

IMAGE GENERATING METHODS AND APPARATUSES, AND DETECTING METHODS AND APPARATUSES

TECHNICAL FIELD

[0001] The present disclosure relates to the field of computer vision technology, in particular to an image generating method and apparatus, and a detecting method and apparatus.

BACKGROUND

[0002] Target detection is an important part of the intelligent video analysis system. In a game scene, high-accuracy detection for a game prop object is desired, while a false detection for a non-game prop object (collectively referred to as foreign things), which affects the analysis of the system, is not desired.

[0003] In a traditional method, sample images which involve foreign things are acquired to train a neural network, so as to improve a robustness of the neural network and reduce false detections. However, since foreign things have a low probability of appearing in a real scene, a cost of acquiring the sample images is high.

SUMMARY

[0004] The present disclosure provides an image generating method and apparatus, and a detecting method and apparatus.

[0005] According to a first aspect of the embodiments of the present disclosure, an image generating method is provide, the method includes: acquiring a first image of a game area; cropping a second image involving a target object from the first image, wherein the target object includes a non-game prop object in the game area; obtaining a transformed image by performing a transformation process on the second image, wherein the target object has different display state attributes in the transformed image and the second image; superimposing the transformed image on a preset game scene image to obtain a game scene image involving the target object, and the game scene image involving the target object is used to train an initial neural network into a target neural network for detecting a game prop object in a game area based on an image.

[0006] In some embodiments, acquiring the first image of the game area includes: acquiring an image of the game area by imaging the game area as the first image.

[0007] In some embodiments, cropping the second image involving the target object from the first image includes: cropping the second image involving the target object from the first image based on position information of the target object in the first image; wherein the position information is obtained from a target detection performed on the first image, or one or more pre-marked positions.

[0008] In some embodiments, cropping the second image involving the target object from the first image includes: acquiring a reference image of the target object; detecting a candidate object from the first image, and determining a similarity between the candidate object and the target object in the reference image; in response to that the similarity is greater than a preset similarity threshold, determining the candidate object as the target object, and cropping the second image involving the target object from the first image.

[0009] In some embodiments, the target object includes a game prop object in the game area; obtaining the first image includes: obtaining an image detection result corresponding to a candidate image acquired by imaging the game area; in response to the image detection result indicating that the game prop object in the game area is operated incorrectly, determining the candidate image as the first image.

[0010] In some embodiments, the image detection result includes information of the incorrectly operated game prop object; cropping the second image involving the target object from the first image includes: based on the information of the incorrectly operated game prop, cropping an image involving the incorrectly operated game prop object from the first image, and determining the image involving the incorrectly operated game prop object as the second image.

[0011] In some embodiments, obtaining the transformed image by performing the transformation process on the second image is realized by at least one of the following: cropping a target element on the target object from the second image, performing the transformation process on the target element, and superimposing the transformed target element on the second image to obtain the transformed image, wherein the transformed target element and the target element from the second image has different display state attributes; acquiring an image involving a same-category object of a same category as the target object from an image library, and determining the image involving the same-category object as the transformed image.

[0012] In some embodiments, the method further includes obtaining the target neural network by training the initial neural network based on the game scene image involving the target object.

[0013] In some embodiments, obtaining the target neural network by training the initial neural network based on the game scene image involving the target object includes: performing a first training on the initial neural network based on the image of a game prop object to obtain an intermediate neural network; performing a second training on the intermediate neural network based on the game scene image involving the target object to obtain the target neural network.

[0014] According to a second aspect of the embodiments of the present disclosure, a detecting method is provided, the method includes: acquiring a to-be-processed image involving a game prop object; inputting the to-be-processed image into a pre-trained target neural network, so as to obtain a detection result of the game prop object output by the target neural network; wherein, the target neural network is trained based on one or more sample images, and the sample images are generated by the image generation method according to any of the embodiments of the present disclosure.

[0015] According to a third aspect of the embodiments of the present disclosure, an image generating apparatus is provided, the apparatus includes: a first obtaining module, configured to acquire a first image of a game area; an image cropping module, configured to, crop a second image involving a target object from the first image, wherein the target object includes a non-game prop object in the game area; an image transforming module, configured to obtain a transformed image by performing a transformation process on the second image, wherein the target object has different display state attributes in the transformed image and the second image; and a superimposing module, configured to superimpose the transformed image on a preset game scene image to obtain a game scene image involving the target object, and the game scene image involving the target object is used to train an initial neural network into a target neural network for detecting a game prop object in a game area based on an image.

[0016] In some embodiments, the first obtaining module is configured to acquire an image of the game area by imaging the game area as the first image.

[0017] In some embodiments, the image cropping module is configured to crop the second image involving the target object from the first image based on position information of the

target object in the first image; wherein the position information is obtained from a target detection performed on the first image, or one or more pre-marked positions.

[0018] In some embodiments, the image cropping module includes: a reference image obtaining unit, configured to acquire a reference image of the target object; a similarity determining unit, configured to detect a candidate object from the first image, and determining a similarity between the candidate object and the target object in the reference image; and a cropping unit, configured to in response to that the similarity is greater than a preset similarity threshold, determine the candidate object as the target object, and crop the second image involving the target object from the first image.

[0019] In some embodiments, the target object includes a game prop object in the game area; the first obtaining module includes: a detection result obtaining unit, configured to obtain an image detection result corresponding to a candidate image acquired by imaging the game area; an image determining unit, configured to in response to the image detection result indicating that the game prop object in the game area is operated incorrectly, determine the candidate image as the first image.

[0020] In some embodiments, the image detection result includes information of the incorrectly operated game prop object, the image cropping module is configured to: crop, based on the information of the incorrectly operated game prop, an image involving the incorrectly operated game prop object from the first image, and determine the image involving the incorrectly operated game prop object as the second image.

[0021] In some embodiments, the image transformation module is configured to obtain the transformed image by performing the transformation process on the second image is realized by at least one of the following: cropping a target element on the target object from the second image, performing the transformation process on the target element, and superimposing the transformed target element on the second image to obtain the transformed image, wherein the transformed target element and the target element from the second image has different display state attributes; acquiring an image involving a same-category object of a same category as the target object from an image library, and determining the image involving the same-category object as the transformed image.

[0022] In some embodiments, the apparatus further includes a training module, configured to train the initial neural network based on the game scene image involving the target object to obtain the target neural network.

[0023] In some embodiments, the training module includes: a first training unit, configured to perform a first training on the initial neural network based on the image of a game prop object to obtain an intermediate neural network; a second training unit, configured to perform a second training on the intermediate neural network based on the game scene image involving the target object to obtain the target neural network.

[0024] According to a fourth aspect of the embodiments of the present disclosure, a detecting apparatus is provided, the apparatus includes: a second obtaining module, configured to acquire a to-be-processed image involving a game prop object; an inputting module, configured to input the to-be-processed image into a pre-trained target neural network, so as to obtain a detection result of the game prop object output by the target neural network; wherein, the target neural network is trained based on one or more sample images, and the sample images are generated by the image generation apparatus of the embodiments of the present disclosure.

[0025] According to a fifth aspect of the embodiments of the present disclosure, provided is a computer readable storage medium, storing computer programs, where the programs are executed by a processor to implement the method according to any embodiment.

[0026] According to a sixth aspect of the embodiments of the present disclosure, provided is a computer device, including a memory, a processor and computer programs stored in the memory and run on the processor, where the processor executes the programs to implement the method according to any one embodiment.

[0027] In the embodiments of the present disclosure, by performing a transformation process on an image involving a target object as a non-game prop object to obtain a transformed image, and then superimposing the transformed image on a game scene image, a game scene image involving the target object can be quickly generated, thereby reducing image acquisition costs.

[0028] It should be understood that the above general descriptions and the subsequent detailed descriptions are merely illustrative and explanatory rather than limit the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] The accompanying drawings, which are incorporated in and constitute a part of this specification and illustrates examples consistent with the present disclosure and, together with the description, serve to explain the technical solution of the disclosure.

[0030] FIG. 1A is a schematic diagram of a game scene according to some embodiments.

[0031] FIG. 1B is a schematic diagram of a game area according to some embodiments.

[0032] FIG. 2 is a flowchart of an image generating method according to embodiments of the present disclosure.

[0033] FIG. 3A, FIG. 3B, and FIG. 3C are schematic diagrams of transformed images according to embodiments of the present disclosure.

[0034] FIG. 4 is a flowchart of an detecting method according to embodiments of the present disclosure.

[0035] FIG. 5 is a block diagram of an image generating apparatus according to embodiments of the present disclosure.

[0036] FIG. 6 is a block diagram of a detecting apparatus according to embodiments of the present disclosure.

[0037] FIG. 7 is a schematic structural diagram of an computer device provided according to embodiments of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0038] Examples will be described in detail herein, 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 embodiments described in the following examples do not represent all embodiments consistent with the present disclosure. Rather, they are merely examples of apparatuses and methods consistent with some aspects of the present disclosure as detailed in the appended claims.

[0039] The terms used in the present disclosure are for the purpose of describing a particular embodiment only, and not intended to be limiting of the present disclosure. The singular forms such as “a”, “said”, and “the” used in the present disclosure and the appended claims are also intended to include multiple, unless the context clearly indicates otherwise. It is also to be understood that the term “and/or” as used herein refers to any or all possible combinations that include one or more associated listed items. Further, the term “at least one” herein represents any one of multiple or any combination of at least two of multiple.

[0040] It is to be understood that although different information may be described using the terms such as first, second, third, etc. in the present disclosure, the information should not be limited to these terms. These terms are used only to distinguish the same type of

information from each other. For example, the first information may also be referred to as the second information without departing from the scope of the present disclosure, and similarly, the second information may also be referred to as the first information. Depending on the context, the word “if” as used herein may be interpreted as “when” or “as” or “determining in response to”.

[0041] To help those skilled in the art to better understand the technical solutions of the embodiments of the present disclosure and make the above objects, advantages and features of the embodiments of the present disclosure clearer and more understandable, the technical solutions of the embodiments of the present disclosure will be further detailed below in combination with the accompanying drawings.

[0042] As shown in FIG.1A, which is a schematic diagram of a game scene. Player A and player B can sit at a table and play a game. The table includes a game area 103, as shown by a gray oval area in FIG. 1A. One or more image acquisition devices 101 may be arranged around the game area for imaging the game area to obtain images of the game area during the game of the player A and the player B. For example, in this embodiment, a total of three image acquisition devices 101 are provided, which are located above the game area and on both sides of the game area. The image acquisition device 101 may send the acquired images to a server 102 for processing, so as to detect information of a game prop object based on the image, and determine whether an operation performed on the game prop object satisfies a preset game rule based on the information of the detected game prop object. For example, it may be determined whether a placement position of the game prop object complies with the game rule based on one image frame, or whether a placement order of the game prop object complies with the game rule based on multiple image frames. Those skilled in the art can understand that this embodiment is only an exemplary description and is not intended to limit the present disclosure. The solutions of the embodiments of the present disclosure may also be applied to other game scenes.

[0043] In the game scene, a high-accuracy detection of game prop objects is required. However, the detection process may be interfered by objects other than the game prop. As shown in FIG. 1B, when the game prop object is a playing card, the game area 103 may include a membership card, and the detection system may mistakenly detect the membership card as a playing card and determine an incorrect number and placement positions of the playing cards placed in the game area. Especially when the game prop object and/or a non-game prop object is blocked, the ambient light is dark, or the characteristics of the non-game

prop object is similar to those of the game prop object, the false detection rate may be greatly increased. In order to reduce false detections, a neural network can be trained with a sample image that involves a non-game prop object, and then the game prop object can be detected from the image of the game area through the trained neural network. However, since the probability of the non-game prop object appearing in the game scene is low, the related technology generally obtains sample images involving the non-game prop object from a large number of real images, or constructs a real game scene by manually placing the non-game prop object to acquire sample images. The image acquisition in the above manner is difficult and the acquisition cost is high, and it is difficult to acquire a sufficient number of sample images including the non-game prop object in a short time to train the neural network.

[0044] Based on the above, a detecting method is provided by the embodiments of the present disclosure, as shown in FIG. 2, the method includes the following:

[0045] At step 201, a first image of a game area is acquired.

[0046] At step 202, a second image involving a target object is cropped from the first image, wherein the target object includes a non-game prop object in the game area.

[0047] At step 203, a transformed image is obtained by performing a transformation process on the second image, wherein the target object has different display state attributes in the transformed image and the second image.

[0048] At step 204, the transformed image is superimposed on a preset game scene image to obtain a game scene image involving the target object, and the game scene image involving the target object is used to train an initial neural network into a target neural network for detecting a game prop object in the game area based on an image.

[0049] In step 201, the game area may include an operation area of game props, which are objects related to game contents, including but not limited to at least one of the following game icons used to indicate a payout ratio of game coins: playing cards, dice, game coins, and game tokens.

[0050] The first image of the game area may include a game prop object or a non-game prop object. The non-game prop object may include but is not limited to one or more of a membership card, a mobile phone, a wallet, a key, a water cup, a bottle cap, an ashtray, etc.. The non-game prop object is an object that is not related to the game contents. In general, the probability of the non-game prop object appearing in the game area is lower than the probability of the game prop object appearing in the game area. For example, in 100 images of the game scene, there may be only one image involving the non-game prop object. The

non-game prop object can be determined as the target object, or the non-game prop object and a specific game prop object can both be determined as the target object. The specific game prop object can include but is not limit to at least one of the following: a game prop object with a false detection rate higher than a false detection rate threshold, a game prop object with an appearance frequency in an image of the game area higher than a preset frequency, and a game prop object in a specific sub-area in the game area.

[0051] Optionally, the first image of the game area does not involve the game prop object and only includes the non-game prop object. Since in general, a specific category of non-game prop objects are not required to be identified and only needs to be determined that whether the object involved in the image is the game prop object or not, the category of the non-game prop objects can be determined as a same category, and the categories of game prop objects can be determined respectively. For example, in a case that the game area involves 5 category of objects: membership card, mobile phone, wallet, playing card, game coin, the playing card can be determined as a first category, the game coin can be determined as a second category, and the membership card, the mobile phone and the wallet can be determined collectively as a third category. In this case, the category of the non-game prop objects involved in the first image of the game area are not required to be labeled, which lower the cost of image processing.

[0052] In some embodiments, the first image of the game area may be obtained by an image acquisition device set around the game area imaging the game area. The first image may be a single image or an image frame in a video stream. The first image may be acquired by a single image acquisition device; or the first image may be acquired by acquiring respective initial images with each of multiple image acquisition devices, synchronizing the acquired initial images, and then fusing the synchronized initial images.

[0053] The first image may be an image acquired in real time during the game process in the game area, or may be an image acquired in the game area after a target object is placed in the game area when the game is not playing in the game area. Only a small amount of images of the target object is required here so that the difficulty and cost of acquiring the image is relatively low.

[0054] In some other embodiments, the image acquired by imaging the game area may be determined as a candidate image and an image detection result on the candidate image is obtained. In a case that the image detection result indicating that the game prop object in the game area is incorrectly operated, the candidate image is determined as the first image. The

candidate of the embodiment may be an image acquired in real time during the game process or may be an image recorded and saved during the game process.

[0055] The image detection result may be a detection result of an operation on the game prop involved in the candidate image. For example, including but is not limit to a detection result of at least one of: a placement position, a placement order and a number of the game props. Every time at least one frame of the candidate image is obtained, the detection can be performed on the candidate image. If it is detected that the game prop object is incorrectly operated, warning information is output. Therefore, in a case that the warning information for the candidate image is obtained, the candidate image can be determined as the first image.

[0056] The warning information for the image generally includes two types. The first type is that the operation on the game prop object involved in the image does not comply with the game rule. The second type is that the target object involved in the image is mistakenly determined as the game prop object which causes a false detection (that is the detection result is not complied with a real result). A second type image can be selected from the image related to the warning information and determined as the second image involving the target object. The selecting process can be realized manually. For example, warning information for image P1 and warning information for image P2 is obtained. After manually check, in image P1, a game participant mistakenly place the game prop (such as a playing card) to a wrong position; in image P2, the game participant place a membership card outside a prop operation area in the game area, which causes the detecting program mistakenly determines that the playing card is placed outside the prop operation area, and outputs the warning information of the game prop is mistakenly placed. Therefore, only P2 may be determined as the first image and the image P1 is not determined as the first image.

[0057] In other embodiments, a key word corresponding to the target object can be obtained and the second image involving the target object can be searched for based on the key word from an image data library. An image in the image data library can be pre-associated with the key word. The key word may include a key word indicating a category of the target object, for example, “wallet”, “key”, etc., or may also include a key word indicating a feature such as shape, size, color, material, texture of the target object, for example, “round chip”, “less than 10cm”, “metal”, “stripe”, etc..

[0058] In step 202, in a case that the first image is acquired by imaging the game area, the second image involving the target object is cropped from the first image. In some embodiments, the second image involving the target object can be cropped from the first

image based on position information of the target object in the first image. The position information can be determined by performing target detection on the first image or can be determined based on a pre-labeled position. The target objection can be realized by a neural network. The pre-labeled position can be a position labeled manually or automatically. The position of a detection frame of the target object can be obtained by any of the above methods, and the second image involving the target object can be cropped from the first image based on the position of the detection frame. The second image involving the target object may only involve the target object and does not involve any other object than the target object.

[0059] In some embodiments, a reference image of the target object can be acquired; a candidate object is detected in the first image, and a similarity of the candidate object and the target object in the reference image is determined. In a case that the similarity, the candidate object is determined as the target object, and the second image involving the target object is cropped from the first image. In this way, the second image involving the target object of a specific category can be obtained. For example, the image of the membership card can be determined as the reference image, and a candidate object having a high similarity with the reference image of the membership card is selected as the target object. In this way, the image of the membership card can be cropped from the first image.

[0060] In the case that the image acquired by imaging the game area is determined as the candidate image and the first image is determined from the candidate image based on an image detection result, an image involving the incorrectly operated game prop object can be cropped from the first image based on the information of the incorrectly operated game prop object, and the image involving the incorrectly operated game prop object can be determined as the second image. The information of the incorrectly operated game prop object can include position information of the incorrectly operated game prop object, and can also include other information such as quantity information and/or category information. The information of the incorrectly operated game prop object can be written into an image detection log, so that the corresponding information can be read from the image detection log as needed. For example, in a case that the information of the incorrectly operated game prop object includes the position information of the incorrectly operated game prop object, the position information can be read from the image detection log, and the image of the game prop object can be cropped from the corresponding position in the first image based on the read position information.

[0061] In step 203, a transformed image can be obtained by performing a transformation process on the second image. Through the transformation process, a plurality of transformed images having different display state attributes can be generated. As shown in FIG. 3A, the transformation process can be performed on the target object involved in the second image to obtain the transformed image. For example, the second image can be rotate (such as rotating the second image by 90 degrees in clockwise), to obtain an image A1. A color of the second image can be transformed to obtain an image A2. The second image can be flipped horizontally to obtain an image A3. A size of the second image can be transformed to obtain an image A4. The second image can be cropped (i.e. change the integrity of the second image) to obtain an image A5. The distortion degree of the second image can be changed to obtain an image A6. A transparency of the second image can be changed to obtain an image A7.

[0062] The above transformation methods are only illustrative examples and the transformation method adopted in the present disclosure is not limited to the above. For example, in addition to clockwise rotation, the rotation direction in the image can also be counterclockwise rotation, and the rotation angle can be other angles besides 90 degrees. For another example, the color of the image may be other colors in addition to the colors shown in the figures. In addition to horizontal flipping, the flipping direction of the image can also be vertical flipping, or flipping with a straight line at any angle as the axis of rotation. In addition to reducing the size of an image, the size transformation method can also be an enlarging the size. The image can also be cropped by other cropping methods. In addition to barrel distortion, the image distortion can also be pincushion distortion or other types of distortion. In addition to the transparency shown in the figure, the transparency of the image may also be other transparency. In addition to the above transformation process methods, the transformed image can also be obtained by changing the contrast and brightness of the image, adding noise to the second image at random, and so on. Each transformed image can be obtained through one or more of the above-mentioned processing methods. For example, the second image can be rotated to obtain a transformed image; the second image can also be rotated and color transformed to obtain another transformed image.

[0063] As shown in FIG. 3B, a target element on the target object can be cropped from the second image, the transformation process can be performed on the target element, and the transformed target element can be superimposed on the second image to obtain the transformed image, wherein the transformed target element and the target element from the

second image has different display state attributes. The target element may be any element that constitutes the target object, for example, it may be a part of the edge contour of the target object, or a part of a plurality of characters included in the target object, or a certain body part of the target object such as a person or an animal (for example, eyes, head), etc.

[0064] Taking the target element as a part of the characters included in the target object as an example, by reducing the number of letter elements "VIP" in the second image, and increasing the number of diamond symbol elements in the image, an image B1 is obtained. By rotating the letter element "VIP" in the second image, an image B2 is obtained. Through the color transformation of the diamond symbol element in the second image, an image B3 is obtained. By shifting the letter element "VIP" in the second image, an image B4 is obtained. Through the scale transformation of the letter element "VIP" in the second image, an image B5 is obtained. By cropping the diamond symbol element in the second image (that is, changing the integrity of the diamond symbol element), an image B6 is obtained. By changing the transparency of the image area where the letter element "VIP" in the second image is located, an image B7 is obtained. In addition to the method shown in the figure, the transformed image can also be obtained in other ways, for example, changing the brightness of the target object, adding random noise to the image area where the target object is located, and changing the distortion degree of the target object. The rotation, flipping, translation, changing amount, and size transformation of the target object are not limited to those shown in the figure.

[0065] An image involving a same-category object of a same category as the target object can be obtained from an image library, and the image involving the same-category object is determined as the transformed image. As shown in FIG. 3C, in a case that the target object is a membership card, other membership cards can be searched for in the image database, such as image C1, C2 and C3 in the figure. The searched membership cards have different features with that of the membership card as the target object. The features include but not limit to at least one of font, size, color, scale and pattern.

[0066] In step 204, the transformed image can be superimposed on a preset game scene image to obtain the game scene image involving the target object. The game scene image can be an image of the game area acquired during the game process. The game scene image may include background image of the game scene and the image of the game prop, and may also include the image of the non-game prop.

[0067] In some embodiments, for a target object belongs to the non-game prop category, in a case that the attribute of the target object is similar to the attributes of the game prop object, the false detection rate for the target object is relatively high. Therefore, the transformation process can be performed on the second image based on the attribute of the game prop object to obtain the transformed image, so that the similarity of the attribute of the target object involved in the transformed image and the attribute of the game prop is larger than a preset first similarity threshold. The similarity may be a similarity of the attribute in one dimension, or may be a comprehensive similarity of the attributes in all dimensions For example, the shape of the game prop object is a rectangle with a length A and width B, in the generated transformed image, the length of the target object is within an adjacent range of A, the width of the target object is within an adjacent range of B. For another example, the transparency of the game prop object is 50%, and the transparency of the target object involved in a generated augmented image can be between 40% to 60%.

[0068] In some other embodiments, for the target object belongs to the non-game prop category, the transformation process can be performed on the second image based on the attribute of the game prop object to obtain transformed images, so that a ration of first transformed images to the transformed images reaches a preset ratio threshold. In a first transformed image, the similarity between the attribute of the target object and the attribute of the game prop object is higher than a preset first similarity threshold. For example, the transparency of the image of the game prop object, the augmented images with transparency between 40% to 60% take up to 70% of all the augmented images.

[0069] In some embodiments, the target object includes both non-game prop object that has similar feature to the game prop object and non-game prop object that has larger feature difference to the game prop object, and the probability of detecting the non-game prop object that has larger feature difference to the game prop object as the game prop object is relatively low. For example, a bottle cap is generally not detected as a playing card. Therefore, the sample image does not need to involve all the non-game prop objects. The non-game prop object having a high similarity to the game prop object can be selected as the target object. The non-game prop object having a high similarity to the game prop object can be selected as the target object.

[0070] Specifically, the candidate object can be detected in the first image, where the candidate object is a non-game prop object; a similarity between the candidate object and the game prop object is determined; in a case that the similarity is larger than a preset second

similarity threshold, the candidate object is determined as the target object. The similarity may be a similarity of the attribute in one dimension, or may be a comprehensive similarity of the attributes in all dimensions. For example, the similarity can be a similarity in a shape dimension, or may include similarities of the shape dimension and a color dimension

[0071] After the transformed image is obtained, an image process such as Gaussian filtering can be performed on the transformed image so that the superimposed part of the transformed image and the game scene image is more smooth and real.

[0072] In some embodiments, the initial neural network can be trained based on the game scene image involving the target object to obtain the target neural network. Since the game scene image involving the target object is obtained by superimposed the transformed image corresponding to the target object and the game scene image, the solution in the embodiments of the present disclosure can obtain sufficient game scene images involving the target object in a short time for training the neural network without increasing the cost, which lower the cost of obtaining sample images and improve the training efficiency of the target neural network. Further, by making the attribute of the target object in the transformed image has a relatively high similarity to the attribute of the game prop object, the sample image causing a higher false detection rate can be generated, thereby improving the accuracy of the trained target neural network

[0073] During the training process, a first training can be performed on the initial neural network based on one or more images involving one or more game prop objects to obtain an intermediate neural network, and a second training can be performed on the intermediate neural network based on the game scene image involving the target object to obtain the target object. In this way, the number of game scene images involving the target object required during the training process can be reduced and the accuracy of the target neural network can be improved.

[0074] The embodiments of the present disclosures can be used in a casino scene, where the game prop object may include a playing card, a chip, a marker, etc., which has a higher probability of appearing in the image. However, foreign things such as a bottle cap and a membership that is not related to the gambling has a lower probability of appearing in the image. Through the solution of the embodiments of the present disclosure, the part involving a foreign thing sample can be cropped from an image involving a small amount of foreign things, and then the foreign thing sample images can be copied through a data augment method to generate multiple sample images with subtle differences. Finally, the generated

sample images are randomly superimposed on other images that do not involve foreign things samples to form a virtual foreign things sample image.

[0075] An embodiment of the present disclosure further provides a detecting method. As shown in FIG. 4, the method includes the following steps:

[0076] At step 401, a to-be-processed image involving a game prop object is acquired.

[0077] At step 402, the to-be-processed image is input into a pre-trained target neural network, so as to obtain a detection result of the game prop object output by the target neural network;

[0078] wherein, the target neural network is trained based on one or more sample images, and the sample images are generated by the image generation method of any one of the above embodiments of the present disclosure.

[0079] For details of the above detecting method, reference may be made to the foregoing embodiment of the image generation method, and details are not described herein again.

[0080] A person skilled in the art may understand that, in the described method of the specific implementation, the drafting order of each step does not imply that the strictly executed order forms any limitation to the implementation process, and the specific execution order of each step should be determined by its function and possibly intrinsic logic.

[0081] As shown in FIG. 5, the embodiments of the present disclosure further provide an image generating apparatus, where the apparatus includes:

[0082] a first obtaining module 501, configured to obtain a first image of a game area;

[0083] an image cropping module 502, configured to, crop a second image involving a target object from the first image, wherein the target object includes a non-game prop object in the game area;

[0084] an image transforming module 503, configured to obtain a transformed image by performing a transformation process on the second image, wherein the target object has different display state attributes in the transformed image and the second image;

[0085] a superimposing module 504, configured to superimpose the transformed image on a preset game scene image to obtain a game scene image involving the target object, and the game scene image involving the target object is used to train an initial neural network into a target neural network for detecting a game prop object in a game area based on an image.

[0086] In some embodiments, the first obtaining module 501 is configured to acquire an image of the game area by imaging the game area as the first image.

[0087] In some embodiments, the image cropping module 502 is configured to crop the second image involving the target object from the first image based on position information of the target object in the first image; wherein the position information is obtained from a target detection performed on the first image, or one or more pre-marked positions.

[0088] In some embodiments, the image cropping module 502 includes: a reference image obtaining unit, configured to acquire a reference image of the target object; a similarity determining unit, configured to detect a candidate object from the first image, and determining a similarity between the candidate object and the target object in the reference image; and a cropping unit, configured to in response to that the similarity is greater than a preset similarity threshold, determine the candidate object as the target object, and crop the second image involving the target object from the first image.

[0089] In some embodiments, the target object includes a game prop object in the game area; the first obtaining module 501 includes: a detection result obtaining unit, configured to obtain an image detection result corresponding to a candidate image acquired by imaging the game area; an image determining unit, configured to in response to the image detection result indicating that the game prop object in the game area is operated incorrectly, determine the candidate image as the first image.

[0090] In some embodiments, the image detection result includes information of the incorrectly operated game prop object, the image cropping module is configured to: crop, based on the information of the incorrectly operated game prop, an image involving the incorrectly operated game prop object from the first image, and determine the image involving the incorrectly operated game prop object as the second image.

[0091] In some embodiments, the image transformation module is configured to obtain the transformed image by performing the transformation process on the second image is realized by at least one of the following: cropping a target element on the target object from the second image, performing the transformation process on the target element, and superimposing the transformed target element on the second image to obtain the transformed image, wherein the transformed target element and the target element from the second image has different display state attributes; or acquiring an image involving a same-category object of the same category as the target object from an image library, determining the image involving the same-category object as the transformed image.

[0092] In some embodiments, the apparatus further includes a training module, configured to train the initial neural network based on the game scene image involving the target object to obtain the target neural network.

[0093] In some embodiments, the training module includes: a first training unit, configured to perform a first training on the initial neural network based on the image of a game prop object to obtain an intermediate neural network; a second training unit, configured to perform a second training on the intermediate neural network based on the game scene image involving the target object to obtain the target neural network.

[0094] As shown in FIG. 6, the embodiments of the present disclosure further provide a detecting apparatus, the apparatus includes:

[0095] a second obtaining module 601, configured to acquire a to-be-processed image involving a game prop object;

[0096] an inputting module 602, configured to input the to-be-processed image into a pre-trained target neural network, so as to obtain a detection result of the game prop object output by the target neural network;

[0097] wherein, the target neural network is trained based on one or more sample images, and the sample images are generated by the image generation apparatus of the embodiments of the present disclosure.

[0098] In some embodiments, the functions of the apparatus provided by the embodiments of the present disclosure or the included modules may be configured to execute the method described in the foregoing method embodiments. For specific implementation, reference may be made to the description of the foregoing method embodiments. For brevity, details are not described herein again.

[0099] In some embodiments, the embodiments further provide a computer device, including: a memory, a processor, and a computer program stored on the memory and executable on the processor; wherein when the computer program is executed by the processor, the method according to any of the above embodiments is implemented.

[0100] FIG. 9 shows a hardware structure diagram of a more specific computer device according to one or more embodiments of the present disclosure. The device may include a processor 701, a memory 702, an input/output interface 703, a communication interface 704, and a bus 705. The processor 701, the memory 702, the input/output interface 703 and the communication interface 704 realize communication via the bus 705 in the device.

[0101] The processor 701 may be implemented by a general central processing unit (CPU), a microprocessor, an Application Specific Integrated Circuit (ASIC) or one or more integrated circuits or the like to execute relevant programs so as to realize the technical solutions of the embodiments of the present disclosure. The processor 701 may also include a graphics card which may be Nvidia Titan X graphics card or 1080Ti graphics card or the like.

[0102] The memory 702 may be implemented by read only memory (ROM), random access memory (RAM), static storage device, and dynamic storage device and the like. The memory 702 stores operating system and other application programs. When the technical solutions of the embodiments of the present disclosure are realized by software or firmware, relevant program codes are stored in the memory 702 and may be invoked and executed by the processor 701.

[0103] The input/output interface 703 is used to connect with an inputting/outputting module to realize information input and output. The inputting/outputting module may be configured as a component in a device (not shown), or externally connected with a device to provide corresponding functions. The input device may include keyboard, mouse, touch screen, microphone, and various sensors and the like, and the output device may include display, loudspeaker, vibrator and indicator lamp and the like.

[0104] The communication interface 704 is used to connect with a communication module (not shown) to realize communication interaction between the present device and other devices. The communication module may realize communication in a wired manner (for example, USB and network cable and the like) or in a wireless manner (for example, mobile network, WIF, Bluetooth and the like).

[0105] The bus 705 includes a passage which transmits information among various components of the device (e.g. the processor 701, the memory 702, the input/output interface 703 and the communication interface 704).

[0106] It should be noted that although the above device only shows the processor 701, the memory 702, the input/output interface 703, the communication interface 704 and the bus 705, the device may further include other components to realize normal operation during a specific implementation. Furthermore, those skilled in the art may understand that the above device may only include the components required for realizing the technical solution of the embodiments of the present disclosure rather than all components shown in figures.

[0107] An embodiment of the present disclosure further provides a computer readable storage medium, storing computer programs, where the programs are executed by a processor to implement the method according to any one of the above embodiments.

[0108] The computer readable storage medium includes permanent, non-permanent, mobile and non-mobile media, which can realize information storage by any method or technology. The information may be computer readable instructions, data structures, program modules and other data. The examples of the computer storage medium include but not limited to: phase change random access memory (PRAM), a Static Random Access Memory (SRAM), a Dynamic Random Access Memory (DRAM), and other types of RAMs, Read-Only Memory (ROM), an Electrically-Erasable Programmable Read-Only Memory (EEPROM), a Flash Memory, or other memory technology, CD-ROM, digital versatile disc (DVD) or other optical storage, cassette type magnetic tape, magnetic disk storage or other magnetic storage device or other non-transmission medium for storing information accessible by computing devices. As defined in the present disclosure, the computer readable medium does not include transitory computer readable media such as modulated data signals or carriers.

[0109] It may be known from descriptions of the above embodiments that persons skilled in the art may clearly understand that the embodiments of the present disclosure may be implemented by means of software and a necessary general hardware platform. Based on such understanding, the technical solutions of embodiments of the present disclosure essentially or a part contributing to the prior art may be embodied in the form of a software product, and the computer software product may be stored in a storage medium, such as a ROM/RAM, a diskette or a compact disk, and includes several instructions for enabling a computer device (such as a personal computer, a server or a network device) to perform the methods of different embodiments or some parts of the embodiments of the present disclosure.

[0110] The systems, apparatuses, modules or units described in the above embodiments may be specifically implemented by a computer chip or an entity or may be implemented by a product with a particular function. A typical implementing device may be a computer and the computer may be specifically a personal computer, a laptop computer, a cellular phone, a camera phone, a smart phone, a personal digital assistant, a media player, a navigation device, an email transceiver, a game console, a tablet computer, a wearable device, or a combination of any several devices of the above devices.

[0111] Different embodiments in the present disclosure are described in a progressive manner. Each embodiment focuses on the differences from other embodiments with those same or similar parts among the embodiments referred to each other. Particularly, since the apparatus embodiments are basically similar to the method embodiments, the apparatus embodiments are briefly described with relevant parts referred to the descriptions of the method embodiments. The apparatus embodiments described above are merely illustrative, where the modules described as separate members may be or not be physically separated, and the functions of various modules may be implemented in one or more softwares and/hardwares during implementation of the embodiments of the present disclosure. Alternatively, part or all of the modules may be selected according to actual requirements to implement the objectives of the solutions in the embodiments. Those of ordinary skill in the art may understand and carry out them without creative work.

[0112] The above descriptions are made to merely some embodiments of the present disclosure. It should be pointed out that those skilled in the art may also make several improvements and modifications without departing from the principle of the present disclosure, and these improvements and modifications shall all fall within the scope of protection of the present disclosure.

CLAIMS

1. An image generating method, comprising:

acquiring a first image of a game area;

cropping a second image involving a target object from the first image, wherein the target object comprises a non-game prop object in the game area;

obtaining a transformed image by performing a transformation process on the second image, wherein the target object has different display state attributes in the transformed image and the second image; and

superimposing the transformed image on a preset game scene image to obtain a game scene image involving the target object, wherein the game scene image involving the target object is used to train an initial neural network into a target neural network for detecting a game prop object in a game area based on an image.

2. The method of claim 1, wherein obtaining the first image of the game area comprises: acquiring an image of the game area by imaging the game area as the first image.

3. The method of claim 2, wherein cropping the second image involving the target object from the first image comprises:

cropping the second image involving the target object from the first image based on position information of the target object in the first image;

wherein the position information is obtained from a target detection performed on the first image, or one or more pre-marked positions.

4. The method of claim 2, wherein cropping the second image involving the target object from the first image comprises:

acquiring a reference image of the target object;

detecting a candidate object from the first image, and determining a similarity between the candidate object and the target object in the reference image;

in response to that the similarity is greater than a preset similarity threshold, determining the candidate object as the target object and cropping the second image involving the target object from the first image.

5. The method of claim 1, wherein obtaining the first image of the game area comprises:

obtaining an image detection result of a candidate image acquired by imaging the game area;

in response to the image detection result indicating that a game prop object in the game area is operated incorrectly, determining the candidate image as the first image.

6. The method of claim 5, wherein the image detection result comprises information of the incorrectly operated game prop object; cropping the second image involving the target object from the first image comprises:

based on the information of the incorrectly operated game prop, cropping an image involving the incorrectly operated game prop object from the first image, and

determining the image involving the incorrectly operated game prop object as the second image.

7. The method of any one of claims 1-6, wherein obtaining the transformed image by performing the transformation process on the second image is realized by at least one of the following:

cropping a target element on the target object from the second image, performing the transformation process on the target element, and superimposing the transformed target element on the second image to obtain the transformed image, wherein the transformed target element and the target element from the second image has different display state attributes;

acquiring an image involving a same-category object of a same category as the target object from an image library, and determining the image involving the same-category object as the transformed image.

8. The method of any one of claims 1-7, further comprising:

obtaining the target neural network by training the initial neural network based on the game scene image involving the target object.

9. The method of claim 8, wherein obtaining the target neural network by training the initial neural network based on the game scene image involving the target object comprises:

performing a first training on the initial neural network based on one or more images involving one or more game prop objects to obtain an intermediate neural network;

performing a second training on the intermediate neural network based on the game scene image involving the target object to obtain the target neural network.

10. A detecting method, comprising:

acquiring a to-be-processed image involving a game prop object;

inputting the to-be-processed image into a pre-trained target neural network, so as to obtain a detection result of the game prop object output by the target neural network;

wherein, the target neural network is trained based on one or more sample images generated by the image generation method of any one of claims 1-9.

11. An image generating apparatus, comprising:

a first obtaining module, configured to acquire a first image of a game area;

an image cropping module, configured to crop a second image involving a target object from the first image, wherein the target object comprises a non-game prop object in the game area;

an image transforming module, configured to obtain a transformed image by performing a transformation process on the second image, wherein the target object has different display state attributes in the transformed image and the second image; and

a superimposing module, configured to superimpose the transformed image on a preset game scene image to obtain a game scene image involving the target object, wherein the game scene image involving the target object is used to train an initial neural network into a target neural network for detecting a game prop object in a game area based on an image.

12. A detecting apparatus, comprising:

a second obtaining module, configured to acquire a to-be-processed image involving a game prop object;

an inputting module, configured to input the to-be-processed image into a pre-trained target neural network, so as to obtain a detection result of the game prop object output by the target neural network;

wherein, the target neural network is trained based on one or more sample images generated by the image generation apparatus of claim 11.

13. A computer readable storage medium, having a computer program stored wherein in a case that the computer program is executed by a processor, the method according to any one of claims 1-10 is implemented.

14. A computer device, comprising: a memory, a processor, and a computer program stored on the memory and executable on the processor; wherein when the computer program is executed by the processor, the method according to any one of claims 1-10 is implemented.