

METHOD AND APPARATUS FOR RECOGNIZING DICE DOTS

FIELD OF THE INVENTION

The present invention relates to a method and apparatus to
5 recognize dice dots and particularly to a method and apparatus
to recognize dice dots through a plurality of recognition and
calculation methods.

BACKGROUND OF THE INVENTION

These days people increasingly treasure leisure activities.
10 As a result recreational businesses are flourishing. Among
them gambling is very popular. Throwing or rolling dice is
one of the widely loved games. It is almost ubiquitous, and
can be seen in houses, outdoors and business environments.
One of the common rules of the game of rolling dice is:
15 players place bets first and guess the total dots; the dealer
rolls the dice and counts the total dots when moving of the
dice stops to determine win and loss.

In the conventional game playing rolling of the dice is
done manually. The rectitude or fairness of the dealer who
20 rolls the dice often is suspected by the players. As the force or
angle of throwing the dice could affect the dot number and
outcome. Some even resort to cheating schemes such as
crooked dice or loaded dice to take the advantages of the
ignorance of the players. This spoils the pleasure of playing
25 dice games.

To remedy the aforesaid problem, automatic dice rolling machines have been developed that have a recognition means to confirm dice dots. The recognition means usually performs recognition by detecting the dots through electric signals such as picture signals. However, such a method is easily compromised by control of people and produces fake results. This creates concerns of the players and affects their willingness and interests in playing the game. Hence the automatic dice rolling machine is not well accepted in legitimate recreational sites.

Moreover, even if the dealer does not tamper the dice and affect the fairness of the dice games, the automatic dice rolling machine is prone to recognition errors due to deficiency of recognition techniques, such as starting recognition process while the dice are still moving, impact of environmental factors such as light and angles of image capturing and the like.

Therefore how to provide an accurate method and apparatus to recognize dice dots to improve the efficiency and fairness of dice rolling game is an issue remained to be resolved in the industry.

SUMMARY OF THE INVENTION

The primary object of the present invention is to provide a method for recognizing dice dots. The method includes the following steps: projecting at least one dice with a plurality of

different angle light sources; capturing a plurality of images of the dice according to the projecting times of the light sources on the dice; and recognizing dice dots based on the images through a plurality of calculation methods.

5 By means of the method set forth above, if recognized results of the calculation methods are the same, the dice dots are confirmed and accepted. If the recognized results of the calculation methods are different, the dice is rolled again. The light sources are generated by a light source module. The images of the dice are
10 captured by a capturing module. The calculations are stored in a recognizing module. The method set forth above may be built in an application program stored in a computer accessible recording medium.

Another object of the invention is to provide an apparatus for
15 recognizing dice dots. It includes a dice cup holding at least one dice, a light source module and a capturing module located in the dice cup. The light source module generates a plurality of lights to project on the dice. The capturing module captures images of the dice a number of times according to the
20 projecting times of the light sources to generate a plurality of image information. The image information is sent to the recognizing module which stores a plurality of calculation methods to recognize the dice dots based on the image information.

25 The invention, by projecting multiple light sources to the

dice to get images of varying angles and through multiple calculation methods, achieves recognition of the dice dots. The recognition result of dice dots of the automatic dice rolling machine equipped with the features of the invention is
5 more accurate. Operation efficiency of dice rolling improves and fairness of the game is enhanced.

The foregoing, as well as additional objects, features and advantages of the invention will be more readily apparent from the following detailed description, which proceeds with
10 reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of the structure of the invention

FIG. 2 is a sectional view of the dice cup of the invention.

FIGS. 3A, 3B and 3C are schematic views of the invention in
15 operating conditions.

FIG. 4 is a flowchart of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to FIGS. 1 and 2 for an apparatus to
20 recognize dice dots according to the invention. It includes a dice cup 1 for holding at least one dice 15, a light source module 12, a capturing module 13 and a recognizing module 14. The dice cup 1 has a base 11 to hold the dice 15 and a hood 10 made from an opaque material to be fastened to the
25 base 11. The light source module 12 is located in the hood 10

to generate a plurality of light sources 121, 122 and 123 to project lights to the dice 15 at different angles. The capturing module 13 also is located in the hood 10 to capture images of the dice 15 at a number of times according to the light projecting times of the light sources 121, 122 and 123 onto the dice 15 to generate a plurality of corresponding image information S1, S2 and S3 (referring to FIGS. 3A, 3B and 3C). The recognizing module 14 receives the image information S1, S2 and S3 from the capturing module 13 through a wired or wireless transmission means and also stores a plurality of calculation methods to recognize dots on the dice 15 based on the image information S1, S2 and S3. In an embodiment of the invention, the capturing module 13 is a dynamic image capturing device such as a video camera consisting of CCDs or CMOS, or may include a static image capturing device such as a camera. The techniques and devices for capturing the images of the dice 15 are known in the art, thus details are omitted herein. Furthermore, the numbers of the dice 15 and light sources 121, 122 and 123 are not limited to those shown in the drawings, and can be increased or decreased as required when in use. The recognizing module 14 is a computer equipped with an image capturing adapter card to execute two or more calculation methods to recognize the dots on the dice 15 based on the captured image information S1, S2 and S3.

Refer to FIGS. 3A through 4 for the process flow and

method for recognizing the dots of the dice 15 according to the invention. After the dice 15 is rolled, the light sources 121, 122 and 123 project light to the dice 15 for three times (step 201), and the hood 10 prevents external light from interfering the projection of the light sources 121, 122 and 123. The capturing module 13 captures images of the dice 15 resulting from the projection of the light sources 121, 122 and 123 to generate the image information S1, S2 and S3 (step 202). More specifically, the light source 121 projects light to the dice 15 and the capturing module 13 captures the image of the dice 15 and transmit the image information S1 to the recognizing module 14. Next, the light source 122 projects light to the dice 15 and the capturing module 13 captures another image of the dice 15 and transmits the another image information S2 to the recognizing module 14. Finally, the light source 123 projects light to the dice 15 and the capturing module 13 captures yet another image of the dice 15 and transmits the yet another image information S3 to the recognizing module 14. The recognizing module 14 processes the received image information S1, S2 and S3 through the calculation methods to do recognition of the dice 15 (step 203). Then a recognition result is determined after processing of the calculation methods is finished (step 204).

In the event that the calculation results show that the dots of the dice 15 are the equal, the results indicate that the

captured images of the capturing module 13 are correct, and the recognizing module 14 displays the dots of the dice 15 (step 205). If the calculation results show different dots of the dice 15, problems could occur to the captured images of the capturing module 13, the recognizing module 14 issues a command to redo rolling of the dice 15 (step 206), and the recognition process for the dots of the dice 15 is executed anew.

It is to be noted that the number and types of calculation methods stored in the recognizing module 14 are not limited to two as previously discussed. Image recognition of the dice 15 can be performed through varying numbers of calculation methods. This technique is known in the art and can be easily adapted to the process of the recognizing module 14, thus details are omitted.

The method for recognizing dice dots of the invention can be implemented through an application program to control various modules of the apparatus previously discussed. The application program may be stored in a computer accessible recording medium such as a ROM (read only memory), flash memory, floppy diskette, hard disk, optical disk, portable disk, magnetic tape, database accessible through networks, or other storage media of the same function.

As a conclusion, the invention provides a hood 10 made from opaque material to prevent the light source module 12

held in the hood 10 from being interfered by the external light.
By providing different angle light sources 121, 122 and 123,
the capturing module 13 can capture a plurality of images of
the dice 15 to generate a plurality of image information S1, S2
5 and S3. Through multiple calculation methods provided by the
recognizing module 14 the image information S1, S2 and S3
are compared and recognized, therefore accuracy of
recognizing the dots of the dice 15 improves. In the event that
the recognized results are different or the dots of the dice 15
10 cannot be determined, rolling of the dice 15 is redone to
restart recognizing of the dots of the dice 15 to maintain
fairness of the game.

While the preferred embodiments of the invention have been
set forth for the purpose of disclosure, modifications of the
15 disclosed embodiments of the invention as well as other
embodiments thereof may occur to those skilled in the art.
Accordingly, the appended claims are intended to cover all
embodiments which do not depart from the spirit and scope of the
invention.

20

What is Claimed is:

1. A method for recognizing dice dots, comprising the steps
of:
 projecting a plurality of light sources to at least one
5 dice;
 capturing a plurality of images of the dice according to
 the number of projection of the light sources to the dice;
 and
 recognizing dice dots based on the images through a
10 plurality of calculation methods.
2. The method of claim 1, wherein the dice dots are confirmed
 and accepted when recognizing results of the calculation
 methods are same.
3. The method of claim 1, wherein the dice is rolled anew
15 when recognizing results of the calculation methods are
 different.
4. The method of claim 1, wherein the light sources are
 generated by a light source module.
5. The method of claim 1, wherein the images of the dice are
20 captured by a capturing module.
6. The method of claim 1, wherein the calculation methods
 are stored in a recognizing module to calculate results of
 the calculation methods.
7. The method of claim 1, wherein the steps are built in an
25 application program.

8. The method of claim 7, wherein the application program is stored in a computer accessible recording medium.
9. An apparatus for recognizing dice dots, comprising:
 - a dice cup for holding at least one dice;
 - 5 a light source module located in the dice cup to generate a plurality of light sources projecting to the dice;
 - a capturing module located in the dice cup to capture dice images for a plurality of times according to the times of light sources projection to generate a plurality of image
 - 10 information; and
 - a recognizing module to receive the image information and store a plurality of calculation methods to recognize dice dots according to the image information.
10. The apparatus of claim 9, wherein the dice cup includes a
- 15 base to hold the dice and a hood to fasten to the base.
11. The apparatus of claim 10, wherein the hood is made from an opaque material.
12. The apparatus of claim 9, wherein the capturing module is a dynamic image capturing device.
- 20 13. The apparatus of claim 12, wherein the dynamic image capturing device is a video camera.
14. The apparatus of claim 9, wherein the capturing module is a static image capturing device.
- 25 15. The apparatus of claim 14, wherein the static image capturing device is a camera.