

METHODS, APPARATUSES, DEVICES AND STORAGE MEDIA FOR SWITCHING STATES OF CARD GAMES

TECHNICAL FIELD

[0001] The present disclosure relates to the field of computer technology, in particular to a method, an apparatus, a device and a storage medium for switching states of a card game.

BACKGROUND

[0002] A card game indicates a game proceeding in a game site in which cards are dealt and a result of winning or losing is determined accordingly. In each phase of the game, game props including cards need to be placed in a pre-determined area according to a game rule, otherwise it will be regarded as a violation of the rule and the game will be interrupted.

[0003] For automatic supervision on the game procedure, a card game is classified into different states according to phases of the card game, and a detection logic corresponding to the classified state is executed to determine whether there is a violation in the game. The different states of a card game can include at least a starting state and a halt state.

[0004] The starting state indicates a beginning of a card game. When the game starts, cards are usually dealt to a plurality of players participating in the game in a predetermined card dealing order, i.e., the cards are dealt to a corresponding card placement area of each game player in a certain order. For a game in the starting state, if the cards are dealt in a wrong order, it is necessary to immediately interrupt the game and inform a supervisory system that the game is switched to the halt state, so to avoid generating a wrong game result due to the wrong card dealing order.

SUMMARY

[0005] In view of this, the present application discloses at least one method of switching states of a card game. The method including: obtaining card information including position information of at least one card involved in a live image of a current card game from a card detection on the live image, wherein the live image is acquired from a game tabletop for proceeding the current card game, and the game tabletop includes two or more placement areas for placing a card; determining, in response to that the at least one card is excluded from one or more recorded cards of the current card game, that the at least one card is a target card, wherein the one or more recorded cards include each card detected in the current card game; determining, according to pre-acquired recorded card information and card

sequential configuration information of the current card game, an expected placement area for the target card from the two or more placement areas, wherein the card sequential configuration information is used to define a placement area for a card dealt in the current card game; and updating, in response to position information of the target card indicating that the target card is not placed in the expected placement area, the current card game to a halt state.

[0006] In some embodiments, the method further including: obtaining a face state of the target card from a face state detection on the target card; and updating, in response to that a number of dealt cards in the current card game is less than or equal to a predetermined threshold and the face state of the target card does not match a first face state, the current card game to the halt state; wherein the dealt cards include the one or more recorded cards and the target card, the first face state indicates an expected face state for a card in a dealing phase, which is determined from game type configuration information of the current card game.

[0007] In some embodiments, the two or more placement areas include a first placement area to place a card for an operator of a target game operation and a second placement area to place a card for a non-operator; based on the card detection performed on the live image, first card information of cards within the first placement area and second card information of cards within the second placement area are further obtained; when the game type configuration information of the current card game indicates the current card game is of a first type, the method further including: updating, in response to that the first card information and the second card information do not meet a card information condition for the target game operation, the current card game to the halt state.

[0008] In some embodiments, the first card information includes a number of cards within the first placement area obtained from the card detection on a first live image as a first card number, and a number of cards within the first placement area obtained from the card detection on a second live image captured later than the first live image in time sequence as a new first card number; the second card information includes a number of cards within the second placement area obtained from the card detection on the first live image as a second card number, and a number of cards within the second placement area obtained from the card detection on the second live image as a new second card number; the first card information and the second card information do not meet the card information condition for the target game operation, includes: the first card number equals to a first number while the

second card number equals to a second number; and the new first card number also equals to the first number while the new second card number is less than the second number.

[0009] In some embodiments, the first card information includes a number of cards within the first placement area obtained from the card detection on a first live image as a first card number, and a number of cards within the first placement area obtained from the card detection on a second live image captured later than the first live image in time sequence as a new first card number; the second card information includes a number of cards within the second placement area obtained from the card detection on the first live image as a second card number, and face states of cards within the second placement area obtained from the card detection on the second live image; the first card information and the second card information do not meet the card information condition for the target game operation, includes: the first card number equals to a first number while the second card number equals to a second number; and the new first card number also equals to the first number while the face states of cards within the second placement area include a visible state.

[0010] In some embodiments, the game tabletop further including a predetermined operating area for the target game operation; the first card information includes an actual number of cards within the first placement area; the second card information includes an actual number of cards within the second placement area; based on the card detection performed on the live image, an actual number of cards within the predetermined operating area is further obtained; the first card information and the second card information do not meet the card information condition for the target game operation, includes at least one of: the actual number of cards within the first placement area does not match a target number of cards for the first placement area; the actual number of cards within the second placement area does not match a target number of cards for the second placement area; or the actual number of cards within the predetermined operating area does not match a target number of cards for the predetermined operating area.

[0011] In some embodiments, the card sequential configuration information includes a correspondence between placement areas and serial positions of cards dealt in the current card game; determining, according to the pre-acquired recorded card information and the card sequential configuration information of the current card game, the expected placement area for the target card from the two or more placement areas includes: determining, in response to that a number of recorded cards determined based on the recorded card information does not exceed a predetermined threshold, a serial position of the target card

based on the number of recorded cards; and determining, based on the correspondence included in the card sequential configuration information, the expected placement area corresponding to the serial position of the target card from the two or more placement areas.

[0012] In some embodiments, the recorded card information including recorded card face values; the card sequential configuration information includes an association relationship between recorded card face values and a placement area for the target card; determining, according to the pre-acquired recorded card information and the card sequential configuration information of the current card game, the expected placement area for the target card from the two or more placement areas includes: obtaining, in response to that a number of recorded cards determined based on the recorded card information is greater than a predetermined threshold, the recorded card face values included in the recorded card information; and determining, based on the association relationship included in the card sequential configuration information, the expected placement area associated with the recorded card face values from the two or more placement areas.

[0013] In some embodiments, the recorded card information further including recorded card face states; the method further including: obtaining, when determining that the at least one card is the target card and a number of recorded cards determined based on the recorded card information is greater than or equal to a predetermined threshold, the recorded card face states included in the recorded card information; updating, in response to that the recorded card face states include a face state other than a second face state while the second face state is expected for a recorded card when dealing the target card, the current card game to the halt state.

[0014] In some embodiments, the recorded card information including recorded card position information. Accordingly, determining, in response to that the at least one card is excluded from the one or more recorded cards of the current card game, that the at least one card is the target card includes: determining, in response to that position information of the at least one card is excluded from the recorded card position information, that the at least one card is a candidate card; for each of a plurality of consecutive subsequent images of the live image, obtaining card information and card operator information from the subsequent image by performing a detection of card and card operator on the subsequent image, wherein the card information includes a boundary box indicating position information of a card; the card operator information includes a boundary box indicating position information of a card operator; and determining the candidate card as the target card in response to at least one of:

determining, based on the respective card information and card operator information, that a boundary box of the candidate card does not overlap with a boundary box of the card operator in each of the plurality of consecutive subsequent images; or, a position of the candidate card indicating by the boundary box of the candidate card is not changed in the plurality of consecutive subsequent images.

[0015] In some embodiments, the method further including: updating the recorded card information by storing card information of the target card which includes at least one of: position information indicated by a boundary box of the target card; or attribute information of the target card, wherein the attribute information includes at least one of a face value or a face state, and the face state includes a visible state or a hidden state.

[0016] The present application further provide an apparatus for switching states of a card game, including: a card detecting module, configured to obtain card information including position information of at least one card involved in a live image of a current card game from a card detection on the live image, wherein the live image is acquired from a game tabletop for proceeding the current card game, and the game tabletop includes two or more placement areas for placing a card; a target card determining module, configured to determine, in response to that the at least one card is excluded from one or more recorded cards of the current card game, that the at least one card is a target card, wherein the one or more recorded cards include each card detected in the current card game; an expected placement area determining module, configured to determine, according to pre-acquired recorded card information and card sequential configuration information of the current card game, an expected placement area for the target card from the two or more placement areas, wherein the card sequential configuration information is used to define a placement area for a card dealt in the current card game; and a first updating module, configured to update, in response to position information of the target card indicating that the target card is not placed in the expected placement area, the current card game to a halt state.

[0017] In some embodiments, the apparatus further includes: a first detecting module for a face state, configured to obtain a face state of the target card from a face state detection on the target card; a second updating module, configured to update, in response to that a number of dealt cards in the current card game is less than or equal to a predetermined threshold and the face state of the target card does not match a first face state, the current card game to the halt state; wherein the dealt cards include the one or more recorded cards and the target card,

the first face state indicates an expected face state for a card in a dealing phase, which is determined from game type configuration information of the current card game.

[0018] In some embodiments, wherein the two or more placement areas include a first placement area to place a card for an operator of a target game operation and a second placement area to place a card for a non-operator; the card detecting module is further configured to obtain, based on the card detection performed on the live image, first card information of cards within the first placement area and second card information of cards within the second placement area; the apparatus further including: a third updating module, configured to update, in response to that the first card information and the second card information do not meet a card information condition for the target game operation, the current card game to the halt state when the game type configuration information of the current card game indicates the current card game is of a first type.

[0019] In some embodiments, wherein the recorded card information including recorded card position information. Accordingly, the target card determining module is specially configured to determine, in response to that position information of the at least one card is excluded from the recorded card position information, that the at least one card is a candidate card; for each of a plurality of consecutive subsequent images of the live image, obtain card information and card operator information from the subsequent image by performing a detection of card and card operator on the subsequent image, wherein the card information includes a boundary box indicating position information of a card; the card operator information includes a boundary box indicating position information of a card operator; and determine the candidate card as the target card in response to at least one of: determining, based on the respective card information and card operator information, that a boundary box of the candidate card does not overlap with a boundary box of the card operator in each of the plurality of consecutive subsequent images; or, a position of the candidate card indicating by the boundary box of the candidate card is not changed in the plurality of consecutive subsequent images.

[0020] In some embodiments, the apparatus further including: a cache updating module, configure to update the recorded card information by storing card information of the target card which includes at least one of: position information indicated by a boundary box of the target card; or attribute information of the target card, wherein the attribute information includes at least one of a face value or a face state, and the face state includes a visible state or a hidden state.

[0021] The present application further provides an electronic device, including: a processor, and a memory for storing computer instructions that can be read by the processor; wherein, by executing the computer instructions, the processor is caused to implement the method of switching states of a card game according to any one of the above-mentioned embodiments.

[0022] The present application further provides a non-transitory computer readable storage medium, storing computer readable instructions for causing a computer to perform the method of switching states of a card game according to any one of the above-mentioned embodiments.

[0023] In the technical solution described in the above-mentioned embodiment, firstly, from a live image of a current card game, a target card (i.e., a newly dealt card) excluded from recorded cards in the current card game is determined; and then, based on recorded card information and card sequential configuration information of the current card game, an expected placement area for the target card is determined. Afterwards, in response to that the target card is not placed in the expected placement area, the current card game can be updated to a halt state.

[0024] In this way, by determining whether a current newly dealt card is in the expected placement area, it is possible to automatically determine whether a current card dealing order is correct and further switch the current card game to the halt state in a case of detecting that the newly dealt card is not in the expected placement area. In comparison with manual switching, it is possible to switch the game state in time when detecting that the card dealing order is wrong, which is beneficial to avoid incorrect game results due to the wrong card dealing order, and thus improving the fairness of the card game.

[0025] It should be understood that the general description and the following detailed description are only exemplary and explanatory, and cannot limit the present application.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] In order to describe one or more embodiments of the present application or a technical solution provided in related technology more clearly, a brief description for the accompanying drawings that need to be used in the embodiments or the related technology is given in the following. Obviously, the drawings in the following description are merely some of the one or more embodiments described in the present application. For those of

ordinary skill in the art, other drawings can be obtained based on these drawings without creative labor.

[0027] FIG. 1 is a schematic flowchart illustrating a method of switching states of a card game according to the present application;

[0028] FIG. 2 is a schematic flowchart illustrating a method of determining an expected placement area according to the present application;

[0029] FIG. 3 is a schematic flowchart illustrating a method of determining an expected placement area according to the present application;

[0030] FIG. 4 is a schematic flowchart illustrating a method of determining a target card according to the present application;

[0031] FIG. 5 is a schematic flowchart illustrating a method of switching states of a card game according to the present application;

[0032] FIG. 6 is a schematic flowchart illustrating a method of switching states of a card game according to the present application;

[0033] FIG. 7 is a schematic flowchart illustrating a method of switching states of a card game according to the present application;

[0034] FIG. 8 is a schematic diagram illustrating a game scene according to the present application;

[0035] FIG. 9 is a structural schematic illustrating an apparatus for switching states of a card game according to the present application; and

[0036] FIG. 10 is a block diagram of hardware of an electronic device according to the present application.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0037] Exemplary embodiments will be described in detail in the following, with the illustrations thereof represented in the drawings. When the following descriptions involve the drawings, like numerals in different drawings refer to like or similar elements unless otherwise indicated. The specific manner described in the following exemplary embodiments does not represent all embodiments consistent with the present application. Rather, they are merely examples of apparatuses and methods consistent with some aspects of the present application as detailed in the appended claims.

[0038] The terminology used in the present application is for the purpose of describing particular embodiments only and is not intended to limit the present application. The

singular forms ‘a’, ‘said’ and ‘the’ used in the present application and the appended claims are also intended to include the majority of forms unless the context clearly indicates other meanings. It should also be understood that the term ‘and/or’ as used herein refers to and includes any or all possible combinations of one or more associated listed items. It should also be understood that depending on the context, the word “if” as used herein may be interpreted as “when” or “upon” or “in response to determining”.

[0039] An objective of the present application is to provide a method of switching states of a card game. In the method, firstly, from a live image of a current card game, a target card (i.e., a newly dealt card) excluded from recorded cards in the current card game is determined, and then, based on card information of recorded cards (hereinafter referred to as recorded card information) and card sequential configuration information of the current card game, an expected placement area for the target card is determined. Afterwards, in response to that the target card is not placed in the expected placement area, the current card game is updated to a halt state.

[0040] In this way, by determining whether a current newly dealt card is in the expected placement area, it is possible to automatically determine whether a current card dealing order is correct and further switch the current card game to the halt state when detecting that the newly dealt card is not in the expected placement area. In comparison with manual switching, it is possible to switch the game state in time when detecting that the card dealing order is wrong, which is beneficial to avoid incorrect game results due to the wrong card dealing order, and thus improving the fairness of the card game.

[0041] Please refer to FIG. 1, which is a schematic flowchart illustrating a method of switching states of a card game in the present application.

[0042] As shown in FIG. 1, the method may include step 102 to step 108.

[0043] At step 102, card information including position information of at least one card involved in a live image of a current card game is obtained from a card detection on the live image.

[0044] At step 104, in response to that the at least one card is excluded from recorded cards of the current card game, the at least one card is determined as a target card, where the recorded cards include each card detected in the current card game.

[0045] At step 106, an expected placement area for the target card is determined from the two or more placement areas according to pre-acquired recorded card information and card sequential configuration information of the current card game, where the card sequential

configuration information is used to define a placement area for a card dealt in the current card game.

[0046] At step 108, in response to position information of the target card indicating that the target card is not placed in the expected placement area, the current card game is updated to a halt state.

[0047] The method (hereinafter referred to as the switching method) of switching game states shown in FIG. 1 can be applied to an electronic device. The electronic device can perform the switching method by installing software logic corresponding to the switching method. The type of the electronic device can be a notebook computer, a computer, a server, a mobile phone, a PAD terminal, and so on. The type of the electronic device is not particularly limited in the present application. The electronic device can also be a client device or a server device, which is not particularly limited herein.

[0048] In some embodiments, the electronic device can be a node device deployed at a card game site. The node device can be connected to several image capture devices deployed on the game site to obtain captured live images. The node device can analyze the live images to determine a state of a card game. In some embodiments, the node device can update the state of the card game according to the procedure of the game, or send the game state determined through the image analysis to a cloud server or a background server for maintenance or real-time update.

[0049] In some embodiments, the node device can be used as an edge computing device, corresponding to a game tabletop in a one-to-one correspondence. Each node device can obtain the captured image from the image capture device deployed around the corresponding game tabletop, and monitor the game played on the game tabletop based on the captured image. The node device can transmit a monitoring result to a cloud server or a background server.

[0050] In the following, a node device is taken as an example of the executive subject for description. The node device can analyze a state of a card game based on an obtained image. The game state may include at least a starting state and a halt state. Where, the starting state indicates an initial state when the game starts. The halt state indicates a state in which the monitoring procedure for a game is interrupted due to an abnormal case occurred during the game, and/or the game is to be interrupted for back to be normal with some adjustment on operations.

[0051] In some embodiments, the node can execute step 102 to perform a card detection on a live image of the current card game to obtain card information of at least one card involved in the live image, where the card information includes position information of the at least one card; the live image is acquired from a game tabletop for proceeding the current card game, and the game tabletop includes two or more placement areas for placing a card.

[0052] The card game can refer to a game of any type, the type of the card game is not specifically limited in the present application.

[0053] The live image can be an image captured in real time and transmitted to the node by an image capture device. Meanwhile, the live image is obtained by capturing an image of a tabletop for proceeding a tabletop card game, which may involve objects such as a card, a hand and the like. By analyzing objects involved in a live image, whether the current game procedure is reasonable or not can be determined. For example, by sequentially analyzing a plurality of live images, a position of each dealt card on a game tabletop can be determined, and further whether the current card dealing order is correct or not can be determined.

[0054] The game tabletop can be divided into a plurality of areas according to functions, which may include two or more placement areas for placing a card.

[0055] The at least one card refers to a card object involved in the live image.

[0056] The card detection refers to a process of performing a detection on an image to be processed and obtaining card information of a card object involved in the image. The image to be processed in step 102 can refer to the live image. The card information includes position information of a card, which can indicate a position of the card in the live image. In some embodiments, the field of view area covered by the live image is the same as the area of the game tabletop for proceeding the current card game, and the position information can indicate the position of the card on the game tabletop.

[0057] In some embodiments, an object detection model can be used to perform the card detection.

[0058] The object detection model can be a detection model built based on a RCNN (Region Convolutional Neural Network), a FAST-RCNN (Fast Region Convolutional Neural Network) or a FASTER-RCNN (Faster Region Convolutional Neural Network). The present application does not specifically limit the network structure of the object detection model.

[0059] When training the model, supervised training can be performed on the object detection model with a plurality of training samples labeled with position information of boundary boxes of cards until the model converges.

[0060] When the training is completed, the object detection model can be used to perform a card detection on a live image to obtain a boundary box of a card involved in the image and position information of the boundary box, and accordingly, position information of a card (that is, the card information) can be obtained from the position information of the boundary box for the card. In some examples, for an image involving a plurality of cards, boundary boxes of the different cards may be numbered in a detection result of the image. It should be noted that the card information obtained from the card detection can be stored for using in other steps in this application.

[0061] In step 104, the target card includes a card that is excluded from recorded cards of the current card game. The recorded cards include each card that has been detected in the current card game. That is, the target card is a newly detected card from the live image, i.e. a current newly dealt card. For example, in a card game, a manager of the current game will deal cards to game participants. An image capture device deployed on site can capture the process of the manager dealing cards, and store card information in a cache when the manager has dealt a card. In this way, by comparing the card information detected from the current image with the card information in the cache, whether the card detected from the current image involves a newly dealt card can be determined.

[0062] In some embodiments, the target card can be determined by comparing the card information obtained from the card detection on the live image with recorded card information.

[0063] In some embodiments, the image capture device can capture images in real time when the current card game proceeding, and then card information detected from the captured images can be cached in a device memory or multi-level cache, thereby obtaining recorded card information of the current card game.

[0064] At step 104, step 1042 can be executed first to obtain pre-stored recorded card information. Then step 1044 can be executed to compare the recorded card information with the card information of the at least one card obtained in step 102 to determine a card that is excluded from the recorded cards in the live image as the target card.

[0065] In some embodiments, the card information may include position information of a card. At step 1044, the at least one card can be determined as a target card in response to

that position information of the at least one card is excluded from the recorded card position information.

[0066] In some embodiments, the card information may include a unique ID (Identity Document) assigned to a detected card during the card detection and tracking. At step 1044, the at least one card can be determined as the target card in response to that the ID of the at least one card is excluded from recorded card IDs.

[0067] In step 106, the expected placement area can refer to an area where the target card is expected to be placed on the game tabletop in the current card game. The expected placement area may be determined according to a game rule of the card game. In some embodiments, when the number of dealt cards reaches a predetermined number, the expected placement area for a card may be associated with the number of dealt cards and card face information of the dealt cards. In the present application, according to whether the number of recorded cards in the current card game reaches a predetermined threshold, there can be at least two ways of determining the expected placement area for the target card, which will be described in detail later. The predetermined threshold is a value set according to business requirements. For example, in some games, the predetermined threshold is 4.

[0068] In some embodiments, the card sequential configuration information includes: a correspondence between placement areas and serial positions of cards dealt in the current card game. In a case that the number of recorded cards is not greater than the predetermined threshold, the expected placement area can be determined according to the correspondence and a serial position of the target card.

[0069] Please refer to FIG. 2, which is a schematic flowchart illustrating a method of determining an expected placement area according to this application. The method illustrated in FIG. 2 indicates a detailed description for step 106. As shown in FIG 2, step 11 to step 12 can be executed for step 106.

[0070] At step 11, in response to that the number of recorded cards determined based on the recorded card information does not exceed a predetermined threshold, a serial position of the target card is determined based on the number of recorded cards.

[0071] At step 11, the recorded card information can be obtained first, and then the number of recorded cards can be obtained according to the recorded card information. In a case that the number of recorded cards does not exceed the predetermined threshold, the serial position of the target card in the dealt cards can be determined by adding 1 to the number of recorded cards.

[0072] At step 12, based on the correspondence included in the card sequential configuration information, the expected placement area corresponding to the serial position of the target card is determined from the two or more placement areas.

[0073] The correspondence may include an association relationship between various possible serial positions and corresponding expected placement areas. For example, a game tabletop in a card game includes two card placement areas A and B. During the game, cards are sequentially dealt to the two card placement areas in a card dealing order of A-B-A-B, i.e., when a card being dealt in an order of 1st or 3rd, the corresponding expected placement area indicates A, and when a card being dealt in an order of 2nd or 4th, the corresponding expected placement area indicates B.

[0074] The corresponding expected placement area for the target card can be obtained by querying the correspondence based on the serial position of the target card obtained in step 11.

[0075] For example, assuming that the card dealing order in a game is A-B-A-B and the number of recorded cards is 3, the newly dealt target card is the 4-th card and the expected placement area for the target card can be determined according to the correspondence as the placement area B.

[0076] Thus, it is possible to accurately determine the expected placement area for the newly dealt target card involved in the live image in a case that the number of recorded cards does not exceed the predetermined threshold.

[0077] In some embodiments, the card sequential configuration information includes an association relationship between recorded card face values and a placement area for the target card. In a case that the number of recorded cards is greater than the predetermined threshold, the expected placement area can be determined according to the association relationship and a serial position of the target card.

[0078] Please refer to FIG. 3, which is a schematic flowchart illustrating a method of determining an expected placement area according to this application. The method illustrated in FIG. 3 is a detailed description for step 106. As shown in FIG 3, step 21 and step 22 can be executed to implement the above-mentioned step 106.

[0079] At step 21, in response to that the number of recorded cards determined based on the recorded card information is greater than a predetermined threshold, recorded card face values included in the recorded card information are obtained.

[0080] The recorded card information includes face value information of recorded cards. In some embodiments, the face value information of a card can be obtained from a face value detection on card objects involved in an image which is captured during the game. For example, the face value information of a card can be obtained from a face value detection on the card with a face value detection model which is generated based on a neural network through pre-supervised training. Then, the face value information of the card can be cached in the recorded card information.

[0081] At step 21, the recorded card information can be obtained first, and the number of recorded cards can be obtained from the recorded card information. In a case that the number of recorded cards is greater than the predetermined threshold, face value information of recorded cards can be further obtained from the recorded card information.

[0082] Face value information can indicate a face value of a card.

[0083] At step 22, based on the association relationship included in the card sequential configuration information, the expected placement area associated with the recorded card face values is determined from the two or more placement areas.

[0084] The association relationship includes a relationship between recorded card face values and an expected placement area. For example, there are two card placement areas A and B in a game tabletop of a card game, and face values of 4 recorded cards are 4, 5, 6, and 7 respectively. This situation corresponds to an expected placement area A, that is, the expected placement area for the target card is placement area A.

[0085] The expected placement area for the target card can be obtained by querying the association relationship based on the recorded card face values obtained in step 21.

[0086] Thus, it is possible to accurately determine the expected placement area for the newly dealt target card involved in the live image, in a case that the number of recorded cards exceeds the predetermined threshold.

[0087] In some embodiments, step 1082 to step 1086 can be executed for step 108.

[0088] At step 1082, an actual placement area of the target card in the game tabletop is determined according to position information of the target card.

[0089] In some embodiments, the actual placement area can be determined through a hot zone mapping method, which can simplify the neural network structure, reduce the amount of computation, and help improving the detection efficiency.

[0090] A predetermined hot zone map can be stored in the node device, and the hot zone map is generated based on a live image captured for a game tabletop. The field of view area

covered by the hot zone map is the same as the field of view area covered by the live image, which both include the game tabletop. The hot zone map can represent area division information of the game tabletop, and the area division information includes position information of each of a plurality of areas divided from the game tabletop. The plurality of areas includes two or more placement areas.

[0091] At step 1082, position information of the target card can be obtained from the card information obtained in step 102, and then the actual placement area of the target card can be determined according to the position information and the area division information.

[0092] At step 1084, whether the actual placement area and the expected placement area are the same placement area is determined.

[0093] In some embodiments, a placement area may be assigned with a unique identifier in advance. For example, a certain placement area may be marked with a unique pixel value or a unique ID in a hot zone map. By determining whether the identifier of the actual placement area is the same as that of the expected placement area, whether the actual placement area and the expected placement area are the same placement area can be determined.

[0094] At step 1086, in response to that the actual placement area and the expected placement area are the same placement area, it is determined that the target card is placed in the expected placement area, and the game can be continued; and in response to that the actual placement and the expected placement area are different placement areas, it is determined that the target card is not placed in the expected placement area, and the current card game can be updated to a halt state.

[0095] For example, there are two card placement areas A and B in a game tabletop of a card game. During the game, cards are sequentially dealt to the two card placement areas in a card dealing order of A-B-A-B. According to step 102 to step 106, the newly dealt 4-th card involved in the live image is determined as the target card, and an identifier of the expected placement area for the target card indicates B. While an identifier of the actual placement area of the target card is detected as A according to step 108. In this case, the target card is not placed in the expected placement area can be determined, and the current card game can be updated to the halt state.

[0096] In the technical solution described in the above-mentioned embodiments, firstly, from a live image of a current card game, a target card (i.e., a newly dealt card) excluded from recorded cards in the current card game is determined; and then, based on recorded

card information and card sequential configuration information of the current card game, an expected placement area for the target card is determined. Afterwards, in response to that the target card is not placed in the expected placement area, the current card game can be updated to a halt state.

[0097] In this way, by determining whether a current newly dealt card is in the expected placement area, it is possible to automatically determine whether a current card dealing order is correct and further switch the current card game to the halt state in a case of detecting that the newly dealt card is not in the expected placement area. In comparison with manual switching, it is possible to switch the game state in time when detecting that the card dealing order is wrong, which is beneficial to avoid incorrect game results due to the wrong card dealing order, and thus improving the fairness of the card game.

[0098] In some embodiments, a card that remains unchanged in position and/or not covering by a card operator in a plurality of consecutive images can be determined as a target card. When a card remains unchanged in position or not covering by a card operator in a plurality of consecutive images, it may indicate that the newly dealt card is already in a stable position. At this time, a placement area of the target card is an area where the target card is located on the game tabletop in the end, such that the placement area of the target card can be determined accurately, the accuracy of card sorting detection and switching game states can be improved.

[0099] Referring to FIG. 4 which is a schematic flowchart illustrating a method of determining a target card according to the present application. The method illustrated in FIG. 4 is a detailed description for step 104. As shown in FIG. 4, step 402 to step 406 can be executed for step 104.

[0100] At step 402, in response to that position information of the at least one card is excluded from recorded card position information, the at least one card is determined as a candidate card.

[0101] The recorded card information may include recorded card position information, thus the recorded card position information can be obtained from the recorded card information. The recorded card position information can be compared with position information of the at least one card obtained in step 102. In a case that position information of a certain card is excluded from the recorded card position information, it represents that the card may be a newly dealt card detected at a new position on the game tabletop, that is, a candidate card, or the card may be a card that is being dealt and is still moving. At this

time, it is necessary to further determine whether the card is in a stable state to determine whether the card is a newly dealt card.

[0102] At step 404, for each of a plurality of consecutive subsequent images of the live image, card information and card operator information are obtained from the subsequent image by performing a detection of card and card operator on the subsequent image. The card information can include a boundary box indicating position information of a card; the card operator information can include a boundary box indicating position information of a card operator. The card operator may be any object for dealing or moving a card. For example, the card operator can be a card distribution stick, a hand, etc. The subsequent image refers to an image captured later than the live image in time sequence.

[0103] At step 404, an object detection model can be used for performing a detection of card and card operator on the subsequent images captured later than the live image.

[0104] The object detection model can be a detection model built based on RCNN, FAST-RCNN or FASTER-RCNN. The network structure of the object detection model is not specifically limited in the present application.

[0105] When training the model, supervised training can be performed on the object detection model with a plurality of training samples labeled with position information of boundary boxes of cards and card operators (for example, a hand) until the model converges.

[0106] When the training is completed, the object detection model can be used for performing a detection of card and card operator on a live image to obtain a boundary box for a card involved in the image and/or a boundary box for a card operator involved in the image, position information of the boundary box for the card and/or position information of the boundary box for the card operator. Position information of the detected card (that is, the card information) can be determined from the position information of the boundary box for the card. Similarly, position information of the detected card operator (that is, the card operator information) can be determined from the position information of the boundary box for the card operator. It should be noted that in the present application, the information obtained from the card and card operator detection can be stored for using in subsequent steps.

[0107] At step 406, the candidate card is determined as the target card in response to that a boundary box of the candidate card does not overlap with a boundary box of the card operator in each of the plurality of consecutive subsequent images based on the respective card information and card operator information, and/or, determining that a position of the

candidate card indicating by the boundary box of the candidate card is not changed in the plurality of consecutive subsequent images.

[0108] Step 406 may be implemented in at least three manners. Firstly, it may be implemented as step 4061, that is, in response to that, in each of the plurality of consecutive subsequent images, the boundary box of the candidate card does not overlap with the boundary box of the card operator based on the card information and card operator information, the candidate card is determined as the target card.

[0109] At step 4061, as the card information and the card operator information for the plurality of consecutive subsequent images has been acquired by performing step 404, for each of the plurality of subsequent images, whether a boundary box of the candidate card overlaps with a boundary box of the card operator in the subsequent image can be determined based on the card information and card operator information obtained from the subsequent image. In a case that the boundary box of the candidate card overlaps with the boundary box of the card operator, it can represent that the candidate card is still moving. In a case that, if at least N subsequent images in the plurality of consecutive subsequent images are determined as that the boundary box of the candidate card does not overlap with the boundary box of the card operator, it can represent that an operation on the candidate card is completed and thus the candidate card is in a stable state can be determined as the target card. The N is a predetermined value.

[0110] At this time, the placement area of the target card is the area where the target card is finally located on the game tabletop, such that the placement area of the target card can be accurately determined, and thus further improving the accuracy of the card sorting detection and the switching between game states.

[0111] Secondly, step 406 may be implemented as step 4062, that is, in response to that the position of the candidate card remains unchanged in the plurality of consecutive subsequent images based on the card information, the candidate card is determined as the target card.

[0112] At step 4062, as the card information for the plurality of consecutive subsequent images of the live image has been acquired by performing step 404, for each of the plurality of subsequent images, whether a position of a boundary box for the candidate card involved in the subsequent image changes can be determined based on the card information obtained from the subsequent image and a next image thereof. In a case that the position of the boundary box for the candidate card changes, it can represent that the candidate card is still

moving. In a case that the position of the boundary box for the candidate card does not change in any one of the plurality of consecutive subsequent images, it can represent that an operation on the candidate card is completed and thus the candidate card is in a stable state can be determined as the target card.

[0113] At this time, the placement area of the target card is the area where the target card is finally located on the game tabletop, such that the placement area of the target card can be accurately determined, and thus further improving the accuracy of the card sorting detection and the switching between game states.

[0114] Thirdly, step 406 may be implemented as step 4063, that is, in response to determining that the boundary box of the candidate card does not overlap with the boundary box of the card operator based on the card information and the card operator information in the plurality of consecutive subsequent images, and determining that the position of the candidate card is not changed in the plurality of consecutive subsequent images, the candidate card is determined as the target card.

[0115] When executing step 4063, step 4061 and step 4062 can be executed at the same time. In a case that the boundary box of the candidate card does not overlap with the boundary box of the card operator in the plurality of consecutive subsequent images, and the position of the candidate card represented by the boundary box of the candidate card is not changed in the plurality of consecutive subsequent images, it can represent that an operation on the candidate card is completed, and thus the candidate card is in a stable state can be determined as the target card.

[0116] At this time, by determining the position of the candidate card and the overlapping between the card operator and the candidate card in the plurality of consecutive subsequent images, the placement area of the target card can be further accurately determined, which can improve the accuracy of card sorting detection and further improve the accuracy of switching between game states.

[0117] In some embodiments, when the target card is determined, card information of the target card can be stored for updating the recorded card information, which includes at least one of: position information indicated by a boundary box of the target card; or attribute information of the target card, where the attribute information includes at least one of a face value or a face state, and the face state includes a visible state or a hidden state.

[0118] The face refers to a side on which information such as a face value of a card etc. can be indicated. A card usually includes two sides, one of which is the back side, and the other is the face side.

[0119] Since the target card is in a stable state, after updating the recorded card information, the recorded card information can include card information of each card in the stable state, thereby improving the reliability of the cached information.

[0120] In some embodiments, when the target card involved in the live image is determined, an attribute detection can be performed on the target card to obtain attribute information. The attribute detection can be set according to business requirements. For example, a face value detection can be performed on the target card to obtain a face value of the target card. For another example, in some games, a face of a card is in a hidden state during a card dealing process and is changed to be visible in a specific game phase. In this situation, a face state of the target card may be determined by performing a face state detection on the target card.

[0121] In some embodiments, a trained attribute information detection model which is generated based on a neural network can be used for performing the attribute information detection. The process for training the attribute information detection model will not be described in detail herein. After acquiring the attribute information of the target card, the attribute information and/or the position information indicated by the boundary box of the target card can be cached in the recorded card information as the card information of the target card. In this way, the recorded card information can include card information of each card in a stable state, thus improving the reliability of the cached information.

[0122] In some embodiments, a face state of a card in the card dealing phase depends on a type of the game. According to the present application, for the card dealing phase of various card games, a card face state detection can be performed, and a state of the game can be switched when the detection result indicates an abnormal.

[0123] Please refer to FIG. 5, which is a schematic flowchart illustrating a method of switching game states according to the present application. As shown in FIG. 5, the method can include step 502 to step 504.

[0124] At step 502, a face state of the target card is obtained from a face state detection on the target card.

[0125] In some embodiments, when the target card is determined, a face state of the target card can be obtained by a face state detection model which is pre-trained based on a neural network. The model training process is not described in detail here.

[0126] At step 504, in response to that the number of dealt cards in the current card game is less than or equal to a predetermined threshold and the face state of the target card does not match a first face state, the current card game is updated to the halt state.

[0127] The dealt cards include the recorded cards and the target card, and the first face state indicates an expected face state for a card in a dealing phase, which is determined from game type configuration information of the current card game.

[0128] The game type configuration information can indicate a game type of the current card game. Before a game starts, a game manager can configure a game type of the game by, such as selecting a game type, etc. When the game configuration is completed, the game type configuration information can be obtained and stored in a node device.

[0129] In a case that the face state of the target card obtained in step 502 is consistent with the first face state, it represents that the face state of the target card is correct. While in a case that the face state of the target card obtained in step 502 does not match the first face state, it represents that the face state of the target card is abnormal and the current card game should be updated to the halt state. In this way, for the card dealing phase of various card games, a card face state detection can be performed, and a state of the game can be switched when the detection result indicates an abnormal.

[0130] For example, types of card games include a first type and a second type, where for a game of the first type, an expected face state for a card in the card dealing phase indicates a hidden state, and for a game of the second type, an expected face state for a card in the card dealing phase indicates a visible state. Assuming that the current game is determined as a game of the first type according to the game type configuration information, and the number of dealt cards is less than or equal to the predetermined threshold, in a case that the face state of the target card indicates the visible state, it represents that the game is abnormal and should be updated to the halt state. In this way, for the card dealing phase of various card games, a card face state detection can be performed, and a state of the game can be switched when the detection result indicates an abnormal.

[0131] In some embodiments, while performing a target game operation, whether card information of cards within a card placement area meets a card information condition for the target game operation can be determined. In a case that the determination result indicates

not meeting, the current card game is updated to the halt state, thereby realizing relevant detection on the target game operation.

[0132] The target game operation can be set according to business requirements. For example, in a card game of the first type, the target game operation may include a card viewing operation.

[0133] In some embodiments, two or more placement areas in a game tabletop includes a first placement area to place a card for an operator of a target game operation and a second placement area to place a card for a non-operator.

[0134] Please refer to FIG. 6, which is a schematic flowchart illustrating a method of switching game states according to the present application. As shown in FIG. 6, the method may include step 602 to step 604.

[0135] At step 602, first card information of cards within the first placement area and second card information of cards within the second placement area are determined based on the card information obtained from the card detection performed on the live image.

[0136] At step 602, referring to the method shown in step 1082, an actual placement area of each of the at least one card can be determined according to position information of each of the at least one card obtained in step 102. And then cards located within the first placement area and the second placement area in the game tabletop are filtered out based on the determined actual placement areas. Afterwards, according to card information of cards involved in the live image, the first card information of cards within the first placement area and the second card information of cards within the second placement area can be obtained.

[0137] At step 604, in response to that the first card information and the second card information do not meet a card information condition for the target game operation, the current card game is updated to the halt state.

[0138] The card information condition includes expected card information for a card within the first placement area or the second placement area, which can be set according to the target game operation in the card game. In a case that the first card information and the second placement area detected in step 602 meets the card information condition, it can represent that the target game operation is in compliance. In a case that the first card information and the second placement area detected in step 602 does not meet the card information condition, it can represent that the target game operation is not compliant, and the current card game should be updated to the halt state. In this way, the relevant detection on the target game operation is realized.

[0139] In some embodiments, the card information condition for the target game operation includes: the number of cards within the first placement area is equal to a first number and the number of cards within the second placement area is equal to a second number.

[0140] At step 602, based on card position information included in card information obtained from a card detection performed on a first live image, the number of cards within the first placement area is determined as a first card number and the number of cards within the second placement area is determined as a second card number.

[0141] The first live image may be any live image collected for the current card game.

[0142] In some embodiments, referring to the method shown in step 1082, according to the card position information obtained from the card detection performed on the first live image in step 102, an actual placement area of each card can be determined. And then based on the determined actual placement areas, the respective number of cards located within the first placement area and the second placement area in the game tabletop is calculated, thereby obtaining the first card number and the second card number.

[0143] At step 604, step 31 can be executed to, in a case of determining that the first card number equals to the first number and the second card number equals to the second number, based on card position information included in card information obtained from a card detection performed on a second live image, determine the number of cards within the first placement area as a new first card number and the number of cards within the second placement area as a new second card number. The second live image is captured later than the first live image in time sequence.

[0144] The first number and the second number are set according to business requirements. In a case of determining that the first card number equals to the first number and the second card number equals to the second number, the game can be determined as currently in a phase for performing the target game operation. And then, referring to the method shown in step 1082, according to the card position information obtained from the card detection performed on the second live image in step 102, an actual placement area of each card can be determined. Afterwards, based on the determined actual placement areas, the respective number of cards located within the first placement area and the second placement area in the game tabletop is calculated, thereby obtaining the new first card number and the new second card number.

[0145] At step 32, whether the new first card number equals to the first number and the new second card number equals to the second number are determined. In a case that the new

first card number equals to the first number while the new second card number does not equal to the second number, it can represent that the first card information and the second card information do not meet the card information condition, that is, the current game is not compliant.

[0146] At step 33, in response to that the new first card number also equals to the first number while the new second card number is less than the second number, the current card game is updated to the halt state. Thus, the state of the game can be switched when the current game is not compliant.

[0147] For example, in a game of the first type, when the first card number equals to the first number, and the second card number equals to the second number, the current game is in a phase of viewing a card by a first player. At this time, for a subsequent second live image, in a case of determining that the number of cards within the first placement area corresponding to the first player (an operator) also equals to the first number while the number of cards within the second placement area corresponding to a non-operator is less than the second number, it is possible that the non-operator is also performing the operation of viewing a card, which is inconsistent with a rule for the current phase of viewing a card by the first player, and then the game can be switched to the halt state.

[0148] In some embodiments, the card information further includes a face state of a card; the face state includes a visible state or a hidden state. The card information condition for the target game operation includes: the number of cards within the first placement area equals to the first number, and the face state of cards within the second placement area includes the hidden state.

[0149] At step 602, based on card position information obtained from a card detection performed on a first live image, the number of cards within the first placement area is determined as a first card number and the number of cards within the second placement area is determined as a second card number. For the description of this step, reference may be made to the foregoing embodiment, which will not be described in detail here.

[0150] At step 604, step 41 can be executed to, in a case of determining that the first card number equals to the first number and the second card number equals to the second number, based on position information and face states of cards obtained from a card detection performed on a second live image, determine the number of cards within the first placement area as a new first card number and face states of cards within the second placement area. The second live image is captured later than the first live image in time sequence.

[0151] In a case of determining that the first card number equals to the first number and the second card number equals to the second number, the game can be determined as currently in a phase for performing the target game operation. Then, the card position information acquired from the card detection on the second live image in step 102 can be obtained, meanwhile, the face state of each of detected cards can be acquired by performing a face state detection on the detected cards with a trained face state detection model. Referring to the method shown in step 1082, an actual placement area of each card can be determined, and then cards within the first placement area and the second placement area on the game tabletop are separated. Afterwards, the number of cards within the first placement area is counted to obtain a new first card number and the face states of cards within the second placement area are determined from the face states of cards.

[0152] At step 42, whether the new first card number equals to the first number and the face states of cards within the second placement area includes the visible state are determined. In a case that the new first card number equals to the first number and the face states of cards within the second placement area includes the visible state, it can represent that the first card information and the second card information do not meet the card information condition for the target game operation, that is, the current game is not compliant.

[0153] At step 43, in response to that the new first card number also equals to the first number and the face states of cards within the second placement area includes the visible state, the current card game is updated to the halt state. In this way, the game state can be switched when the current game is not compliant.

[0154] For example, in a game of a first type, when the first card number equals to the first number and the second card number equals to the second number, the current game is in a phase of viewing a card by a first player. At this time, for a subsequent second live image, in a case of determining that the number of cards within the first placement area corresponding to the first player (an operator) equals to the first number while the face states of cards within the second placement area corresponding to a non-operator includes the visible state, it is possible that the non-operator is also performing the operation of viewing a card, which is inconsistent with a rule for the current phase of viewing a card by the first player, and then the game can be switched to the halt state.

[0155] In some embodiments, the game tabletop further includes a predetermined operating area for the target game operation. The card information condition for the target

game operation includes: the numbers of cards within the first placement area, the second placement area and the predetermined operating area match respective target card numbers.

[0156] The respective target card number indicates an expected number of cards placed in the first placement area, the second placement area or the predetermined operating area while performing the target game operation.

[0157] At step 602, based on card position information obtained from the card detection performed on the live image, actual numbers of cards within the first placement area, the second placement area and the predetermined operating area are determined respectively.

[0158] In some embodiments, referring to the method shown in step 1082, an actual placement area of each card can be determined based on the card position information obtained from the card detection on the first live image in step 102. And then, based on the determined actual placement areas, actual numbers of cards located within the first placement area, the second placement area and the predetermined operating area on the game tabletop are counted.

[0159] At step 604, step 51 can be executed to respectively determine whether the actual number of cards within the first placement area match the target number of cards for the first placement area, whether the actual number of cards within the second placement area match the target number of cards for the second placement area, and the actual number of cards within the predetermined operating area match the target number of cards for the predetermined operating area. In a case that any item of the above indicates not matching, it can represent that the first card information and the second card information do not meet the card information condition for the target game operation, that is, the current game is not compliant.

[0160] At step 52, in response to that, for at least one of the first placement area, the second placement area and the predetermined operating area, the actual number of cards within the area does not match the corresponding target number of cards, the current card game is updated to the halt state. In this way, the state of the game can be switched when the current game is not compliant.

[0161] For example, a second player is not allowed to view a card while a first player is viewing a card. A target number of cards within the first placement area for the first player (an operator) is 0, a target number of cards within the second placement area for the second player (a non-operator) is 2, and a target number of cards within a card viewing area (a predetermined operating area) is 2. From a live image, in a case of determining, for at least

one of the first placement area, the second placement area and the predetermined operating area, that the actual number of cards within the area does not match the corresponding target number of cards, it is possible that the first player does not perform the card viewing operation, and/or the second player is performing the card viewing operation, which is inconsistent with a rule for the current phase of viewing a card by the first player, thus the game can be switched to the halt state.

[0162] In some embodiments, when the number of recorded cards is greater than or equal to the predetermined threshold, the recorded card face states should all be a second face state. In a case that any recorded card face state is not the second face state, it represents that the game is abnormal.

[0163] The second face state indicates an expected face state of a recorded card when dealing the target card, which can be determined according to the game type configuration information of the current card game. For example, in a game of a first type, when the number of recorded cards is greater than or equal to the predetermined threshold, the recorded card face states should all be the visible state. In a case that any recorded card face state is the hidden state, it represents that the game is abnormal.

[0164] Please refer to FIG. 7, which is a schematic flowchart illustrating a method of switching game states according to the present application. As shown in FIG. 7, the method can include step 702 to step 704.

[0165] At step 702, when the at least one card is determined as the target card and the number of recorded cards is greater than or equal to the predetermined threshold, the recorded card face states included in the recorded card information are obtained.

[0166] The recorded card information further includes recorded card face states. The recorded card face states can be obtained from the recorded card information.

[0167] At step 704, in response to that recorded card face states include a face state other than a second face state, the current card game is updated to the halt state.

[0168] Therefore, whether the game progress is compliant can be determined by detecting the face state.

[0169] A card game is taken as an example to illustrate the embodiments in the following.

[0170] A first player P1, a second player P2 and a game manager for dealing a card are involved in the card game. The card game may include a card dealing phase, a card viewing phase for players P1 and P2, a 5-th card phase and a 6-th card phase.

[0171] In the card dealing phase, players P1 and P2 are dealt with 2 cards respectively in an order of P1-P2-P1-P2, that is a total of 4 cards are dealt, where all the 4 cards are face down.

[0172] And then, the game enters the card viewing phase for player P1 in which player P1 can view the 2 cards dealt to player P1.

[0173] Afterwards, the game enters the card viewing phase for player P2 in which player P2 can view the 2 cards dealt to player P2.

[0174] After that, the game enters the 5-th card phase in which whether a 5-th card is to be further dealt and a target party for receiving the 5-th card when dealing the 5-th card can be determined based on face values of the 4 dealt cards.

[0175] Afterwards, the game enters the 6-th card phase in which whether a 6-th card is to be further dealt and a target party for receiving the 6-th card when dealing the 6-th card can be determined based on face values of the 5 dealt cards. When the 6 cards are dealt, a game result can be output, that is, the game ends normally.

[0176] Please refer to FIG. 8, which is a schematic diagram illustrating a game scene according to the present application.

[0177] The game scene as shown in FIG. 8 can include a game tabletop 80 used for a card game, cameras 811-813 disposed respectively right above the game tabletop 80, at the upper left, and the upper right of the game tabletop 80. These cameras can capture a tabletop image of the game tabletop and transmit the tabletop image to a node device connected to the cameras in real time (hereinafter referred to as the node). The node device can be used as an edge computing device, corresponding to a game tabletop in a one-to-one correspondence and processing a live image corresponding to each game tabletop. The node can maintain game states and game phases for the current tabletop game according to a received tabletop image. Meanwhile, the node can maintain a hot zone map including each area in the game tabletop. Different areas in the hot zone map can be represented by different colors. The node can deploy a pre-trained hand-card object detection network (hereinafter referred to as a first network), a face value and face state recognition network (hereinafter referred to as a second network), and the like.

[0178] The game tabletop 80 can include at least a first placement area 83, a second placement area 84 and an operating area for viewing a card 86.

[0179] The game scene further involves a game manager 82 who manages the progress of the tabletop game, and one or more players 85.

[0180] After receiving a live image, for each hand and each card involved in the image, the node can obtain a boundary box and a card ID corresponding to the hand or the card with the first network. Afterwards, on the one hand, the node can perform a detection on an area image enclosed by the boundary box corresponding to each card to identify a face state and a face value of the card with a second network. On the other hand, the node can determine an actual placement area of each card in the game tabletop based on a stored heat map and the position information indicated by the boundary box corresponding to each card.

[0181] And then, the manner shown in step 104 can be used to determine a target card newly detected from the live image. Since the target card is in a stable position and does not change any more, the card information of the determined target card is accurate.

[0182] When a target card is detected, a card ID, an actual placement area, a face state, a face value and other information corresponding to the target card can be stored as card information of the target card in a cache of the node device to update recorded card information.

[0183] In this example, for an area in which a card is in a stable position and not covered by a hand in the live image, information such as a card ID, an actual placement area, a face state, a face value and the like detected from the area can be used to update the recorded card information, such that the recorded card information stored in the cache can be kept reliable and consistent with the current game process.

[0184] When the number of dealt cards is less than a predetermined threshold, the node can determine a serial position of the target card according to the recorded card information, and determine an expected placement area for the target card according to stored card sequential configuration information.

[0185] In a case that an actual placement area of the target card is not the expected placement area, the node can determine that an error occurs in the card dealing order, and update the current card game to a halt state.

[0186] For example, when 3 cards are recorded, the target card should be dealt to the second placement area. In a case that the target card is not in the second placement area, for example, is in the first placement area, it can be determined that the card dealing order is wrong, the node can switch the current game to the halt state and give out an alarm for suspending the game in time, which is beneficial to avoid incorrect game results due to the wrong card dealing order, and thus improving the fairness of the card game.

[0187] In a case that the actual placement area of the target card is the expected placement area, the game can be continued.

[0188] In the card dealing phase, if it is detected that a face state of any card includes a visible state, the current game can be switched to the halt state.

[0189] Assuming that no error is detected from the card dealing order for the 4 dealt cards, the game enters the card viewing phase for players P1 and P2, in which players P1 and P2 need to view a card separately. At this phase, the node can determine an actual number of cards within the first placement area, the second placement area and the operating area for viewing a card according to position information of each card involved in the live image. In a case that the actual numbers of cards within the first placement area and the second placement area are both 0, and the actual number of cards within the operating area for viewing a card is 4, it can represent that players P1 and P2 are viewing a card at the same time, and then the current game can be switched to the halt state and an alarm can be given out for suspending the game in time.

[0190] Afterwards, the game enters the 5-th card phase. At this phase, after detecting that the fourth card is dealt, the node can determine whether the four dealt cards include a card with a face of a hidden state based on the recorded card information stored in the cache. In a case that the determination result is yes, it can be determined that the game is abnormal, and then the current game can be switched to the halt state and an alarm is given out to suspend the game in time.

[0191] When the game is proceeding normally, the node can determine an expected placement area for dealing a 5-th card according to face values of the 4 recorded cards in this phase. In a case of determining that the 5-th card is located in an area other than the expected placement area, it can be determined that the 5-th card is dealt to a wrong position, and then the current game can be switched to the halt state and an alarm can be given out to suspend the game in time.

[0192] Afterwards, the game enters the 6-th card phase. The processing logic for this phase can refer to that for the 5-th card phase, which will not be detailed here.

[0193] In the technical solution disclosed in this example, firstly, relevant information of a card that is in a stable position and not covered by a hand can be detected and stored in the cache, such that a misdetection of the card information due to the card being covered subsequently can be avoided, which will affect state switching.

[0194] Secondly, the game progress including the card dealing phase, the card viewing phase for players P1 and P2, the 5-th card phase and the 6-th card phase can be monitored. When the game is abnormal, the game can be switched to the halt state, so that the game state can be switched in time when the game is abnormal, which is beneficial to avoid incorrect game results due to the abnormality in game, and thus improving the fairness of the card game

[0195] Thirdly, an alarm can be given out when the game is abnormal, so that an on-site management can keep track of the on-site situation in time.

[0196] Corresponding to any one of the embodiments, the present application also provides an apparatus for switching states of a card game.

[0197] Referring to FIG. 9, which is a structural schematic illustrating an apparatus for switching states of a card game according to the present application. As shown in FIG. 9, the apparatus 90 can include: a card detecting module 91, configured to obtain card information including position information of at least one card involved in a live image of a current card game from a card detection on the live image, wherein the live image is acquired from a game tabletop for proceeding the current card game, and the game tabletop includes two or more placement areas for placing a card; a target card determining module 92, configured to determine, in response to that the at least one card is excluded from one or more recorded cards of the current card game, that the at least one card is a target card, wherein the one or more recorded cards include each card detected in the current card game; an expected placement area determining module 93, configured to determine, according to pre-acquired recorded card information and card sequential configuration information of the current card game, an expected placement area for the target card from the two or more placement areas, wherein the card sequential configuration information is used to define a placement area for a card dealt in the current card game; and a first updating module 94, configured to update, in response to position information of the target card indicating that the target card is not placed in the expected placement area, the current card game to a halt state.

[0198] In some embodiments, the apparatus further includes: a first detecting module for a face state, configured to obtain a face state of the target card from a face state detection on the target card; a second updating module, configured to update, in response to that a number of dealt cards in the current card game is less than or equal to a predetermined threshold and the face state of the target card does not match a first face state, the current card game to the

halt state; wherein the dealt cards include the one or more recorded cards and the target card, the first face state indicates an expected face state for a card in a dealing phase, which is determined from game type configuration information of the current card game.

[0199] In some embodiments, wherein the two or more placement areas include a first placement area to place a card for an operator of a target game operation and a second placement area to place a card for a non-operator; the card detecting module 91 is further configured to obtain, based on the card detection performed on the live image, first card information of cards within the first placement area and second card information of cards within the second placement area; the apparatus further including: a third updating module, configured to update, in response to that the first card information and the second card information do not meet a card information condition for the target game operation, the current card game to the halt state when the game type configuration information of the current card game indicates the current card game is of a first type.

[0200] In some embodiments, the first card information includes a number of cards within the first placement area obtained from the card detection on a first live image as a first card number, and a number of cards within the first placement area obtained from the card detection on a second live image captured later than the first live image in time sequence as a new first card number; the second card information includes a number of cards within the second placement area obtained from the card detection on the first live image as a second card number, and a number of cards within the second placement area obtained from the card detection on the second live image as a new second card number; the first card information and the second card information do not meet the card information condition for the target game operation, includes: the first card number equals to a first number while the second card number equals to a second number; and the new first card number also equals to the first number while the new second card number is less than the second number.

[0201] In some embodiments, the first card information includes a number of cards within the first placement area obtained from the card detection on a first live image as a first card number, and a number of cards within the first placement area obtained from the card detection on a second live image captured later than the first live image in time sequence as a new first card number; the second card information includes a number of cards within the second placement area obtained from the card detection on the first live image as a second card number, and face states of cards within the second placement area obtained from the card detection on the second live image; the first card information and the second card

information do not meet the card information condition for the target game operation, includes: the first card number equals to a first number while the second card number equals to a second number; and the new first card number also equals to the first number while the face states of cards within the second placement area include a visible state.

[0202] In some embodiments, the game tabletop further including a predetermined operating area for the target game operation; the first card information includes an actual number of cards within the first placement area; the second card information includes an actual number of cards within the second placement area; the card detecting module 91 further configured to obtain, based on the card detection performed on the live image, an actual number of cards within the predetermined operating area; the first card information and the second card information do not meet the card information condition for the target game operation, includes at least one of: the actual number of cards within the first placement area does not match a target number of cards for the first placement area; the actual number of cards within the second placement area does not match a target number of cards for the second placement area; or the actual number of cards within the predetermined operating area does not match a target number of cards for the predetermined operating area.

[0203] In some embodiments, the card sequential configuration information includes a correspondence between placement areas and serial positions of cards dealt in the current card game; the expected placement area determining module 93 is specifically configured to determine, in response to that a number of recorded cards determined based on the recorded card information does not exceed a predetermined threshold, a serial position of the target card based on the number of recorded cards; and determine, based on the correspondence included in the card sequential configuration information, the expected placement area corresponding to the serial position of the target card from the two or more placement areas.

[0204] In some embodiments, the recorded card information including recorded card face values; the card sequential configuration information includes an association relationship between recorded card face values and a placement area for the target card; the expected placement area determining module 93 is specifically configured to obtain, in response to that a number of recorded cards determined based on the recorded card information is greater than a predetermined threshold, the recorded card face values included in the recorded card information; and determine, based on the association relationship included in

the card sequential configuration information, the expected placement area associated with the recorded card face values from the two or more placement areas.

[0205] In some embodiments, the recorded card information further including recorded card face states; the apparatus 90 further includes: a second detecting module for a face state, configured to obtain, when determining that the at least one card is the target card and a number of recorded cards determined based on the recorded card information is greater than or equal to a predetermined threshold, the recorded card face states included in the recorded card information; update, in response to that the recorded card face states include a face state other than a second face state while the second face state is expected for a recorded card when dealing the target card, the current card game to the halt state.

[0206] In some embodiments, wherein the recorded card information including recorded card position information. Accordingly, the target card determining module 92 is specially configured to determine, in response to that position information of the at least one card is excluded from the recorded card position information, that the at least one card is a candidate card; for each of a plurality of consecutive subsequent images of the live image, obtain card information and card operator information from the subsequent image by performing a detection of card and card operator on the subsequent image, wherein the card information includes a boundary box indicating position information of a card; the card operator information includes a boundary box indicating position information of a card operator; and determine the candidate card as the target card in response to at least one of: determining, based on the respective card information and card operator information, that a boundary box of the candidate card does not overlap with a boundary box of the card operator in each of the plurality of consecutive subsequent images; or, a position of the candidate card indicating by the boundary box of the candidate card is not changed in the plurality of consecutive subsequent images.

[0207] In some embodiments, the apparatus 90 further includes: a cache updating module, configure to update the recorded card information by storing card information of the target card which includes at least one of: position information indicated by a boundary box of the target card; or attribute information of the target card, wherein the attribute information includes at least one of a face value or a face state, and the face state includes a visible state or a hidden state.

[0208] The examples of the apparatus for switching states of a card game according to the present application can be used in an electronic device. Correspondingly, the present

application discloses an electronic device, which can include a processor; a memory configured to store executable instructions of the processor. The processor is configured to invoke the executable instructions stored in the memory to implement the method of switching states of a card game as shown in any of the examples.

[0209] Referring to FIG. 10, FIG. 10 is a block diagram of hardware of an electronic device according to the present application.

[0210] As shown in FIG. 10, the electronic device can include a processor for executing instructions, a network interface for network connection, a memory for storing operating data for the processor, and a non-transitory memory for storing instructions corresponding to the apparatus for switching states of a card game.

[0211] The examples of the apparatus can be implemented by software, or can be implemented by hardware or a combination of software and hardware. Taking software implementation as an example, as a logical device, it is formed by reading the corresponding computer program instructions in the non-transitory memory into the memory through the processor of the electronic device where it is located. From a hardware perspective, in addition to the processor, memory, network interface, and non-transitory memory shown in FIG. 10, the electronic device in which the device is located in the example usually includes other hardware based on the actual functions of the electronic device, which will not be elaborated here.

[0212] It should be understood that, in order to improve the processing speed, the corresponding instructions of the apparatus for switching states of a card game can also be directly stored in the memory, which is not limited here.

[0213] The present application provides a non-transitory computer-readable storage medium, the storage medium stores a computer program, and the computer program is configured to perform any method of switching states of a card game according to any of the above examples.

[0214] Those skilled in the art should understand that one or more examples of the present application can be provided as a method, a system, or a computer program product. Therefore, one or more examples of the present application can adopt the form of a complete hardware example, a complete software example, or an example combining software and hardware. Moreover, one or more examples of the present application can be in a form of a computer program product having one or more computer-usable storage media (which can

include but not limited to disk storage, CD-ROM, optical storage, etc.) containing computer-usable program codes.

[0215] In the present application, "and/or" means having at least one of the two. For example, "A and/or B" can include three schemes: A, B, and "A and B".

[0216] The various examples in the present application are described in a progressive manner, and the same or similar parts between the various examples can be referred to each other, and each example focuses on the differences from other examples. In particular, as for the data processing device example, since it is basically similar to the method example, the description is relatively simple, and for related parts, reference can be made to the part of the description of the method example.

[0217] The above has described specific examples of the present application. Other examples are within the scope of the appended claims. In some cases, the actions or steps described in the claims can be performed in a different order from that in the examples and still achieve desired results. In addition, the processes depicted in the drawings do not necessarily require the specific order or sequential order shown to achieve the desired result. In some examples, multitasking and parallel processing are also possible or can be advantageous.

[0218] The examples of the subject and functional operations described in the present application can be implemented in the following: digital electronic circuits, tangible computer software or firmware, computer hardware that can include the structures disclosed in the present application and their structural equivalents, or one or more of them. The examples of the subject matter described in the present application can be implemented as one or more computer programs, that is, one or more units in the computer program instructions that are encoded in the tangible non-transitory program carrier to be executed by the data processing device or to control the operation of the data processing device. Alternatively or in addition, the program instructions can be encoded in artificially generated propagated signals, such as machine-generated electrical, optical, or electromagnetic signals, which are generated to encode information and transmit it to a suitable receiver device to be performed by the data processing device. The computer storage medium can be a machine-readable storage device, a machine-readable storage substrate, a random or serial access memory device, or a combination of one or more of them.

[0219] The processing and logic flows described in the present application can be executed by one or more programmable computers executing one or more computer programs, to perform corresponding functions by operating according to input data and generating output. The processing and logic flow can also be executed by a dedicated logic circuit, such as FPGA (Field Programmable Gate Array) or ASIC (Application Specific Integrated Circuit), and the device can also be implemented as a dedicated logic circuit.

[0220] A computer suitable for executing a computer program can include, for example, a general-purpose and/or special-purpose microprocessor, or any other type of central processing unit. Generally, the central processing unit will receive instructions and data from a read-only memory and/or random access memory. The basic components of a computer can include a central processing unit for implementing or executing instructions and one or more memory devices for storing instructions and data. Generally, the computer will also include one or more mass storage devices for storing data, such as magnetic disks, magneto-optical disks, or optical disks, etc., or the computer will be operatively coupled with this mass storage device to receive data or send data to it, or both. However, the computer does not have to have such equipment. In addition, the computer can be embedded in another device, such as a mobile phone, a personal digital assistant (PDA), a mobile audio or video player, a game console, a global positioning system (GPS) receiver, or a universal serial bus (USB) flash drives are portable storage devices, to name a few.

[0221] Computer readable media suitable for storing computer program instructions and data can include all forms of non-transitory memory, media and memory devices, such as semiconductor memory devices (such as EPROMs, EEPROMs and flash memory devices), magnetic disks (such as internal hard disks or removable disks), magneto-optical disks, CD ROMs and DVD-ROM disks. The processor and the memory can be supplemented by or incorporated into a dedicated logic circuit.

[0222] Although the present application contains many specific implementation details, these should not be construed as limiting any disclosed scope or claimed scope, but are mainly used to describe the features of specific disclosed examples. Certain features described in a plurality of examples in the present application can also be implemented in combination in a single example. On the other hand, various features described in a single example can also be implemented in a plurality of examples separately or in any suitable sub-combination. In addition, although features can function in certain combinations as described above and even as originally claimed, one or more features from the claimed

combination can in some cases be removed from the combination, and the claimed combination can refer to a sub-combination or a variant of the sub-combination.

[0223] Similarly, although operations are depicted in a specific order in the drawings, this should not be construed as requiring these operations to be performed in the specific order shown or sequentially, or requiring all illustrated operations to be performed to achieve the desired result. In some cases, multitasking and parallel processing can be advantageous. In addition, the separation of various system units and components in the examples should not be understood as requiring such separation in all examples, and it should be understood that the described program components and systems can usually be integrated in a single software product, or packaged into a plurality of software products.

[0224] Thus, specific examples of the subject matter have been described. Other examples are within the scope of the appended claims. In some cases, the actions recited in the claims can be performed in a different order and still achieve desired results. In addition, the processes depicted in the drawings are not necessarily in the specific order or sequential order shown in order to achieve the desired result. In some implementations, multitasking and parallel processing can be advantageous.

[0225] The above are only preferred examples of one or more examples of the present application, and are not used to limit one or more examples of the present application. Any modification, equivalent replacement, improvement within the spirit and principle of one or more examples of the present application shall be included in the protection scope of one or more examples of the present application.

CLAIMS

1. A method of switching states of a card game, comprising:

obtaining card information comprising position information of at least one card involved in a live image of a current card game from a card detection on the live image, wherein the live image is acquired from a game tabletop for proceeding the current card game, and the game tabletop comprises two or more placement areas for placing a card;

determining, in response to that the at least one card is excluded from one or more recorded cards of the current card game, that the at least one card is a target card, wherein the one or more recorded cards comprise each card detected in the current card game;

determining, according to pre-acquired recorded card information and card sequential configuration information of the current card game, an expected placement area for the target card from the two or more placement areas, wherein the card sequential configuration information is used to define a placement area for a card dealt in the current card game; and

updating, in response to position information of the target card indicating that the target card is not placed in the expected placement area, the current card game to a halt state.

2. The method according to claim 1, further comprising:

obtaining a face state of the target card from a face state detection on the target card; and

updating, in response to that a number of dealt cards in the current card game is less than or equal to a predetermined threshold and the face state of the target card does not match a first face state, the current card game to the halt state;

wherein the dealt cards comprise the one or more recorded cards and the target card,

the first face state indicates an expected face state for a card in a dealing phase, which is determined from game type configuration information of the current card game.

3. The method according to claim 2, wherein

the two or more placement areas comprise a first placement area to place a card for an operator of a target game operation and a second placement area to place a card for a non-operator;

based on the card detection performed on the live image, first card information of cards within the first placement area and second card information of cards within the second placement area are further obtained;

when the game type configuration information of the current card game indicates the current card game is of a first type, the method further comprising:

updating, in response to that the first card information and the second card information do not meet a card information condition for the target game operation, the current card game to the halt state.

4. The method according to claim 3, wherein

the first card information comprises

a number of cards within the first placement area obtained from the card detection on a first live image as a first card number, and

a number of cards within the first placement area obtained from the card detection on a second live image captured later than the first live image in time sequence as a new first card number;

the second card information comprises

a number of cards within the second placement area obtained from the card detection on the first live image as a second card number, and

a number of cards within the second placement area obtained from the card detection on the second live image as a new second card number;

the first card information and the second card information do not meet the card information condition for the target game operation, comprises:

the first card number equals to a first number while the second card number equals to a second number; and

the new first card number also equals to the first number while the new second card number is less than the second number.

5. The method according to claim 3, wherein

the first card information comprises

a number of cards within the first placement area obtained from the card detection on a first live image as a first card number, and

a number of cards within the first placement area obtained from the card detection on a second live image captured later than the first live image in time sequence as a new first card number;

the second card information comprises

a number of cards within the second placement area obtained from the card detection on the first live image as a second card number, and

face states of cards within the second placement area obtained from the card detection on the second live image;

the first card information and the second card information do not meet the card information condition for the target game operation, comprises:

the first card number equals to a first number while the second card number equals to a second number; and

the new first card number also equals to the first number while the face states of cards within the second placement area comprise a visible state.

6. The method according to claim 3, wherein

the game tabletop further comprising a predetermined operating area for the target game operation;

the first card information comprises an actual number of cards within the first placement area;

the second card information comprises an actual number of cards within the second placement area;

based on the card detection performed on the live image, an actual number of cards within the predetermined operating area is further obtained;

the first card information and the second card information do not meet the card information condition for the target game operation, comprises at least one of:

the actual number of cards within the first placement area does not match a target number of cards for the first placement area;

the actual number of cards within the second placement area does not match a target number of cards for the second placement area; or

the actual number of cards within the predetermined operating area does not match a target number of cards for the predetermined operating area.

7. The method according to claim 1, wherein the card sequential configuration information comprises a correspondence between placement areas and serial positions of cards dealt in the current card game; determining, according to the pre-acquired recorded card information and the card sequential configuration information of the current card game,

the expected placement area for the target card from the two or more placement areas comprises:

determining, in response to that a number of recorded cards determined based on the recorded card information does not exceed a predetermined threshold, a serial position of the target card based on the number of recorded cards; and

determining, based on the correspondence comprised in the card sequential configuration information, the expected placement area corresponding to the serial position of the target card from the two or more placement areas.

8. The method according to claim 1, the recorded card information comprising recorded card face values; the card sequential configuration information comprises an association relationship between recorded card face values and a placement area for the target card; determining, according to the pre-acquired recorded card information and the card sequential configuration information of the current card game, the expected placement area for the target card from the two or more placement areas comprises:

obtaining, in response to that a number of recorded cards determined based on the recorded card information is greater than a predetermined threshold, the recorded card face values comprised in the recorded card information; and

determining, based on the association relationship comprised in the card sequential configuration information, the expected placement area associated with the recorded card face values from the two or more placement areas.

9. The method according to claim 1, the recorded card information further comprising recorded card face states; the method further comprising:

obtaining, when determining that the at least one card is the target card and a number of recorded cards determined based on the recorded card information is greater than or equal to a predetermined threshold, the recorded card face states comprised in the recorded card information; and

updating, in response to that the recorded card face states comprises a face state other than a second face state while the second face state is expected for a recorded card when dealing the target card, the current card game to the halt state.

10. The method according to any one of claims 1 to 9, wherein the recorded card information comprising recorded card position information; determining, in response to that the at least one card is excluded from the one or more recorded cards of the current card game, that the at least one card is the target card comprises:

determining, in response to that position information of the at least one card is excluded from the recorded card position information, that the at least one card is a candidate card;

for each of a plurality of consecutive subsequent images of the live image, obtaining card information and card operator information from the subsequent image by performing a detection of card and card operator on the subsequent image, wherein the card information comprises a boundary box indicating position information of a card; the card operator information comprises a boundary box indicating position information of a card operator; and

determining the candidate card as the target card in response to at least one of:

determining, based on the respective card information and card operator information, that a boundary box of the candidate card does not overlap with a boundary box of the card operator in each of the plurality of consecutive subsequent images; or,

a position of the candidate card indicating by the boundary box of the candidate card is not changed in the plurality of consecutive subsequent images.

11. The method according to claim 1, further comprising:

updating the recorded card information by storing card information of the target card which comprises at least one of:

position information indicated by a boundary box of the target card; or

attribute information of the target card, wherein the attribute information comprises at least one of a face value or a face state, and the face state comprises a visible state or a hidden state.

12. An apparatus for switching states of a card game, comprising:

a card detecting module, configured to obtain card information comprising position information of at least one card involved in a live image of a current card game from a card detection on the live image, wherein the live image is acquired from a game tabletop for proceeding the current card game, and the game tabletop comprises two or more placement areas for placing a card;

a target card determining module, configured to determine, in response to that the at least one card is excluded from one or more recorded cards of the current card game, that the at least one card is a target card, wherein the one or more recorded cards comprise each card detected in the current card game;

an expected placement area determining module, configured to determine, according to pre-acquired recorded card information and card sequential configuration information of the current card game, an expected placement area for the target card from the two or more placement areas, wherein the card sequential configuration information is used to define a placement area for a card dealt in the current card game; and

a first updating module, configured to update, in response to position information of the target card indicating that the target card is not placed in the expected placement area, the current card game to a halt state.

13. The apparatus according to claim 12, the apparatus further comprising:

a first detecting module for a face state, configured to obtain a face state of the target card from a face state detection on the target card;

a second updating module, configured to update, in response to that a number of dealt cards in the current card game is less than or equal to a predetermined threshold and the face state of the target card does not match a first face state, the current card game to the halt state;

wherein the dealt cards comprise the one or more recorded cards and the target card, the first face state indicates an expected face state for a card in a dealing phase, which is determined from game type configuration information of the current card game.

14. The apparatus according to claim 13, wherein the two or more placement areas comprise a first placement area to place a card for an operator of a target game operation and a second placement area to place a card for a non-operator;

the card detecting module is further configured to obtain, based on the card detection performed on the live image, first card information of cards within the first placement area and second card information of cards within the second placement area; and

the apparatus further comprising:

a third updating module, configured to update, in response to that the first card information and the second card information do not meet a card information condition for

the target game operation, the current card game to the halt state when the game type configuration information of the current card game indicates the current card game is of a first type.

15. The apparatus according to any one of claims 12 to 14, wherein the recorded card information comprising recorded card position information; the target card determining module is specially configured to:

determine, in response to that position information of the at least one card is excluded from the recorded card position information, that the at least one card is a candidate card;

for each of a plurality of consecutive subsequent images of the live image, obtain card information and card operator information from the subsequent image by performing a detection of card and card operator on the subsequent image, wherein the card information comprises a boundary box indicating position information of a card; the card operator information comprises a boundary box indicating position information of a card operator; and

determine the candidate card as the target card in response to at least one of:

determining, based on the respective card information and card operator information, that a boundary box of the candidate card does not overlap with a boundary box of the card operator in each of the plurality of consecutive subsequent images; or,

a position of the candidate card indicating by the boundary box of the candidate card is not changed in the plurality of consecutive subsequent images.

16. The apparatus according to claim 15, the apparatus further comprising:

a cache updating module, configured to update the recorded card information by storing card information of the target card which comprises at least one of:

position information indicated by a boundary box of the target card; or

attribute information of the target card, wherein the attribute information comprises at least one of a face value or a face state, and the face state comprises a visible state or a hidden state.

17. An electronic device, comprising:

a processor, and

a memory for storing computer instructions that can be read by the processor;

wherein, by executing the computer instructions, the processor is caused to implement the method of switching states of a card game according to any one of claims 1 to 11.

18. A non-transitory computer readable storage medium, storing computer readable instructions for causing a computer to perform the method of switching states of a card game according to any one of claims 1 to 11.