

PROGRAM AND DART GAME SYSTEM

Cross-reference to Related Applications

[0001] This application is based on Japanese Patent Application No. 2017-145426 filed on 27 July 2017, the contents of which are incorporated herein by reference.

Technical Field

[0002] The present invention relates to a program and a dart game system.

Background Art

[0003] In a dart game system, when a player throws a dart toward a dart board, a region (segment) stuck by a dart is detected, and a score is given according to the detected segment (for example, Patent Document 1).

Generally, in a dart game, which player will go first is determined by corking. Corking is a rule by which each player throws one dart before the start of a game, and the player who threw at the position closer to the center of the dart board goes first.

Citation List

Patent Document

[0004] Patent Document 1: Patent Publication JP-A-2014-095508

Summary

[0005] Conventionally, the order of throwing is determined by corking, by the players or the judge using their naked eyes to check the positions stuck by the darts.

However, when there is no significant difference between the positions stuck by the darts of both players, spectators who cannot see the dart board at a close distance cannot easily see the outcome of the corking and have to rely on the judgment by the players or the judge. Moreover, when an online remote competition is held, since it

is not possible to immediately see the position hit by a dart of an opponent who is competing at a remote location, it is difficult to see the outcome, and furthermore, the sense of reality is missing.

[0006] Therefore, an object of the present invention is to mechanically determine the outcome of corking in a dart game so that spectators as well as the players and the judge can know the outcome immediately.

[0007] A program according to the present invention causes a computer running a dart game to function as: a hitting-position acquisition unit that acquires positional information of tips of a first dart and a second dart hitting on a dart board; and a determining unit that determines a dart that has hit a position closer to a center of the dart board on the basis of the acquired positional information of the tips of the first and second darts.

[0008] A dart game system according to the present invention includes: a server that executes a dart game; and a dart board apparatus that detects positional information of tips of a first dart and a second dart hitting on a dart board and transmits the positional information to the server, wherein the server includes: a hitting-position acquisition unit that acquires the positional information; and a determining unit that determines a dart that has hit a position closer to a center of the dart board on the basis of the acquired positional information of the tips of the first and second darts.

Advantageous Effects of Invention

[0009] According to the present invention, the outcome of corking in a dart game is determined immediately by the machine so that spectators as well as players and a judge can know the outcome immediately.

Brief Description of Drawings

[0010] Fig. 1 is a block diagram illustrating a configuration of a dart game system 1 according to an embodiment of the present invention.

Fig. 2 is a block diagram illustrating a configuration of a server 10 according to the embodiment of the present invention.

Fig. 3 is a schematic diagram of a configuration of a dart board apparatus 20 according to the embodiment of the present invention.

Fig. 4 is a diagram illustrating a competition method of a dart game according to the embodiment of the present invention.

Fig. 5 is a sequence program of the flow of corking according to the embodiment of the present invention.

Fig. 6 is a diagram illustrating a screen displayed on a display 30 according to the embodiment of the present invention.

Fig. 7 is a diagram illustrating a screen displayed on the display 30 according to the embodiment of the present invention.

Fig. 8 is a sequence program of the flow of a game according to the embodiment of the present invention.

Description of Embodiment

[0011] Hereinafter, an embodiment of the present invention will be described in detail with reference to the drawings.

Embodiment

Fig. 1 is a block diagram illustrating a configuration of a dart game system 1 according to an embodiment of the present invention. As illustrated in Fig. 1, the dart game system 1 includes a server (a computer) 10, a dart board apparatus 20, a

display 30, and a camera system 40. The server 10, the dart board apparatus 20, the display 30, and the camera system 40 are connected via a communication network N. The communication network N may be, for example, the Internet, a LAN, a dedicated line, a telephone line, an intra-enterprise network, a mobile communication network, the Bluetooth (registered trademark), the Wireless Fidelity (Wi-Fi), other communication lines, or any one of combinations thereof, and whether the communication network is a cable network or a wireless network is irrelevant.

[0012] In the present embodiment, players can compete at remote locations. In the example of Fig. 1, although only one dart board apparatus 20, one display 30, and one camera system 40 are illustrated, when players compete at remote locations, a dart board apparatus 20, a display 30, and a camera system 40 at the remote location are also connected to the server 10 via the communication network N.

[0013] Fig. 2 is a block diagram illustrating a configuration of the server 10. The server 10 acquires information of the positions hit by darts thrown by respective players from the dart board apparatus 20 and manages the scores of each player. The server 10 is a general-purpose computer and may be formed of one computer and may be formed of a plurality of computers distributed on the communication network N.

[0014] As illustrated in Fig. 2, the server 10 includes a control device 11 and an external storage device 12. The control device 11 includes, as its hardware configuration, a memory such as a CPU, a ROM, and a RAM, an input interface, an output interface, a communication interface, and a bus connecting these components. The control device 11 realizes various functions by a CPU executing a program stored in a ROM or the like. Functional modules realized by the control device 11

include a hitting-position acquisition unit 111, a determining unit 112, an image display unit 113, and a score management unit 114.

[0015] The external storage device 12 is a hard disk drive or the like and has a game information storage unit 121 mounted therein. Information on a progress state of a game such as information on the scores of each player participating in the dart game is stored in the game information storage unit 121. The game information includes information on the score of a player competing at a remote side.

[0016] Fig. 3 is a schematic diagram of a configuration of the dart board apparatus 20. As illustrated in Fig. 3, the dart board apparatus 20 includes a housing 21 and a control unit 22. A circular target area 211 serving as the target of darts is provided on a front surface of the housing 21, and a plurality of segments 212 partitioned in a radial direction and a circumferential direction is defined in the target area 211.

[0017] The target area 211 is formed of a resin material such as plastics, for example, and a number of holes are formed in the surface thereof. Sensors such as pressure sensors are provided in the rear surface of the target area 211. When a player throws a dart toward the target area 211 and the tip of the dart is stuck in any one of the holes, a physical displacement resulting from the stuck dart is detected by the sensor, and a detection signal specifying a segment in which the tip of the dart is stuck is output to the control unit 22. Furthermore, a more accurate hitting position in a segment region may be detected using a position detection sensor such as an optical sensor. In the case of the dart board apparatus 20 in which holes in the surface and sensors on the rear surface are not provided in the target area 211, it is possible to detect the position at which the tips of darts are stuck with the aid of the position detection sensor such as an optical sensor.

[0018] The control unit 22 includes a CPU, a memory such as a ROM or a RAM, an input interface, an output interface, a communication interface, and a bus connecting these components. The control unit 22 realizes various functions by the CPU executing a program stored in the ROM or the like. The control unit 22 calculates the positional information of hitting positions of darts on the basis of the detection signal output from the sensors on the rear surface of the target area 211 and transmits the positional information to the server 10.

[0019] The positional information of the hitting position of a dart may be information specifying a segment in which the tip of the dart is stuck and may be information specifying a more accurate information on the position at which the tip of a dart is stuck. Moreover, when holes are formed in the surface of the target area 211, the positional information may be information identifying the position of a hole stuck by a dart or the position of a hole closest to the position at which the tip of a dart is stuck.

[0020] The display 30 is a display device such as a liquid crystal display provided on a place where the display 30 is easily visible from players or spectators, such as on the upper side of the dart board apparatus 20 and displays an image related to a game progress state supplied from the server 10. Specifically, a video when a player throws a dart is displayed on a real-time basis. Moreover, a computer graphics (CG) image that reproduces the moment at which a dart is stuck is shown, and a CG image of the target area 211 is also displayed so that spectators can see the position stuck by the dart.

[0021] The camera system 40 is provided so as to be able to capture a video of players throwing darts. The camera system 40 transmits the captured video to the server 10.

[0022] Next, the progression of a dart game according to the dart game system 1 will be described. In this example, as illustrated in Fig. 4, a case will be described in which player A and player B compete at different venues (first and second venues) at remote locations. That is, player A throws darts toward the dart board apparatus 20A at the first venue and player B throws darts toward the dart board apparatus 20B at the second venue. The flow of processes is the same when competition is performed using the same dart board apparatus 20 at the same venue.

[0023] (Corking Determination)

Before an actual competition starts, corking is performed to determine which player will go first. Fig. 5 is a sequence program of the flow of corking.

First, when player A starts throwing his/her dart A toward the dart board apparatus 20A from a throwing position (a throw line), a video in which player A throws the dart is recorded by the camera system 40A and is transmitted to the server 10 on a real-time basis (step S101).

[0024] The image display unit 113 of the server 10 displays the live video of player A received from the camera system 40A on the displays 30A and 30B in both venues (step S102).

[0025] When the thrown dart A hits the target area 211, the positional information of the hitting position of the dart A is transmitted from the dart board apparatus 20A to the server 10 (step S103). The positional information may be information identifying a segment including the position at which the dart A is stuck and information specifying a more accurate position at which the dart A is stuck.

[0026] The hitting-position acquisition unit 111 of the server 10 acquires the positional information of the hitting position of the dart A from the dart board apparatus 20A

(step S104). Subsequently, the image display unit 113 of the server 10 displays a CG image indicating the hitting position of the dart A on the displays 30A and 30B on the basis of the acquired positional information (step S105).

[0027] Fig. 6 is a diagram illustrating a screen displayed on the displays 30A and 30B. As illustrated in the drawing, a CG image indicating the target area 211 of the dart board apparatus 20 is displayed in a display area P1 at the center of the screen, and the video of the player A received from a camera system 40A is displayed in a display area P2 next to the display area P1. In the display area P1, a CG image is displayed reproducing a scene in which the dart A is stuck in the target area 211 at the timing at which the dart A thrown by the player A is stuck in the target area 211, for example. Subsequently, a CG image in which the dart is stuck at the hitting position of the dart A is displayed. The CG image is displayed with the position and the zooming of a virtual camera adjusted according to the hitting position of the dart A, so that the hitting position of the dart A is easily visible. From the moment the player A starts throwing the dart until the dart A is stuck in the target area 211 A, a real-time movie of the player A is displayed in the display area P2. After the dart A is stuck in the target area 211 and rendering of the CG image of the dart A is shown in the display area P1, a still image of the player A having thrown the dart A may be displayed in the display area P2.

[0028] Subsequently, when the player B starts throwing his/her dart B toward the dart board apparatus 20B, a video in which the player B throws the dart B is recorded by a camera system 40B and is transmitted to the server 10 on a real-time basis (step S106).

[0029] The image display unit 113 of the server 10 displays the live video of the player B received from the camera system 40B on the displays 30A and 30B in both venues (step S107).

[0030] When the thrown dart B hits the target area 211, the positional information (information identifying a segment including the position at which the dart B is stuck or information identifying the position at which the dart B is stuck) of the hitting position of the dart B is transmitted from the dart board apparatus 20B to the server 10 (step S108).

[0031] The hitting-position acquisition unit 111 of the server 10 acquires the positional information of the hitting position of the dart B from the dart board apparatus 20B (step S109). Subsequently, the image display unit 113 of the server 10 displays a CG image indicating the hitting positions of the darts A and B on the displays 30A and 30B on the basis of the acquired positional information (step S110).

[0032] Fig. 7 is a diagram illustrating a screen displayed on the displays 30A and 30B. As illustrated in the drawing, a CG image indicating the target area 211 of the dart board apparatus 20 is displayed in the display area P1 at the center of the screen, and the videos of the players A and B received from the camera systems 40A and 40B are displayed in the display areas P2 and P3 on both sides. A CG image reproducing a scene in which the dart B is stuck in the target area 211 at a timing at which the dart B thrown by the player B is stuck in the target area 211, for example, is displayed in the display area P1, and subsequently, an image in which the darts A and B are stuck at the respective hitting positions is displayed.

[0033] As illustrated in Fig. 7, the CG image is displayed in the display area P1 so that the position and the zooming of a virtual camera are adjusted and the hitting positions of the darts A and B are easily visible. Specifically, the position of a virtual camera is

adjusted so that two darts do not overlap on a screen, and a hitting area of the darts is displayed at an enlarged scale so that the difference in the tip positions of the darts is clearly seen. The video of the player A is displayed in the display area P2 until the dart is stuck after the player A started throwing the dart as described in Fig. 6, and the still image of the player A is displayed after the throwing ends. When the player A finishes throwing, a real-time video of the player B having started throwing a dart is displayed in the display area P3. After the dart B thrown by the player B hits the target area 211 and rendering of the CG image is performed in the display area P1, a still image of the player B is displayed in the display area P3. The distance from the center of the target area 211, of the hitting position of each player may be displayed below the images of the players A and B.

[0034] Subsequently, the determining unit 112 of the server 10 determines a dart hitting the position closer to the center of the target area 211 on the basis of the positional information of the hitting positions of the darts A and B acquired from the dart board apparatuses 20A and 20B, respectively (step S111). Specifically, a dart of which the distance between the center of the target area 211 and the hitting position of the tip of the display area is smaller is determined. When information identifying a segment including the stuck position of the dart is acquired as the positional information, a dart hitting a segment closer to the center of the target area 211 is determined.

[0035] The image display unit 113 of the server 10 displays the information on the player having thrown the dart determined to be closer to the center of the target area 211 (winner) on the displays 30A and 30B (step S112). For example, letters "WIN" may be displayed below the image of the winner, out of the players displayed in the display areas P2 and P3 of Fig. 7. Moreover, rendering may be performed, such as

brightening of the image of the winner and darkening of the image of the player who lost, or flashing of the dart of the winner in the display area P1. In the subsequent games, the player who wins the corking goes first.

[0036] When the outcome of corking is not determined in the first throwing (the corking ends in a draw), both players throw again (rethrow) to determine the outcome. Determination of a draw is done, for example, by the determining unit 112 by identifying the positions of the holes in the target area 211 closest to the hitting positions of the respective darts A and B on the basis of the positional information of the hitting positions of the darts, and when the holes are the same, it may be determined that the corking ended in a draw. Moreover, it may be determined that the corking ended in a draw when the difference (distance) between the hitting positions of the darts A and B is within a predetermined range of values. When it is determined that the corking ended in a draw, letters “AGAIN”, for example, may be displayed on the displays 30A and 30B rather than displaying the information on the winner. When rethrowing is performed, a process similar to the flow illustrated in Fig. 5 is performed. Although the order of throwing in the first corking is determined by lottery such as coin flipping, the order of throwing is reversed from the first corking in the case of a rethrowing at the time of a draw. In this manner, throwing is repeated while changing the order of throwing until the outcome of corking is determined.

[0037] (Progression of Game)

When the player who will go first is determined by corking, a main game starts subsequently. Fig. 8 is a sequence program of the flow of a game.

First, the player who goes first (in this example, the player A) throws his/her dart A toward the dart board apparatus 20A. The video in which the player A throws

the dart is recorded by the camera system 40A and is transmitted to the server 10 on a real-time basis (step S201).

[0038] The image display unit 113 of the server 10 displays a live-view video of the player A received from the camera system 40A on the displays 30A and 30B in both venues on a real-time basis (step S202).

[0039] When the thrown dart A hits the target area 211, the positional information of the hitting position of the dart A is transmitted from the dart board apparatus 20A to the server 10 (step S203). The positional information may be information identifying a segment including the stuck position of the dart A or may be information identifying the stuck position of the dart A.

[0040] The hitting-position acquisition unit 111 of the server 10 acquires the positional information of the hitting position of the dart A from the dart board apparatus 20A (step S204). Subsequently, the image display unit 113 of the server 10 displays a CG image reproducing a scene in which the dart A is stuck in the dart board on the displays 30A and 30B on the basis of the acquired positional information (step S205). For example, subsequently to the CG image reproducing a scene in which the dart A is stuck in the target area 211, a CG image in which the dart is stuck at the hitting position of the dart A is displayed.

[0041] Subsequently, the latter player (in this example, the player B) throws his/her dart B toward the dart board apparatus 20B. A video in which the player B throws the dart is recorded by the camera system 40B and is transmitted to the server 10 on a real-time basis (step S206).

[0042] The image display unit 113 of the server 10 displays a live-view video of the player B received from the camera system 40B on the displays 30A and 30B in both venues on a real-time basis (step S207).

[0043] When the thrown dart B hits on the target area 211, the positional information of the hitting position of the dart B is transmitted from the dart board apparatus 20B to the server 10 (step S208). The positional information may be information identifying a segment including the stuck position of the dart B or information identifying the stuck position of the dart B.

[0044] The hitting-position acquisition unit 111 of the server 10 acquires the positional information of the hitting position of the dart B from the dart board apparatus 20B (step S209). Subsequently, the image display unit 113 of the server 10 displays a CG image reproducing a scene in which the dart B is stuck in the dart board on the displays 30A and 30B on the basis of the acquired positional information (step S210). For example, subsequently to the CG image reproducing a scene in which the dart B is stuck in the target area 211, a CG image in which the dart is stuck at the hitting position of the dart B is displayed.

[0045] The score management unit 114 of the server 10 updates and manages the total points of the players on the basis of the points acquired in one throwing of the players (step S211). Specifically, the score management unit 114 can update the total points of the respective players according to the score allocated to the hit segment on the basis of the positional information of the hitting positions of the darts of the respective players.

[0046] As described above, in corking for determining which player goes first, the server 10 acquires information on the hitting position on the hitting positions of the darts thrown by each player to determine which is closer to the center of the dart

board, according to the present embodiment. In this way, even when there is no significant difference in the position of the darts of the respective players, it is possible to determine the outcome of the corking quickly and accurately by automated determination. Moreover, spectators who cannot see the dart board at a close distance as well as players and spectators at remote locations can immediately know the outcome of corking.

[0047] In corking or a main game, since a CG image indicating the hitting positions of the respective darts on the dart board is displayed on the display 30 on the basis of the acquired positional information of the darts thrown by the respective players, the players and spectators in all venues can immediately know the hitting positions of the darts and the outcome of the corking or the game. Moreover, since the hitting positions of the darts can be identified quickly and accurately with the aid of the CG image, such a sense of reality that competition is performed in front of players or spectators can be realized.

[0048] Since the position and the zooming of the virtual camera are adjusted when reproducing a CG image so that the hitting positions of the respective players are easily visible, the hitting positions of the darts of the respective players and the outcome which is difficult to determine can be known easily and accurately.

[0049] Since the positional information of the hitting positions of darts transmitted from the dart board apparatus 20 to the server 10 is the accurate hitting positions of the darts, even when there is no significant difference in the hitting positions of the darts of the respective players, it is possible to determine the outcome accurately. Moreover, it is possible to reproduce an accurate CG image of the hitting positions of the darts.

[0050] The positional information of the hitting positions of darts transmitted from the dart board apparatus 20 to the server 10 may be information identifying segments including the hitting positions of darts. By receiving the information on the hit segments, the server 10 can calculate the scores of players with a simple processing.

[0051] Since the server 10 only receives the information of the hitting position of darts and not the video of the dart board with darts stuck as recorded by the camera, and generates a CG image indicating the hitting positions of the darts on the basis of the received information, it is possible to generate a CG image accurately and quickly with a small amount of data. Therefore, it is possible to improve the efficiency of data transmission/reception and the efficiency of image display processing.

[0052] The sense of reality can be enhanced further by adding the following rendering to the CG image displayed on the display 30 in corking or a main game. For example, a sensor capable of detecting a speed such as a Doppler sensor may be provided to measure the speed of a dart thrown by a player, and how a dart flies may be rendered in the CG image on the basis of the actually measured speed. Specifically, for example, when the measured speed is faster than a predetermined value, an image may be generated so that a dart flies straight and hits the dart board. When the measured speed is slower than the predetermined value, on the other hand, an image may be generated so that a dart flies along a curved trajectory and hits the dart board.

[0053] Rendering that uses effects may be added. For example, when a dart hits a high-score segment, such rendering that the dart emits light may be applied. The designs of darts of respective players may be registered in advance, and the darts may be displayed on the basis of the registered designs when the darts are reproduced in a CG image.

[0054] In the present embodiment, the CG image based on the positional information of the hitting positions of darts can be downloaded to mobile terminals or personal computers held by players via the communication network N. In this way, players can easily know the outcomes of past competitions in the CG image.

[0055] The present invention is not limited to the embodiments described above, and can be implemented in various other forms without departing from the spirit of the present invention. Therefore, the embodiments described above are merely examples in every aspect and are not intended to be construed in a limiting sense. For example, the order of the processing steps described above may be changed arbitrarily or the processing steps may be executed in parallel as long as no conflict occurs in the details of the processing. Other steps may be added between the respective processing steps. Moreover, a step described as one step may be executed in a plurality of steps, and a plurality of steps may be grasped as one step.

Reference Signs List

[0056]

1	Dart board game system
10	Server
11	Control device
12	External storage device
20, 20A, 20B	Dart board apparatus
21	Housing
22	Control unit
30, 30A, 30B	Display

40, 40A, 40B	Camera system
111	Hitting-position acquisition unit
112	Determination unit
113	Image display unit
114	Score management unit
121	Game information storage unit
211	Target area
212	Segment

What is claimed is:

1. A program for causing a computer executing a dart game to function as:

a hitting-position acquisition unit for acquiring positional information of respective tips of a first dart and a second dart hitting on a dart board; and

a determining unit for determining a dart that has hit a position closer to a center of the dart board on a basis of the acquired positional information of the tips of the first and the second darts.
2. The program according to claim 1, further causing the computer to function as:

an image display unit for generating an image indicating the hitting position of the respective darts on the dart board on the basis of the acquired positional information of the tips of the first and the second darts respectively, to display the image on a display device.
3. The program according to claim 1 or 2, wherein

the hitting-position acquisition unit acquires information on the hitting positions of the tips of the respective darts on the dart board, and

the determining unit determines a dart hitting a position closer to the center of the dart board.
4. The program according to claim 1 or 2, wherein

the hitting-position acquisition unit acquires information on a segment region on which the tip of each dart hits among a plurality of segment regions defined on the dart board, and

the determining unit determines a dart that has hit a segment region closer to the center of the dart board.

5. The program according to claim 2, wherein the image display unit adjusts a position and a zooming of a virtual camera when reproducing the image on the basis of the hitting position of the dart on the dart board.

6. The program according to claim 2, wherein the image display unit displays an image reproducing a scene in which a dart hits the dart board on the display device on the basis of a speed of each dart thrown.

7. A dart game system comprising:

a server configured to execute a dart game; and

a dart board apparatus configured to detect positional information of tips of a first dart and a second dart hitting on a dart board to transmit the positional information to the server, wherein

the server includes:

a hitting-position acquisition unit that acquires the positional information; and

a determining unit that determines a dart that has hit a position closer to a center of the dart board on the basis of the acquired positional information of the tips of the first and second darts.