including a dart fraudulently hitting a target. A threshold of a normal time when a dart is thrown and hits may be set as the predetermined reaction time (for example, approximately 32 msec). With this configuration, a fraudulent act that is clearly recognized as a finger press (time of the detection signal is clearly long) can be determined to be a fraudulent act at an early stage.

[0047]

For example, the fraud determining part 106 determines that there is a possibility that a player committed a fraudulent act if the hit detecting sensor detects that an object has hit a segment, and if a condition where an impact value due to an impact detected by the impact sensor 20 is smaller than a predetermined impact value (hereinafter, referred to as "first condition") is satisfied. The predetermined impact value is a value where the impact value to be determined determines an impact value based on an object including a dart fraudulently hitting a target. A threshold for determining whether or not is an impact value for a hit due to throwing a dart may be set as the predetermined impact value.

[0048]

For a fraudulent act of hitting a target by pressing with a finger or the like, a segment is hit by directly depressing or the like using a finger, and therefore, an impact applied on the

dartboard (in particularly, outside of the target) is smaller than when a dart is thrown as usual. Based thereon, with this configuration of the fraud determining part 106, whether or not a fraudulent act was committed can be determined by determining that the impact value of a hit by a finger press is smaller than an impact value of a hit where throwing a dart was properly performed.

[0049]

The fraud determining part 106 may, for example, determine that there is a possibility that a player committed a fraudulent act if a condition where speed of an object detected by the speed detecting part 102 is included in a predetermined range (hereinafter, referred to as "third condition") is satisfied. The predetermined range is a value indicating a range where the speed to be determined is a normal speed based on a dart being thrown toward the dartboard from a player's hand. For example, an upper limit value and/or lower limit value of the normal speed range may be set as the predetermined range. With this configuration, for example, if a dart is launched using a tool such as a blow dart or the like, if a dart is thrown by a so-called baseball throw, or the like, there is a possibility that the first condition where an impact exceeding the predetermined impact value is applied on the dartboard is not satisfied. However, even in this case, speed exceeding the predetermined speed is exceeded is detected, and thus the third condition is satisfied. Therefore, this act can be detected and be determined to be a fraudulent act.

[0050]

The fraud determining part 106 may, for example, determine that there is a possibility that a player committed a fraudulent act if an analysis result of the image analyzing part 108 satisfies a condition where a darts game is properly performed in accordance with a predetermined standard within a first predetermined period of time (hereinafter, referred to as "fourth condition"). The first predetermined period of time is a period of time when a player who should launch a dart into a predetermined region described later should be present when the player correctly launches a dart such that the darts game is correctly performed. For example, a time such as approximately several tenths of a second (for example, 1 second, 0.5 seconds, and the like) from timing when a dart is detected to have hit the target may be appropriately set as the first predetermined period of time.

[0051]

For example, with the aforementioned configuration, if a player performs an act of moving from the predetermined position and hits the target by directly inserting a dart into the target, the player can be analyzed as not being present in a predetermined region, and the act can be detected and be determined to be a fraudulent act.

[0052]

The fraud determining part 106 may, for example, determine that there is a possibility that a player committed a fraudulent act if an analysis result of the image analyzing part 108 satisfies a condition where an object other than a dart is projected in an image captured within a second predetermined period of time (hereinafter, referred to as "fifth condition"). The second predetermined period of time is a period of time when a dart is projected in the image when a player correctly launches the dart. For example, a time such as approximately several

tenths of a second (for example, 1 second, 0.5 seconds, and the like) from timing when a dart is detected to have hit the target may be appropriately set as the second predetermined period of time.

[0053]

5 With this configuration, when an object other than a dart (for example, a player's hand, finger, or the like) is projected, an act where a player directly inserts a dart in the target by hand, an act where a dart is inserted by hand to a depth where a hit in the target is not detected, and then inserted all the way by instantaneously pressing with great force from behind the dart such that a hit is detected, and the like, can be detected and determined to be a
10 fraudulent act.

[0054]

The fraud determining part 106 may, for example, update a fraud detection count number indicating a number of times that the possibility of the fraudulent act was detected and determine when there is a possibility that a fraudulent act was committed. Specifically, the
15 fraud determining part 106 may update the fraud detection count number by incrementing

[0055]

The fraud determining part 106 may determine whether or not the fraud detection and determination count number is greater than a predetermined count number for each game or round (for example, a first predetermined number of times for each game, and a second
20 predetermined number of times for each round), and may determine at least one of the following (1) to (4): (1) outputting a launching result by the game executing part 100 (For example, referred to as determination that a dart has hit the dartboard 12, determination of position where a dart penetrates in the target 18 or the like, a result of calculating a score, and the like. The same applies hereinafter); (2) outputting a fraud detection alert warning that a
25 fraudulent act has been detected; (3) redoing the launch without reflecting anything on the launching result; and (4) outputting the launching result as "OUT" indicating that a dart has not hit the target 18 and a score was not achieved.

[0056]

For example, the fraud determining part 106 may set a case where the fraud detection and determination count number for each game (hereinafter, referred to as "fraud detection and
30 determination number of times (game)") is less than the first predetermined number of times as the aforementioned (1), a case where the fraud detection and determination number of times (game) is greater than the first predetermined number of times and where the fraud detection and determination count number for each round (hereinafter, referred to as "fraud
35 detection and determination number of times (round)") is less than a second predetermined number of times as the aforementioned (2) and (3), and a case where the fraud detection and determination number of times (game) is greater than the first predetermined number of times and where the fraud detection and determination count number for each round is greater than the second predetermined number of times as the aforementioned (4).

40 [0057]

With this configuration, a range for the number of times an act is determined to be fraudulent can be provided, players that repeatedly commit a fraudulent act can be targeted, and an "OUT" result where points are not applied and redoing of a launch is not allowed, and the like, can be output. Thus, a determination result for suppressing fraudulent acts can be output.

[0058]

When the fraud determining part 106 determines that there is a possibility that a player committed a fraudulent act, the game executing part 100 may not count a score. Furthermore, the game executing part 100 may determine that a player committed a fraudulent act and not count a score when the number of times when it is determined that there is a possibility that a player committed a fraudulent act at the fraud determining part 106 exceeds a preset predetermined count.

[0059]

The image analyzing part 108 has a function of analyzing a still image or moving image. The image analyzing part 108, for example, analyzes an image captured by the player camera and determines whether or not a darts game is being correctly performed in accordance with a predetermined standard. The predetermined standard is a standard indicating that a darts game is being correctly performed, and for example, is a standard indicating that a player who should be throwing (throwing turn) is throwing a dart from a vicinity of a predetermined position in front of the dart gaming device 10 as usual. Specific examples of a darts game that is not correctly performed in accordance with a predetermined standard include: a player is not present in a predetermined region in the captured image; a person other than a player whose turn it is to throw or the like is present in the predetermined region of the captured image; a person that is not a player who should be throwing is throwing a dart; and the like. The predetermined region is a region where a presence of a player can be confirmed when throwing a dart from a vicinity of the predetermined position in front of the dart gaming device 10. Furthermore, a region that may exist when a player is throwing from the predetermined position may be appropriately set as the predetermined region.

[0060]

The image analyzing part 108 may, for example, extract a characteristic of a captured image and then match the characteristic with a characteristic pattern indicating that a player is throwing a dart in accordance with the predetermined standard registered in advance in the memory 34 or the like to analyze whether or not the player is throwing a dart in accordance with the predetermined standard in the image. In the analysis, conventional techniques such as person recognition or the like may be used.

[0061]

The image analyzing part 108, for example, analyzes an image captured by the target camera and determines whether or not an object other than a dart is projected in the image within the second predetermined period of time. The image analyzing part 108 may, for example, extract a characteristic of a captured image and then match the characteristic with a characteristic pattern indicating at least a portion of a dart registered in advance in the memory 34 or the like to analyze whether or not an object other than a dart is projected in the

image. In the analysis, conventional techniques such as image recognition or the like may be used.

[0062]

Operation

- 5 FIGS. 5 to 8 are flowcharts showing an example of an operation of the darts gaming device 10. An operation of the darts gaming device 10 will be described using FIGS. 5 to 8. The operation is repeated for each dart throw. Note that the process order described below is one example and may be appropriately changed.

[0063]

- 10 FIGS. 5 and 6 show an example of an operation of detecting and determining a fraudulent act using the hit detecting sensor and an impact sensor 20, and the flowchart shown in FIG. 5 and the flowchart shown in FIG. 6 are mutually linked by a link indicated by the same reference code.

[0064]

- 15 The darts gaming device 10 detects that an object has hit a target of the dartboard (step S10).

[0065]

- 20 The darts gaming device 10 determines whether or not the second condition where a time of the detection signal from the displacement sensor 22 is longer than the predetermined reaction time is satisfied (step S11).

[0066]

- 25 When the second condition where a time of the detection signal from the displacement sensor 22 is longer than the predetermined reaction time is not satisfied (No in step S11), the darts gaming device 10 determines whether or not the impact sensor 20 is normally operating (step S12).

[0067]

- 30 When the impact sensor 20 is determined to be normally operating (Yes in step S12), the darts gaming device 10 determines whether or not the first condition where an impact value due to an impact detected by the impact sensor 20 is smaller than the predetermined impact value (step S13). Note that when the impact sensor 20 is determined to not be normally operating (No in step S12), the darts gaming device 10 does not determine whether or not the first condition is satisfied (skips step S13). The darts gaming device 10 proceeds to the flowchart in FIG. 6 via link A.

[0068]

- 35 When the second condition where the time of the detection signal from the displacement sensor 22 is longer than the predetermined reaction time is satisfied (Yes in step S11) or when the first condition where the impact value due to an impact detected by the impact sensor 20 is smaller than the predetermined impact value is satisfied (Yes in step S13), the

darts gaming device 10 updates the fraud detection and determination count number (game) (step S14). The darts gaming device 10 proceeds to the flowchart in FIG. 6 via link B.

[0069]

5 As illustrated in FIG. 6, the darts gaming device 10 determines whether or not the updated fraud detection and determination count number (game) is greater than the first predetermined number of times (step S15).

[0070]

10 When the updated fraud detection and determination count number (game) is greater than the first predetermined number of times (Yes in step S15), the darts gaming device 10 updates the fraud detection and determination count number (round) (step S16).

[0071]

When the first condition where impact value due to a detected impact is smaller than the predetermined impact value is not satisfied (No in step S13 in FIG. 5), the darts gaming device 10 outputs a launching result (step S18).

15 [0072]

The darts gaming device 10 determines whether or not the updated fraud detection and determination count number (round) is greater than the second predetermined number of times (step S17).

[0073]

20 When the updated fraud detection and determination count number (round) is smaller than the second predetermined number of times (No in step S17), the darts gaming device 10 outputs a fraud detection alert as a determination result of fraud determination (step S19).

[0074]

25 When the updated fraud detection and determination count number (round) is greater than the second predetermined number of times (Yes in step S17), the darts gaming device 10 outputs a launching result as OUT as a determination result of fraud determination (step S20).

[0075]

30 When the updated fraud detection and determination count number of times (game) is smaller than the first predetermined count (No in step S15), the darts gaming device 10 outputs a launching result as a determination result of fraud determination (step S18).

[0076]

35 FIGS. 7 and 8 show an example of an operation of detecting and determining a fraudulent act using the speed sensor 16, target camera 27, and player camera 28, in addition to the hit detecting sensor and impact sensor 20. The flowchart shown in FIG. 7 and flowchart shown in FIG. 8 are mutually linked by a link indicated by the same reference code. Note that the process order described below is one example and may be appropriately changed.

[0077]

As illustrated in FIG. 7, the darts gaming device 10 captures an image of a player using the player camera 28 (step S30).

[0078]

5 The darts gaming device 10 measures speed of a launched object using the speed sensor 16 and outputs speed data indicating the measured speed of the object (step S31).

[0079]

The darts gaming device 10 captures an image of a target of the dartboard using the target camera 27 (step S32).

[0080]

10 The darts gaming device 10 detects an impact applied on the dartboard using the impact sensor 20 (step S33).

[0081]

15 The darts gaming device 10 detects that an object has hit a segment of the dartboard using the hit detecting sensor (step S34). Note that in steps S30 to S34, the sensors independently perform sensing, and therefore, steps S30 to S34 may be partially or entirely performed in parallel, or the order may be changed.

[0082]

20 The darts gaming device 10 determines whether or not the second condition where a time of the detection signal from the displacement sensor 22 is longer than the predetermined reaction time is satisfied (step S35).

[0083]

25 When the second condition where a time of the detection signal from the displacement sensor 22 is longer than the predetermined reaction time is not satisfied (No in step S35), the darts gaming device 10 determines whether or not the impact sensor 20 is normally operating (step S36).

[0084]

30 When the impact sensor 20 is determined to be normally operating (Yes in step S36), the darts gaming device 10 determines whether or not the first condition where an impact value due to an impact detected by the impact sensor 20 is smaller than the predetermined impact value (step S37). Note that when the impact sensor 20 is determined to not be normally operating (No in step S36), the darts gaming device 10 does not determine whether or not the first condition is satisfied (skips step S37). The darts gaming device 10 proceeds to the flowchart in FIG. 8 via link A.

[0085]

35 When the second condition where the time of the detection signal from the displacement sensor 22 is longer than the predetermined reaction time is satisfied (Yes in step S35) or when the first condition where the impact value due to an impact detected by the impact

sensor 20 is smaller than the predetermined impact value is satisfied (Yes in step S37), the darts gaming device 10 proceeds to the flowchart in FIG. 8 via the link B.

[0086]

- 5 When the impact sensor 20 is determined to not be normally operating (No in step S36) or when the first condition where the impact value due to an impact detected by the impact sensor 20 is smaller than the predetermined impact value is not satisfied (No in step S37), the darts gaming device 10 detects speed of an object thrown by a player toward the dartboard using speed data received from the speed sensor 16 (step S38).

[0087]

- 10 The darts gaming device 10 determines whether or not the third condition where the speed of the detected object is included in the predetermined range is satisfied (step S39).

[0088]

When the third condition is not satisfied (No in step S39), the darts gaming device 10 analyzes a captured image (step S40).

- 15 [0089]

The darts gaming device 10 determines whether or not a result of image analysis satisfies the fourth condition where a darts game is not being correctly performed in accordance with the predetermined standard within the first predetermined period of time (step S41).

[0090]

- 20 When the fourth condition is not satisfied (No in step S41), the darts gaming device 10 determines whether or not the result of image analysis satisfies the fifth condition where an object other than a dart is projected within the second predetermined period of time (step S42).

[0091]

- 25 When the fifth condition is not satisfied (No in step S42), the darts gaming device 10 outputs a launching result (step S43).

[0092]

- 30 When the any of the third condition, fourth condition, or fifth condition is satisfied (Yes in steps S39, S41, or S42), the darts gaming device 10 determines that there is a possibility of a fraudulent act (step S44).

[0093]

The darts gaming device 10 outputs the determination result (step S45).

[0094]

- 35 Note that in the present operation example, an example was described where a determination was made that there is a possibility of a fraudulent act when any of the first condition, second condition, third condition, fourth condition, or fifth condition was satisfied. However, a determination may be made that there is a possibility of a fraudulent act when at

least two of the first condition, second condition, third condition, fourth condition, or fifth condition are satisfied. For example, a determination may be made that there is a possibility of a fraudulent act when the first condition and second condition are satisfied, or a determination may be made that there is a possibility of a fraudulent act when the first condition, third condition, and fifth condition are satisfied.

[0095]

The embodiment described above is used to facilitate understanding of the present invention, and is not meant to limit the present invention. Elements, arrangements, materials, conditions, shapes, sizes, and the like thereof included in the embodiment are not limited to those exemplified and can be appropriately changed. Furthermore, configurations shown in different embodiments can be partially substituted or combined with each other.

[0096]

Note that in the present embodiment, "part" does not simply refer to physical means, but also includes cases where a function provided by a "part" is implemented by software.

Furthermore, one function provided by a "part" or a device may be achieved by two or more physical means or devices, and functions of two "parts" or devices may be achieved by one physical means or device.

Description of Codes

[0097]

10... Darts gaming device, 12... Dartboard, 14... Displaying device, 16... Speed sensor, 18... Target, 20... Impact sensor, 22... Displacement sensor, 24... Position detecting sensor, 24A... Light source, 24B... Light sensor, 26... Operating device, 27... Target camera, 28... Player camera, 29... Input/output interface, 30... Controlling device, 32... CPU, 34... Memory, 100... Game executing part, 102... Speed detecting part, 104... Outputting part, 106... Fraud determining part, 108... Image analyzing part

Claims

[Claim 1]

A darts gaming device providing a darts game where a player throws a dart towards a dartboard, comprising:

5 a hit detecting sensor that detects that an object has hit a target segment of the dartboard;
 an impact sensor that detects an impact applied on the dartboard;
 a fraud determining part that determines whether or not there is a possibility that the player committed a fraudulent act; and
 10 an output part that outputs a result of the determination; wherein
 the fraud determining part determines that there is a possibility that the player committed a fraudulent act when the hit detecting sensor detects that an object has hit the segment and when a first condition is satisfied where an impact value due to the impact detected by the impact sensor is smaller than a predetermined impact value.

15 [Claim 2]

The darts gaming device according to claim 1, wherein the hit detecting sensor is at least one of a displacement sensor that detects that the object has hit by measuring a rearward displacement of a segment of the dartboard, or a position detecting sensor that detects that the object has hit by measuring a light intensity of a periphery of the dartboard.

20 [Claim 3]

The darts gaming device according to claim 2, wherein if the hit detecting sensor is a displacement sensor, the fraud determining part determines that the player may have committed a fraudulent act when a second condition is satisfied where a time of a detection signal from the displacement sensor is longer than a predetermined reaction time.

25 [Claim 4]

The darts gaming device according to any one of claims 1 to 3, further comprising:
 a speed sensor installed on the dartboard, that outputs speed data indicating speed of a measured object; and
 a speed detecting part that detects speed of the object thrown by the player toward the
 30 dartboard, using the speed data received from the speed sensor; wherein
 the fraud determining part determines that there is a possibility that the player committed a fraudulent act when a third condition is satisfied where the detected speed of the object is not within a predetermined range.

[Claim 5]

35 The darts gaming device according to claim 4, further comprising:
 a player camera for capturing at least a portion of the player; and
 an image analyzing part that analyzes an image captured by the player camera and determines whether or not a darts game is being correctly performed in accordance with a predetermined standard within a first predetermined period of time; wherein
 40 the fraud determining part determines that there is a possibility that the player

committed a fraudulent act when a result of the analysis satisfies a fourth condition where the darts game is not being correctly performed in accordance with the predetermined standard.

[Claim 6]

The darts gaming device according to claim 4, further comprising:

5 a target camera for capturing a target of the dartboard; wherein
the image analyzing part analyzes an image captured by the target camera and determines whether or not an object other than a dart is projected in the image within a second predetermined period of time, and

10 the fraud determining part determines that there is a possibility that the player committed a fraudulent act when a result of the analysis satisfies a fifth condition where an object other than the dart is projected.

[Claim 7]

The darts gaming device according to any one of claims 1 to 5, wherein

15 the fraud determining part updates a fraud detection and determination count number indicating a number of times that the possibility of the fraudulent act was detected and determines when there is a possibility that the fraudulent act was committed, and

the output part outputs a result of the determination based on the updated fraud detection and determination count number.

[Claim 8]

20 A darts game fraud determining method performed by a darts gaming device providing a darts game where a player throws a dart toward a dartboard, comprising:

a hit detecting step of detecting that an object has hit a target segment of the dartboard;

an impact detecting steps of detecting an impact applied on the dartboard;

25 a determining step of determining whether or not there is a possibility that the player committed a fraudulent act; and

an output step of outputting a result of the determination; wherein

30 the determining step determines that there is a possibility that the player committed a fraudulent act when an object has been detected to have hit the segment and when a first condition is satisfied where an impact value due to the impact detected by the impact sensor is smaller than a predetermined impact value.

[Claim 9]

A program providing a darts game where a player throws a dart at a dartboard, executed by a computer, comprising:

35 a hit detecting function that detects that an object has hit a target segment of the dartboard;

an impact detecting function of detecting an impact applied on the dartboard;

a fraud determining function that determines whether or not there is a possibility that the player committed a fraudulent act; and

40 an output function of outputting a result of the determination; wherein

the fraud determining function determines that there is a possibility that the player committed a fraudulent act when the hit detecting function detects that an object has hit the

segment and when a first condition is satisfied where an impact value due to the impact detected by the impact sensor is smaller than a predetermined impact value.