CHIP RECOGNITION SYSTEM

BACKGROUND

Technical Field

[0001]

The present invention relates to a chip recognition system that recognizes stacked chips.

Related Art

[0002]

In games such as a baccarat game, betting is done by stacking a plurality of chips. Hence, there is a need to correctly recognize the stacked chips.

SUMMARY

[0004]

Embodiments of the present invention seek to provide a chip recognition system capable of accurately recognizing stacked chips.

An aspect of the present invention provides a chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table. The chip recognition system comprises a game recording apparatus that records, as an image, a state of chips stacked on the gaming table, using a camera; an image analysis apparatus that performs an image analysis on the recorded image of the state of chips; a plurality of chip determination apparatuses comprising at least a first apparatus that uses artificial intelligence to determine a number of the chips stacked,

using an image analysis result obtained by the image analysis apparatus, wherein the determination of the number of the chips stacked is made separately by different respective ones of the plurality of chip determination apparatuses, thereby providing a plurality of respective results of the determination of the number of the chips stacked; and a second apparatus that is configured to compare the plurality of respective results to one another; based on the comparison, identify that the respective results of the determination of the number of the chips differ between different ones of the plurality of chip determination apparatuses; and in response to the identification, determine which one of the different determination results to select as being correct or otherwise decide a correct number of the chips stacked.

Another aspect of the present invention provides a chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table. The chip recognition system comprises a game recording apparatus that records, as an image, a state of chips stacked on the gaming table, using a camera; an image analysis apparatus that performs an image analysis on the recorded image of the state of chips; a plurality of chip determination apparatuses comprising at least a first apparatus that uses artificial intelligence to determine a number and a type of the chips stacked, using an image analysis result obtained by the image analysis apparatus, wherein the determination of the number and the type of the chips stacked is made separately by different respective ones of the plurality of chip determination apparatuses,

thereby providing a plurality of respective results of the determination of the number and the type of the chips stacked; and a second apparatus that is configured to compare the plurality of respective results to one another; based on the comparison, identify that the respective results of the determination of the number and the type of the chips differ between different ones of the plurality of chip determination apparatuses; and in response to the identification, determine which one of the different determination results to select as being correct or otherwise decide a correct number or type of the chips stacked.

Another aspect of the present invention provides a chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table. The chip recognition system comprises a game recording apparatus that records, as an image, a state of chips stacked on the gaming table, using a camera; an image analysis apparatus that performs an image analysis on the recorded image of the state of chips; a chip determination apparatus comprising an artificial intelligence apparatus that determines a number of chips bet by a player, using an image analysis result obtained by the image analysis apparatus; a physical measurement determination apparatus that determines a number of the chips bet by the player, by a physical measurement method different from a method used by the artificial intelligence apparatus; and a management and control apparatus that controls the image analysis apparatus, the chip determination apparatus, and the physical measurement determination apparatus,

wherein the management and control apparatus further has a function of comparing the numbers of chips determined by the chip determination apparatus and the physical measurement determination apparatus to thereby identify that the compared numbers differ; and in response to the identification, outputting and displaying “undetermined” as a determination result.

Another aspect of the present invention provides a chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table. The chip recognition system comprises a plurality of cameras that obtain images of a chip bet by a player from different positions or different angles; a game recording apparatus that records, as images, a state of chips stacked on the gaming table, using the plurality of cameras; an image analysis apparatus that performs an image analysis on the recorded images of the state of chips; a plurality of chip determination apparatuses comprising at least a first apparatus that determines a number of the chips stacked, using an image analysis result obtained by the image analysis apparatus, wherein the determination of the number of the chips stacked is made separately by different respective ones of the plurality of chip determination apparatuses, thereby providing a plurality of respective results of the determination of the number of the chips stacked; and a management and control apparatus that controls the image analysis apparatus and the plurality of chip determination apparatuses. The management and control apparatus further has a second apparatus configured to compare the plurality of

respective results to one another; based on the comparison, identify that the results of the determination of the number of chips differ between different ones of the plurality of chip determination apparatuses; and in response to the identification, analyze the images in the game recording apparatus to determine whether the difference in the results of the determination is caused by a stacking state of the chips stacked on the gaming table; and decide a correct number of the chips stacked, based on the results of the determination obtained by the respective plurality of chip determination apparatuses and based on the determination of whether the different is caused by the stacking state.

[0005]

According to one embodiment, provided is a chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table, the chip recognition system comprising: a game recording apparatus that records, as an image, a state of chips stacked on the gaming table, using a camera; an image analysis apparatus that performs an image analysis on the recorded image of the state of chips; a plurality

What is claimed is:

1. A chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table, the chip recognition system comprising:

a game recording apparatus that records, as an image, a state of chips stacked on the gaming table, using a camera;

an image analysis apparatus that performs an image analysis on the recorded image of the state of chips;

a plurality of chip determination apparatuses comprising at least a first apparatus that uses artificial intelligence to determine a number of the chips stacked, using an image analysis result obtained by the image analysis apparatus, wherein the determination of the number of the chips stacked is made separately by different respective ones of the plurality of chip determination apparatuses, thereby providing a plurality of respective results of the determination of the number of the chips stacked; and

a second apparatus that is configured to:

compare the plurality of respective results to one another;

based on the comparison, identify that the respective results of the determination of the number of the chips differ between different ones of the plurality of chip determination apparatuses; and

in response to the identification, determine

which one of the different determination results to select as being correct or otherwise decide a correct number of the chips stacked.

2. The chip recognition system according to claim 1, wherein the plurality of chip determination apparatuses comprise at least:

the first apparatus that determines a number of the chips stacked, using an image analysis result for a first image, the image analysis result being obtained by the image analysis apparatus; and

a third apparatus that uses artificial intelligence to determine a number of the chips stacked, using an image analysis result for a second image, the image analysis result being obtained by the image analysis apparatus and the second image being different from the first image.

3. The chip recognition system according to claim 1, wherein the plurality of chip determination apparatuses comprise at least:

the first apparatus that determines a number of the chips stacked, using an image analysis result obtained by the image analysis apparatus; and

a physical measurement determination apparatus that determines a number of the chips stacked, by a physical measurement method different from a method used by the first apparatus.

4. The chip recognition system according to claim 1, wherein the plurality of chip determination apparatuses comprise at least:

the first apparatus that determines a number of the chips stacked, using an image analysis result for a first image, the image analysis result being obtained by the image analysis apparatus;

a third apparatus that uses artificial intelligence to determine a number of the chips stacked, using an image analysis result for a second image, the image analysis result being obtained by the image analysis apparatus and the second image being different from the first image; and

a physical measurement determination apparatus that determines a number of the chips stacked, by a physical measurement method different from methods used by the first and third apparatuses.

5. The chip recognition system according to claim 3, wherein the physical measurement determination apparatus determines a number of the chips stacked, using a measurement result that uses trigonometry.

6. The chip recognition system according to claim 1, wherein the selection of the one of the different determinations or the decision of the correct number of the chips stacked is performed using at least one of:

a position of the camera used by the game recording apparatus;

a number of pixels obtained from the camera;

a focal position of the image; and

past results obtained by the plurality of chip determination apparatuses.

7. A chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table, the chip recognition system comprising:

a game recording apparatus that records, as an image, a state of chips stacked on the gaming table, using a camera;

an image analysis apparatus that performs an image analysis on the recorded image of the state of chips;

a plurality of chip determination apparatuses comprising at least a first apparatus that uses artificial intelligence to determine a number and a type of the chips stacked, using an image analysis result obtained by the image analysis apparatus, wherein the determination of the number and the type of the chips stacked is made separately by different respective ones of the plurality of chip determination apparatuses, thereby providing a plurality of respective results of the determination of the number and the type of the chips stacked; and

a second apparatus that is configured to:

compare the plurality of respective results to

one another;

based on the comparison, identify that the respective results of the determination of the number and the type of the chips differ between different ones of the plurality of chip determination apparatuses; and

in response to the identification, determine which one of the different determination results to select as being correct or otherwise decide a correct number or type of the chips stacked.

8. The chip recognition system according to claim 7, wherein the plurality of chip determination apparatuses comprise at least:

the first apparatus that determines a number and a type of the chips stacked, using an image analysis result for a first image, the image analysis result being obtained by the image analysis apparatus; and

a third apparatus that uses artificial intelligence to determine a number and a type of the chips stacked, using an image analysis result for a second image, the image analysis result being obtained by the image analysis apparatus and the second image being different from the first image.

9. The chip recognition system according to claim 7, wherein the plurality of chip determination apparatuses

comprise at least:

the first apparatus that determines a number and a type of the chips stacked, using an image analysis result obtained by the image analysis apparatus; and

a physical measurement determination apparatus that determines a number of the chips stacked, by a physical measurement method different from a method used by the first apparatus.

10. The chip recognition system according to claim 7, wherein the plurality of chip determination apparatuses comprise at least:

the first apparatus that determines a number and a type of the chips stacked, using an image analysis result for a first image, the image analysis result being obtained by the image analysis apparatus;

a third apparatus that uses artificial intelligence to determine a number and a type of the chips stacked, using an image analysis result for a second image, the image analysis result being obtained by the image analysis apparatus and the second image being different from the first image; and

a physical measurement determination apparatus that determines a number of the chips stacked, by a physical measurement method different from methods used by the first and third apparatuses.

11. The chip recognition system according to claim 9, wherein the physical measurement determination apparatus determines a number of the chips stacked, using a measurement result that uses trigonometry.

12. The chip recognition system according to claim 7, wherein the selection of the one of the different determinations or the decision of the correct number or type of the chips stacked is performed using at least one of:

a position of the camera used by the game recording apparatus;

a number of pixels obtained from the camera;

a focal position of the image; and

past results obtained by the plurality of chip determination apparatuses.

13. The chip recognition system according to claim 7, wherein the image analysis apparatus is configured such that even if a part of a plurality of stacked chips or a whole of a single chip among the plurality of stacked chips is hidden due to a blind spot of the camera, the image analysis apparatus can obtain information about a type, a number, and a position of the chips.

14. A chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table,

the chip recognition system comprising:

a game recording apparatus that records, as an image, a state of chips stacked on the gaming table, using a camera;

an image analysis apparatus that performs an image analysis on the recorded image of the state of chips;

a chip determination apparatus comprising an artificial intelligence apparatus that determines a number of chips bet by a player, using an image analysis result obtained by the image analysis apparatus;

a physical measurement determination apparatus that determines a number of the chips bet by the player, by a physical measurement method different from a method used by the artificial intelligence apparatus; and

a management and control apparatus that controls the image analysis apparatus, the chip determination apparatus, and the physical measurement determination apparatus, wherein the management and control apparatus further has a function of:

comparing the numbers of chips determined by the chip determination apparatus and the physical measurement determination apparatus to thereby identify that the compared numbers differ; and

in response to the identification, outputting and displaying “undetermined” as a determination result.

15. The chip recognition system according to claim 14, wherein the physical measurement determination apparatus determines a number of the chips using a measurement result that uses trigonometry.

16. A chip recognition system that recognizes a chip on a gaming table in an amusement place having the gaming table, the chip recognition system comprising:

a plurality of cameras that obtain images of a chip bet by a player from different positions or different angles;

a game recording apparatus that records, as images, a state of chips stacked on the gaming table, using the plurality of cameras;

an image analysis apparatus that performs an image analysis on the recorded images of the state of chips;

a plurality of chip determination apparatuses comprising at least a first apparatus that determines a number of the chips stacked, using an image analysis result obtained by the image analysis apparatus, wherein the determination of the number of the chips stacked is made separately by different respective ones of the plurality of chip determination apparatuses, thereby providing a plurality of respective results of the determination of the number of the chips stacked; and

a management and control apparatus that controls the image analysis apparatus and the plurality of chip

determination apparatuses, wherein the management and control apparatus further has a second apparatus configured to:

compare the plurality of respective results to one another;

based on the comparison, identify that the results of the determination of the number of chips differ between different ones of the plurality of chip determination apparatuses; and

in response to the identification:

analyze the images in the game recording apparatus to determine whether the difference in the results of the determination is caused by a stacking state of the chips stacked on the gaming table; and

decide a correct number of the chips stacked, based on the results of the determination obtained by the respective plurality of chip determination apparatuses and based on the determination of whether the different is caused by the stacking state.

17. The chip recognition system according to claim 1, wherein:

the image includes two images;

the camera includes two cameras each configured to capture a respective one of the two images from a different

angle relative to the gaming table; and

at least one of the plurality of chip determination apparatuses is configured to determine the number of the chips stacked by:

identifying in each of the two images a respective relationship between a specific point in the stack of the chips and the gaming table as imaged in the respective image;

determining a height of the stack of the chips based on a combination of the identified relationships; and

determine the number of the chips stacked based on the determined height.

18. The chip recognition system according to claim 17, wherein the specific point is a point of a top of the stack of the chips and the respective relationship includes a respective intersection point at which a line that extends from the respective camera through the specific point intersects a top surface of the gaming table.

19. The chip recognition system according to claim 18, wherein the at least one of the plurality of chip determination apparatuses is configured to determine the height of the stack of the chips based on a determination of a distance between the two respective intersection points.

20. The chip recognition system according to claim 1, wherein the second apparatus uses artificial intelligence to perform its determination.

21. The chip recognition system according to claim 7, wherein the second apparatus uses artificial intelligence to perform its determination.

22. The chip recognition system according to claim 16, wherein the second apparatus uses artificial intelligence to perform its determination.