[0004]

When recognizing chips via images by using cameras, it is requested that not only the outlines of the chips be recognized but also the differences in colors of the chips be recognized, and further, that the quantity of chips stacked up be grasped for each type of chip. However, chips recognized by cameras, even if the chips have the same color, are imaged or recognized as having different colors due to the difference in lighting environments in which the chips are placed, and are not recognized as having the same color. Conventionally, it has been thus difficult for example to count the quantity of chips type-by-type from images.

[0005]

Embodiments of the present invention seek to provide a chip recognition system having a mechanism enabling the recognition of chip color via images and the counting of the quantity of chips even under different lighting environments.

SOLUTION TO SOLVE THE PROBLEM

[0005a]

An aspect of the present invention provides a recognition system for recognition of a chip used on a game table of a game house, the chip having a specific color indicative of a value of the chip, the recognition system comprising:

a recording device configured to record an image having therein a first area of the specific color of the chip and a second area of a reference color; and

at least one processor configured to use an artificial intelligence function to analyze the image, wherein analysis of the image includes:

recognizing, in a representation of the chip in the image, a presence of the specific color, and

identifying the value of the chip based on the specific color, and

wherein the artificial intelligence function is trained on a plurality of images, each image of the plurality of images including the specific color and the reference color captured under different illumination conditions with respect to the other images of the plurality of images.

[0005b]

Another aspect of the present invention provides a recognition system for recognition of an article, based on a specific color that is on the article itself or a wrapping of the article, the recognition system comprising:

a recording device configured to record an image having therein a first area of the specific color and a second area of a reference color; and

at least one processor configured to use an artificial intelligence function to analyze the image, wherein analysis of the image includes:

recognizing, in a representation of the article or of the wrapping in the image, a presence of the specific color, and

identifying the specific color of the article or of the wrapping based on the specific color, and

wherein the artificial intelligence function is trained on a plurality of images, each image of the plurality of images including the specific color and the reference color captured under different illumination conditions with respect to the other images of the plurality of images.

[0006]

There is also disclosed a recognition system for recognizing a chip used on a game table of a game house, the chip configured to at least partially have a specific color indicative of a value of the chip, the recognition system including:

a recording device that uses a camera and records a state

the chip irradiated under different lighting environments. Further, the artificial intelligence device may determine the specific color of the chip by using a relative relation with the reference color.

[0010]

The recognition device determines specific colors of a plurality of the chips stacked one on top of another, and may be configured to be capable of determining the specific colors or a quantity of the chips even when some of the chips are in hidden state due to a dead angle of the camera.

[0011]

There is also disclosed a recognition system for recognizing an article, the article at least partially having, on the article itself or a wrapping of the article, a specific color enabling the article or the wrapping to be specified, including:

a recording device that uses a camera and records a state of the article as an image;

an image analysis device that subjects the image so recorded to image analysis and recognizes at least two colors being the specific color and a reference color that is present in the image and differs from the specific color; and

a recognition device at least including an artificial intelligence device that uses a result of the image analysis by the image analysis device and specifies the specific color of the article itself or the wrapping, wherein

the artificial intelligence device of the recognition

Further, the recognition device determines specific colors of a plurality of the articles stacked one on top of another or the wrappings of the articles, and is configured to be capable of determining the specific colors even when some of the articles are in hidden state due to a dead angle of the camera. Further, the recognition device determines specific colors of a plurality of the articles stacked one on top of another or the wrappings of the articles, and is configured to be capable of determining a total quantity of the articles or a quantity of the articles of each of the specific colors even when some of the articles are in hidden state due to a dead angle of the camera.

[0016]

There is also disclosed a chip recognition system including:

a chip recognition system for recognizing a chip used on a game table of a game house, the chip configured to at least partially have a specific color indicative of the value of the chip, the chip recognition system including:

a recording device that uses a camera and records a state of the chip as an image;

an image analysis device that subjects the image so recorded to image analysis and recognizes at least two colors being the specific color and a reference color that is present in the image and differs from the specific color; and

a recognition device at least including an artificial intelligence device that uses a result of the image analysis

by the image analysis device and specifies the specific color of the chip, wherein

the artificial intelligence device of the recognition device is configured to extract a center line from the image of the chip and subject, to image analysis, a surrounding image covering a predetermined range centered on the center line to recognize, in the surrounding image, at least two colors being the specific color and the reference color, which differs from the specific color, and has been subjected to teaching using, as training data, a plurality of the surrounding images of the chip and the reference color irradiated with different illumination intensities.

[0017]

There is also disclosed a recognition system for recognizing an article, including:

a recognition system for recognizing an article, the article at least partially having, on the article itself or a wrapping of the article, a specific color enabling the article or the wrapping to be specified, the recognition system including:

a recording device that uses a camera and records a state of the article as an image;

an image analysis device that subjects the image so recorded to image analysis and recognizes at least the specific color and a reference color that is present in the image and differs from the specific color; and

a recognition device at least including an artificial

intelligence device that uses a result of the image analysis by the image analysis device and specifies the specific color of the article itself or the wrapping, wherein

the artificial intelligence device of the recognition device is configured to recognize the specific color from the image of the article itself or the wrapping, extract an image portion having the specific color, and subject a surrounding image of the specific color to image analysis to recognize, in the surrounding image, at least two colors being the specific color and the reference color, and has been subjected to teaching using, as training data, a plurality of the surrounding images of the specific color of the article itself or the wrapping and the reference color irradiated with different illumination intensities.

EFFECT OF THE INVENTION

[0018]

Embodiments of the present invention may enable the recognition of chips used on a game table type-by-type and the counting of the quantity of the chips from images.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

FIG. 1 schematically illustrates a chip recognition system in an embodiment of the present invention;

FIG. 2 is a lateral view of a chip in an embodiment of the present invention;

CLAIMS

1. A recognition system for recognition of a chip used on a game table of a game house, the chip having a specific color indicative of a value of the chip, the recognition system comprising:

a recording device configured to record an image having therein a first area of the specific color of the chip and a second area of a reference color; and

at least one processor configured to use an artificial intelligence function to analyze the image, wherein analysis of the image includes:

recognizing, in a representation of the chip in the image, a presence of the specific color, and

identifying the value of the chip based on the specific color, and

wherein the artificial intelligence function is trained on a plurality of images, each image of the plurality of images including the specific color and the reference color captured under different illumination conditions with respect to the other images of the plurality of images.

2. The recognition system according to claim 1, wherein the at least one processor is configured to identify the specific color and the value when the chip includes the specific color at a predetermined position or with a

predetermined shape, wherein the second area of the reference color includes an area other than the chip, and wherein the area other than the chip includes a game table.

3. The recognition system according to claim 1, wherein the at least one processor is configured to determine a quantity of instances of the chip that are present based on recognition of the presence of the specific color.

4. The recognition system according to claim 1, wherein the at least one processor is configured to identify respective specific colors of a plurality of instances of the chip, instance-by-instance, to determine a respective quantity of a plurality of chips each of the specific colors.

5. The recognition system according to claim 1, wherein the plurality of images used for training of the artificial intelligence function are of the reference color and of the chip having the specific color irradiated under different lighting environments.

6. A recognition system for recognition of an article, based on a specific color that is on the article itself or a wrapping of the article, the recognition system comprising:

a recording device configured to record an image

having therein a first area of the specific color and a second area of a reference color; and

at least one processor configured to use an artificial intelligence function to analyze the image, wherein analysis of the image includes:

recognizing, in a representation of the article or of the wrapping in the image, a presence of the specific color, and

identifying the specific color of the article or of the wrapping based on the specific color, and

wherein the artificial intelligence function is trained on a plurality of images, each image of the plurality of images including the specific color and the reference color captured under different illumination conditions with respect to the other images of the plurality of images.

7. The recognition system according to claim 6, wherein the at least one processor is configured to identify the specific color when the article itself or wrapping includes the specific color at a predetermined position or with a predetermined shape, wherein the second area of the reference color includes an area other than the article or the wrapping, and wherein the area other than the article or the wrapping includes a background wall.

8. The recognition system according to claim 6, wherein

the at least one processor is configured to determine a quantity of instances of the article that are present based on recognition of the presence of the specific color.

9. The recognition system according to claim 6, wherein the plurality of images used for training of the artificial intelligence function are of the reference color and of the article having the specific color on itself or on its wrapping irradiated under different lighting environments.

10. The recognition system according to claim 6, wherein, for a plurality of articles stacked one on top of another, the at least one processor is configured to determine respective specific colors of the articles or of their wrappings even when some of the plurality of the articles are in a hidden state due to a dead angle of the recording device.

11. The recognition system according to claim 6, wherein, for a plurality of articles stacked one on top of another, the at least one processor is configured to:

determine respective specific colors of the articles or of their wrappings; and

determine a total quantity of the articles or respective quantities of the articles for each of the specific colors even when some of the plurality of the articles are in a hidden state due to a dead angle of the

recording device.

12. The recognition system according to claim 1, wherein the at least one processor is configured to determine respective specific colors or a quantity of a plurality of chips stacked one on top of another even when some of the plurality of chips are in a hidden state due to a dead angle of the recording device.

13. The recognition system according to claim 8, wherein the at least one processor is configured to identify respective specific colors of the plurality of the instances of the article, instance-by-instance, to determine a respective quantity of the instances for each of the specific colors.

14. The recognition system according to claim 1, wherein the reference color is distinct from the chip.

15. The recognition system according to claim 1, wherein the at least one processor is configured to identify the specific color and the value when the chip includes the specific color at a predetermined position or with a predetermined shape.

16. The recognition system according to claim 1, wherein the at least one processor is configured to identify the

specific color and the value when the chip includes the specific color at a predetermined position and with a predetermined shape.

17. The recognition system according to claim 1, wherein the second area of the reference color includes an area other than the chip.

18. The recognition system according to claim 1, wherein the reference color includes a color of a surface of a game table.

19. The recognition system according to claim 6, wherein the at least one processor is configured to identify the specific color when the article itself or wrapping includes the specific color at a predetermined position or with a predetermined shape.

20. The recognition system according to claim 6, wherein the second area of the reference color includes an area other than the article or the wrapping.

21. The recognition system according to claim 20, wherein the area other than the article or the wrapping includes a background wall.