

DATA GENERATION METHOD AND APPARATUS, ELECTRONIC DEVICE AND COMPUTER STORAGE MEDIUM

TECHNICAL FIELD

[0001] The disclosure relates to a computer vision processing technology, and particularly to a data generation method and apparatus, an electronic device and a computer storage medium.

BACKGROUND

[0002] Object detection is an important part of an intelligent video analysis system. For example, in a game scenario, a game platform image may be acquired by an image acquisition system, so as to detect target objects (for example, fund substitutes) in the game platform image with high accuracy.

[0003] In a related art, in order to enable a detection model to have good detection effect in various scenarios and various game platforms, a mass of image data needs to be acquired in each scenario and each game platform in a traditional optimization method. However, there are two problems as follows with such methods: 1) Considering the difference in data amount between scenarios and between game platforms, if the difference in data amount is large, the generalization ability of the detection model may be deteriorated. For example, if the data amount of a first scenario is much larger than the data amount of a second scenario and the detection model is trained by the data amount of the second scenario, the detection performance of the detection model in the second scenario will be reduced. 2) Each scenario and each game platform need plenty of repetitive manual acquisition and labeling work, which results in the waste of human cost and resource cost.

SUMMARY

[0004] Embodiments of the disclosure are expected to provide a data generation method and apparatus, an electronic device and a computer storage medium, which can improve the generalization ability of a detection model while reducing the waste of human cost and resource cost.

[0005] The embodiments of the disclosure provide a data generation method, which may include the following operations. A pre-labeled game platform image sample set is acquired. The game platform image sample set includes a first image sample and a second image sample. The first image sample and the second image sample contain a same object as each other and contain different image backgrounds respectively. The first image sample and the second image sample are input to a cycle-consistent generative adversarial network (CycleGAN) model for training to obtain a loss of the CycleGAN model. Parameters of the CycleGAN model are adjusted based on the loss of the CycleGAN model until training of the CycleGAN model is completed. The game platform image sample set is expanded by use of the trained CycleGAN model.

[0006] In some embodiments, the CycleGAN model may include a first image generative network and a second image generative network. The first image generative network includes a first generator and a first discriminator, and the second image generative network includes a second generator and a second discriminator. The operation of inputting the first image sample and the second image sample to the CycleGAN model for training to obtain the loss of the CycleGAN model may include the following operations. A loss of the first image generative network is determined according to the first image sample, the first generator, the first discriminator and the second discriminator. A loss of the second image generative network is determined according to the second image sample, the second generator, the first discriminator and the second discriminator. A cycle consistency loss is determined according to the first image sample, the second image sample, the first generator and the second generator. The loss of the CycleGAN model is obtained according to the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss.

[0007] It is to be seen that, in the embodiments of the disclosure, in the process of

training the CycleGAN model, by determining the loss of the CycleGAN model through the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss jointly, and adjusting the parameters of the CycleGAN model by use of the determined loss of the CycleGAN model, the accuracy of model training may be improved.

[0008] In some embodiments, the operation of determining the loss of the first image generative network according to the first image sample, the first generator, the first discriminator and the second discriminator may include the following operations. The first image sample is input to the first generator to generate a first image. The first image sample is discriminated with the first discriminator to obtain a first discrimination result; and the first image is discriminated with the second discriminator to obtain a second discrimination result. The loss of the first image generative network is determined according to the first discrimination result and the second discrimination result.

[0009] It is to be seen that in the embodiments of the disclosure, the output of the first generator is discriminated with the second discriminator while the input of the first generator is discriminated with the first discriminator. That is, by discriminating both the input and output of the first generator, the loss of the first image generative network in the CycleGAN model may be accurately determined.

[0010] In some embodiments, the operation of determining the loss of the second image generative network according to the second image sample, the second generator, the first discriminator and the second discriminator may include the following operations. The second image sample is input to the second generator to generate a second image. The second image sample is discriminated with the second discriminator to obtain a third discrimination result; and the second image is discriminated with the first discriminator to obtain a fourth discrimination result. The loss of the second image generative network is determined according to the third discrimination result and the fourth discrimination result.

[0011] It is to be seen that in the embodiments of the disclosure, the output of the second generator is discriminated with the first discriminator while the input of the second generator is discriminated with the second discriminator. That is, by

discriminating both the input and output of the second generator, the loss of the second image generative network in the CycleGAN model may be accurately determined.

[0012] In some embodiments, the operation of determining the cycle consistency loss according to the first image sample, the second image sample, the first generator and the second generator may include the following operations. The first image sample is input to the first generator to generate a first image; and the first image is input to the second generator to generate a third image. The second image sample is input to the second generator to generate a second image; and the second image is input to the first generator to generate a fourth image. The cycle consistency loss is determined according to a difference between the first image sample and the third image and a difference between the second image sample and the fourth image.

[0013] It is to be seen that in the embodiments of the disclosure, on the basis of determining the loss of the first image generative network and the loss of the second image generative network, the cycle consistency loss of the CycleGAN model is further determined so that the model loss may be accurately obtained, and the accuracy of model training may be improved.

[0014] In some embodiments, the operation of expanding the game platform image sample set by use of the trained CycleGAN model may include the following operations. An extra labeled game platform image is acquired. The extra labeled game platform image is input to the trained first generator or second generator to generate a new game platform image. The game platform image sample set is expanded by use of the new game platform image.

[0015] It is to be seen that in the embodiments of the disclosure, after the trained CycleGAN model is obtained, a game platform image sample set including a large number of images may be obtained by inputting only a small number of labeled game platform images. That is, there is no need to repeatedly acquire and label a large number of images manually, which may save a lot of labor costs.

[0016] In some embodiments, the operation of acquiring the pre-labeled game platform image sample set may include the following operations. Multiple acquired game

platform images are labeled to obtain multiple labelled game platform images. The multiple labelled game platform images are clipped according to a set size to obtain the pre-labeled game platform image sample set.

[0017] It is to be understood that, for a directly acquired game platform image, on the one hand, due to its large size, if it is directly input to the CycleGAN model for subsequent training, the risk of memory explosion is increased; on the other hand, since the surrounding boundary information in an actual scenario or a game platform is quite different and uncertain, direct inputting the game platform image including all the surrounding areas to the CycleGAN model for training will deteriorate the model effect. In the embodiments of the disclosure, by clipping the acquired game platform image, the risk of memory explosion may be reduced and the model effect may be improved as well.

[0018] In some embodiments, the target object may include at least one of following: a fund substitute, a poker card, cash or a marker.

[0019] It is to be seen that in the embodiments of the disclosure, by using the game platform image sample set including a target object, that is at least one of the above-mentioned fund substitute, poker card, cash, marker or the like, as a sample set for subsequently training the CycleGAN model, the application range of the CycleGAN model in game scenarios may be expanded.

[0020] The embodiments of the disclosure further provide a data generation apparatus, which may include an acquisition module, a training module, and an expansion module.

[0021] The acquisition module is configured to acquire a pre-labeled game platform image sample set. The game platform image sample set includes a first image sample and a second image sample; and the first image sample and the second image sample contain a same object as each other and contain different image backgrounds respectively. The training module is configured to input the first image sample and the second image sample to a cycle-consistent generative adversarial network (CycleGAN) model for training to obtain a loss of the CycleGAN model, and adjust parameters of the CycleGAN model based on the loss of the CycleGAN model until training of the CycleGAN model is completed. The expansion module is configured to expand the game

platform image sample set by use of the trained CycleGAN model.

[0022] The embodiments of the disclosure further provide an electronic device including: a processor, and a memory configured to store a computer program capable of running on the processor. The processor is configured to run the computer program to execute any above-mentioned data generation method.

[0023] The embodiments of the disclosure further provide a computer storage medium having stored thereon a computer program that, when executed by a processor, implements any above-mentioned data generation method.

[0024] The embodiments of the disclosure further provide a computer program including processor-executable instructions that, when executed by a processor, cause the processor to implement any above-mentioned data generation method.

[0025] According to the data generation method and apparatus, the electronic device and the computer storage medium in the embodiments of the disclosure, a pre-labeled game platform image sample set is acquired. The game platform image sample set includes a first image sample and a second image sample, and the first image sample and the second image sample contain a same target object as each other and contain different image backgrounds respectively. The first image sample and the second image sample are input to a cycle-consistent adversarial generative network (CycleGAN) model for training to obtain a loss of the CycleGAN model. Parameters of the CycleGAN model are adjusted based on the loss of the CycleGAN model until training of the CycleGAN model is completed. The game platform image sample set is expanded by use of the trained CycleGAN model.

[0026] It is to be seen that, in the embodiments of the disclosure, after training of the CycleGAN model is completed, an expanded game platform image sample set including a large number of images may be obtained by acquiring and inputting only a small number of extra labeled game platform images to the trained CycleGAN model. That is, there is no need to repeatedly acquire and label a large number of images manually, which may save a lot of labor costs. In addition, for each game platform in different scenarios, the expanded game platform image sample set of the game platform in the

corresponding scenario may be obtained through the embodiments of the disclosure, so that the data amount in the game platform image sample set corresponding to each game platform in different scenarios is basically the same. That is, the data proportion of game platforms in different scenarios can be accurately controlled, the generalization ability of the subsequent detection model can be improved; and the expanded game platform image sample set is applied to the subsequent training of the detection model, so that the detection performance may be improved.

[0027] It is to be understood that the above general descriptions and the following detailed descriptions are only exemplary and explanatory, and do not limit the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] The drawings herein are incorporated into and constitute a part of the specification, which illustrate embodiments in accordance with the disclosure and together with the specification are used to explain the technical solutions of the disclosure.

[0029] FIG. 1A illustrates a flowchart of a data generation method according to embodiments of the disclosure.

[0030] FIG. 1B illustrates a flowchart of determining a loss of a first image generative network according to embodiments of the disclosure.

[0031] FIG. 1C illustrates a flowchart of determining a loss of a second image generative network according to embodiments of the disclosure.

[0032] FIG. 2A illustrates a schematic diagram of a result of input of a generator in a CycleGAN model according to embodiments of the disclosure.

[0033] FIG. 2B illustrates a schematic diagram of a result of output of a generator in a CycleGAN model according to embodiments of the disclosure.

[0034] FIG. 3 illustrates a structural diagram of composition of a data generation

apparatus according to embodiments of the disclosure.

[0035] FIG. 4 illustrates a schematic structural diagram of an electronic device according to embodiments of the disclosure.

DETAILED DESCRIPTION

[0036] The disclosure is further described below in detail with reference to accompanying drawings and embodiments. It is to be understood that the embodiments provided herein are only to explain the disclosure and not intended to limit the disclosure. In addition, the embodiments provided below are not all but a portion of embodiments implementing the disclosure, and the technical solutions recorded in the embodiments of the disclosure may be freely combined for implementation without conflicts.

[0037] It is to be noted that, in the embodiments of the disclosure, terms "include" and "contain" or any other variants thereof are intended to cover nonexclusive inclusions herein, so that method or device including a series of elements not only includes those clearly recorded elements but also includes other elements which are not clearly listed or further includes intrinsic elements for implementing the method or the device. Without more limitations, an element defined by a statement "including a/an..." does not exclude existence of another related element in a method or device including the element (for example, step in the method or a unit in the apparatus, the unit may be, for example, part of a circuit, part of a processor, or part of a program or software).

[0038] For example, a data generation method provided in the embodiments of the disclosure includes a series of actions, but the data generation method provided in the embodiments of the disclosure is not limited to the recited actions. Similarly, the data generation apparatus provided in the embodiments of the disclosure includes a series of modules, but the apparatus provided in the embodiments of the disclosure is not limited to include the clearly recited modules, and may further include a module required to be arranged when related information is acquired or processing is performed on the basis of information.

[0039] The term "and/or" in this specification describes only an association relationship for describing associated objects and represents that three relationships may exist. For example, A and/or B may represent the following three cases: Only A exists, both A and B exist, and only B exists. In addition, term "at least one" in the disclosure represents any one of multiple or any combination of at least two of multiple. For example, including at least one of A, B, or C may represent including any one or more elements selected from a set formed by A, B, or C.

[0040] The embodiments of the disclosure may be applied to an edge computing device in a game scenario, and may be operated together with numerous other universal or dedicated computing system environments or configurations. Here, the edge computing device may be a thin client, a thick client, a hand-held or laptop device, a microprocessor-based system, a set-top box, a programmable consumer electronic product, a network personal computer, a minicomputer system, etc.

[0041] The edge computing device may be described in the general context of computer system executable instructions (such as a program module) executed by a computer system. Generally, the program module may include a routine, a program, an object program, a component, logic, a data structure, etc., which executes a specific task or implements a specific abstract data type. The computer system/server may be implemented in a distributed cloud computing environment, and in the distributed cloud computing environment, the task is executed by a remote processing device linked through a communication network. In the distributed cloud computing environment, the program module may be located on a local or remote computing system storage medium including a storage device.

[0042] In the related art, in a game scenario, in order to enable a detection model to have good detection effect in various scenarios and various game platforms, a mass of image data needs to be acquired in each scenario and each game platform a traditional optimization method. There are two inevitable problems with such methods: First, considering the difference in data amount between scenarios and between platforms, if the difference is large, the generalization ability of the detection model may be deteriorated, and therefore, the data proportion of each scenario and each game platform

needs to be manually controlled. Second, each scenario and each game platform need manual acquisition and labeling of a large amount of image data, and a great deal of manpower is required when the model is deployed to a new scenario and game platform, which results in the waste of human cost and resource cost.

[0043] Aiming at the above technical problems, in some embodiments of the disclosure, a technical solution of data generation is proposed, which may be applied to a game scenario.

[0044] Exemplary description is given below to an application scenario of the embodiments of the disclosure.

[0045] In the game scenario, the running status of various games may be acquired by a computer vision processing technology. Here, the running of each game is related to target objects such as fund substitutes, cash and markers.

[0046] In some embodiments, the game in the game scenario may be a poker game or other games on the game platform, which is not limited in the embodiments of the disclosure.

[0047] In the embodiments of the disclosure, Computer Vision is a science for researching how to use a machine to "look", and refers to using a camera and a computer to detect, recognize and measure an object and performing further object detection instead of human eyes. At least one camera may be used to detect what happens on the game platform during the game, so as to perform further analysis. The game platform may be a physical desktop platform or other physical platforms.

[0048] FIG. 1A illustrates a flowchart of a data generation method according to embodiments of the disclosure. As illustrated in FIG. 1A, the flow may include the following actions.

[0049] At S100, a pre-labeled game platform image sample set is acquired. The game platform image sample set includes a first image sample and a second image sample; and the first image sample and the second image sample contain a same object as each other and contain different image backgrounds respectively.

- [0050] Here, the game platform image sample set represents a set of game platform image samples corresponding to a small number of game platforms, such as any two game platforms. Exemplarily, if the game platform image sample corresponding to one game platform is the first image sample, the game platform image sample corresponding to the other game platform is the second image sample.
- [0051] Exemplarily, in the case that the game in the game scenario is a poker game, the target objects may include at least one of following related to the game: fund substitutes, poker cards, cash, markers or the like.
- [0052] In embodiments of the disclosure, the first image sample and the second image sample contain the same target object. That is, in the case that the target object in the first image sample is a fund substitute, the target object in the second image sample is also a fund substitute.
- [0053] Here, the image backgrounds represent remaining areas except the target object in the first image sample and the second image sample. Herein, the image backgrounds in the first image sample and the second image sample being different may be that at least one of background color, background pattern or the like is different between the first image sample and the second image sample.
- [0054] It is to be seen that in the embodiments of the disclosure, by using the game platform image sample set including a target object, that is at least one of the above-mentioned fund substitute, poker card, cash, marker or the like, as a sample set for subsequently training the CycleGAN model, the application range of the CycleGAN model in game scenarios may be expanded.
- [0055] In some embodiments, the operation of acquiring the pre-labeled game platform image sample set may include that: multiple acquired game platform images are labeled to obtain multiple labelled game platform images; and the multiple labelled game platform images are clipped according to a set size to obtain the pre-labeled game platform image sample set.
- [0056] In the embodiments of the disclosure, at least one camera may be used to shoot the game platform to obtain video data or image data, and then the multiple game

platform images are acquired from the video data or image data. Afterwards, the multiple acquired game platform images are labeled to obtain the multiple labelled game platform images.

[0057] In some embodiments, the camera for shooting the game platform may be a camera directly above the game platform for shooting a top view of the game platform, or may be a camera for shooting the game platform from other views. Accordingly, each of the multiple game platform images may be a top view or game platform images with other perspectives, or may be an image obtained by fusing the top view and the game platform images with other perspectives.

[0058] Exemplarily, labeling the multiple acquired game platform images may be labelling at least one of such as the type, location and number of target objects in the multiple game platform images.

[0059] Exemplarily, after the multiple labelled game platform images are obtained, clipping may be performed according to the set size to obtain the multiple clipped game platform images, that is, the pre-labeled game platform image sample set.

[0060] Here, the set size only needs to be larger than the size of the target object in the game platform image and smaller than an original size of the game platform image. Exemplarily, in the case that the original size of a certain game platform image is 15cm * 15cm, assuming that the size of the target object is 5cm * 5cm, the magnitude of the set size may be 6cm * 6cm, or may be 8cm * 10cm.

[0061] It is to be understood that, for a directly acquired game platform image, on the one hand, due to its large size, if it is directly input to the CycleGAN model for subsequent training, the risk of memory explosion is increased; on the other hand, since the surrounding boundary information in an actual scenario or a game platform is quite different and uncertain, direct inputting the game platform image including all the surrounding areas to the CycleGAN model for training will deteriorate the model effect. In the embodiments of the disclosure, by clipping the acquired game platform image, the risk of memory explosion may be reduced and the model effect may be improved as well.

[0062] At S101, the first image sample and the second image sample are input to the

cycle-consistent generative adversarial network (CycleGAN) model for training to obtain a loss of the CycleGAN model, and parameters of the CycleGAN model are adjusted based on the loss of the CycleGAN model until training of the CycleGAN model is completed.

[0063] In some embodiments, the CycleGAN model includes a first image generative network and a second image generative network. The first image generative network includes a first generator and a first discriminator, and the second image generative network includes a second generator and a second discriminator.

[0064] Exemplarily, the operation of inputting the first image sample and the second image sample to the CycleGAN model for training to obtain the loss of the CycleGAN model may include that: a loss of the first image generative network is determined according to the first image sample, the first generator, the first discriminator and the second discriminator; a loss of the second image generative network is determined according to the second image sample, the second generator, the first discriminator and the second discriminator; a cycle consistency loss is determined according to the first image sample, the second image sample, the first generator and the second generator; and the loss of the CycleGAN model is obtained according to the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss.

[0065] Exemplarily, in the process of training the CycleGAN model, the training of the first image generative network and the training of the second image generative network are performed simultaneously. That is, the determination of the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss are also performed simultaneously.

[0066] In the embodiments of the disclosure, each time a loss of the CycleGAN model is obtained, the loss is compared with a set value. If it is determined that the loss is less than the set value, the training of the CycleGAN model is completed. On the contrary, if it is determined that the loss is greater than the set value, it is necessary to continue to adjust the parameters of the CycleGAN model to obtain a next loss of the CycleGAN model, until it is determined that the loss of the CycleGAN model is less than the set

value, which means that the training of the CycleGAN model is completed. Here, after the training of the CycleGAN model is completed, the game platform image sample set may be expanded by use of the model.

[0067] It is to be seen that, in the embodiments of the disclosure, in the process of training the CycleGAN model, by determining the loss of the CycleGAN model through the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss jointly, and adjusting the parameters of the CycleGAN model by use of the determined loss of the CycleGAN model, the accuracy of model training may be improved.

[0068] In some embodiments, FIG. 1B illustrates a flowchart of determining a loss of a first image generative network according to embodiments of the disclosure. As illustrated in FIG. 1B, the flow may include that: the first image sample is input to the first generator to generate a first image; the first image sample is discriminated with the first discriminator to obtain a first discrimination result; the first image is discriminated with the second discriminator to obtain a second discrimination result; and the loss of the first image generative network is determined according to the first discrimination result and the second discrimination result.

[0069] Here, the first discrimination result indicates the probability that the first image sample is a real image, and the second discrimination result indicates the probability that the first image generated by the first generator is a real image. Exemplarily, if a probability is 1, it means it is a real image, and if a probability is 0, it means it is not a real image.

[0070] Exemplarily, in the process of training the CycleGAN model, the most ideal state is that the second discrimination result is 0.5. That is, for the second discriminator, it is difficult to determine whether the first image generated by the first generator is real or not. In this case, the loss of the first image generative network is minimal.

[0071] It is to be seen that in the embodiments of the disclosure, the output of the first generator is discriminated with the second discriminator while the input of the first generator is discriminated with the first discriminator. That is, by discriminating both the

input and output of the first generator, the loss of the first image generative network in the CycleGAN model may be accurately determined.

[0072] In some embodiments, FIG. 1C illustrates a flowchart of determining a loss of a second image generative network according to embodiments of the disclosure. As illustrated in FIG. 1C, the flow may include that: the second image sample is input to the second generator to generate a second image; the second image sample is discriminated with the second discriminator to obtain a third discrimination result; the second image is discriminated with the first discriminator to obtain a fourth discrimination result; and the loss of the second image generative network is determined according to the third discrimination result and the fourth discrimination result.

[0073] Here, the implementation of determining the loss of the second image generative network is similar to that of determining the loss of the first image generative network, which is not elaborated here again.

[0074] It is to be seen that in the embodiments of the disclosure, the output of the second generator is discriminated with the first discriminator while the input of the second generator is discriminated with the second discriminator. That is, by discriminating both the input and output of the second generator, the loss of the second image generative network in the CycleGAN model may be accurately determined.

[0075] In some embodiments, referring to FIG. 1B and FIG. 1C, it is to be seen that the operation of determining the cycle consistency loss may include that: the first image sample is input to the first generator to generate a first image; the first image is input to the second generator to generate a third image; the second image sample is input to the second generator to generate a second image; the second image is input to the first generator to generate a fourth image; the cycle consistency loss is determined according to a difference between the first image sample and the third image, and a difference between the second image sample and the fourth image.

[0076] It is to be seen that in the embodiments of the disclosure, on the basis of determining the loss of the first image generative network and the loss of the second image generative network, the cycle consistency loss of the CycleGAN model is further

determined so that the model loss may be accurately obtained, and the accuracy of model training may be improved.

[0077] At 102, the game platform image sample set is expanded by use of the trained CycleGAN model.

[0078] In the embodiments of the disclosure, after the trained CycleGAN model is obtained through the above-mentioned actions, the game platform image sample set is expanded by use of the trained CycleGAN model.

[0079] In some embodiments, the operation of expanding the game platform image sample set by use of the trained CycleGAN model may include that: an extra labeled game platform image is acquired; the extra labeled game platform image is input to the trained first generator or second generator to generate a new game platform image; and the game platform image sample set is expanded by use of the new game platform image.

[0080] Exemplarily, the extra labeled game platform image may be an image similar to the first image sample in the game platform image sample set, or may be an image similar to the second image sample in the game platform image sample set.

[0081] Here, the two images being similar to each other means that the two images contain a same target object and some information related to the image backgrounds in the two images are the same, such as background colors and background patterns.

[0082] Exemplarily, in the case that it is determined that the extra labeled game platform image is similar to the first image sample, if the extra labeled game platform image is input to the trained first generator, a large number of new game platform images may be generated, thus expanding the game platform image sample set.

[0083] Exemplarily, in the case that it is determined that the extra labeled game platform image is similar to the second image sample, if the extra labeled game platform image is input to the trained second generator, a large number of new game platform images may be generated, thus further expanding the game platform image sample set is further implemented.

[0084] Exemplarily, whether the extra labeled game platform image is similar to the first image sample or the second image sample may be determined by a user, or may be determined by other means, which is not limited in the embodiments of the disclosure.

[0085] It is to be seen that in the embodiments of the disclosure, after the trained CycleGAN model is obtained, a game platform image sample set including a large number of images may be obtained by inputting only a small number of labeled game platform images. That is, there is no need to repeatedly acquire and label a large number of images manually, which may save a lot of labor costs.

[0086] Further, the embodiments of the disclosure can not only be applied to a poker game scenario, but may also be reused in other game scenarios.

[0087] It is to be seen that, in the embodiments of the disclosure, background data augmentation in different game scenarios can be performed by the trained CycleGAN model, so that the data of a new game scenario can reach the order of magnitude of original game scenarios. That is, with a small amount of sample data, migration of the target objects between different scenarios and between different game platforms may still be achieved, and the proportion of data amounts in different scenarios and different game platforms can be accurately controlled, so as to achieve the effect of optimizing the detection model.

[0088] According to the data generation method and apparatus, the electronic device and the computer storage medium in the embodiments of the disclosure, a pre-labeled game platform image sample set is acquired, the game platform image sample set including a first image sample and a second image sample which contain a same target object and contain different image backgrounds respectively; the first image sample and the second image sample are input to the CycleGAN model for training to obtain a loss of the CycleGAN model; parameters of the CycleGAN model are adjusted based on the loss of the CycleGAN model until training of the CycleGAN model is completed; and the game platform image sample set is expanded by use of the trained CycleGAN model. It is to be seen that, in the embodiments of the disclosure, after training of the CycleGAN model is completed, an expanded game platform image sample set including a large number of images may be obtained by acquiring and inputting only a small number of

extra labeled game platform images to the trained CycleGAN model. That is, there is no need to repeatedly acquire and label a large number of images manually, which may save a lot of labor costs. In addition, for each game platform in different scenarios, the expanded game platform image sample set of the game platform in the corresponding scenario may be obtained through the embodiments of the disclosure, so that the data amount in the game platform image sample set corresponding to each game platform in different scenarios is basically the same. That is, the data proportion of game platforms in different scenarios can be accurately controlled, the generalization ability of the subsequent detection model can be improved; and the expanded game platform image sample set is applied to the subsequent training of the detection model, so that the detection performance may be improved.

[0089] In actual application, S100 to S102 may be implemented by using a processor in an electronic device. The above processor may be at least one of an Application Specific Integrated Circuit (ASIC), a Digital Signal Processor (DSP), a Digital Signal Processing Device (DSPD), a Programmable Logic Device (PLD), a Field-Programmable Gate Array (FPGA), a Central Processing Unit (CPU), a controller, a microcontroller, and a microprocessor.

[0090] The embodiments of the disclosure are exemplarily described below in combination with an application scenario. In the application scenario, the game scenario is a smart casino scenario, and the game platform is a gaming table, the fund substitute is a chip. The smart casino scenario may be a poker game.

[0091] In the smart casino, there are different scenarios and gaming table types. Especially when an algorithm is extended to a new scenario, if the model is expected to maintain high detection performance, the traditional solution requires a lot of manpower to acquire and label a mass of image data. By means of the method of the embodiments of the disclosure, the migration between different gaming table types can be completed on a small amount (hundreds of pieces) of acquired image data, achieving the same performance and accuracy as the traditional solution, and saving a great deal of cost.

[0092] Exemplarily, multiple images of a gaming table may be acquired by a camera, and then the multiple acquired gaming table images are labeled. The data of two gaming

table types are randomly selected from the multiple labelled gaming table images as source data (source) and target data (target).

[0093] Exemplarily, local areas where the chips are located are cut out from the source data and the target data as training data of the CycleGAN model.

[0094] Referring to FIG. 1B and FIG. 1C, the CycleGAN model includes two generators and two discriminators. Exemplarily, it may be a unidirectional GAN from scenario A to scenario B plus a unidirectional GAN from scene B to scene A. The first image generative network and the second image generative network in the CycleGAN model share the two generators, that is, the first generator and the second generator. The first generator A2B implements the migration from scenario A to scenario B. The second generator B2A implements the migration from scenario B to scenario A. The first discriminator A discriminates between generated scenario A data and real scenario A data. The second discriminator B discriminates between generated scenario B data and real scenario B data.

[0095] FIG. 2A and FIG. 2B illustrate schematic diagrams of an input and an output of a generator in the CycleGAN model respectively according to embodiments of the disclosure. The image in FIG. 2A is a real image, and the image in FIG. 2B is an image generated by the generator.

[0096] Exemplarily, when the CycleGAN model is deployed to a new scenario, the local background area where the target object is located in the original scenario data may be converted into the background of the new scenario by use of two generators in the CycleGAN model. That is, corresponding migration learning of the model may be completed.

[0097] It is to be seen that, in the embodiments of the disclosure, migration of the background of the target object is performed through the CycleGAN model, which reduces a great deal of manpower and resource costs. That is, the performance achieved on a small amount of sample data is comparable to that on a large amount of data.

[0098] It can be understood by those skilled in the art that, in the above-mentioned method of the specific implementation modes, the writing sequence of each step does not

mean a strict execution sequence and is not intended to form any limitation to the implementation process and a specific execution sequence of each step should be determined by functions and probable internal logic thereof.

[0099] The embodiments of the disclosure provide a data generation apparatus on the basis of the data generation method provided in the foregoing embodiments.

[00100] FIG. 3 illustrates a structural diagram of composition of a data generation apparatus according to embodiments of the disclosure. As illustrated in FIG. 3, the apparatus may include an acquisition module 300, a training module 301, and an expansion module 302.

[00101] The acquisition module 300 is configured to acquire a pre-labeled game platform image sample set. The game platform image sample set includes a first image sample and a second image sample; and the first image sample and the second image sample contain a same object as each other and contain different image backgrounds respectively.

[00102] The training module 301 is configured to input the first image sample and the second image sample to a cycle-consistent generative adversarial network (CycleGAN) model for training to obtain a loss of the CycleGAN model, and adjust parameters of the CycleGAN model based on the loss of the CycleGAN model until training of the CycleGAN model is completed.

[00103] The expansion module 302 is configured to expand the game platform image sample set by use of the trained CycleGAN model.

[00104] In some embodiments, the CycleGAN model includes a first image generative network and a second image generative network. The first image generative network includes a first generator and a first discriminator, and the second image generative network includes a second generator and a second discriminator. In inputting the first image sample and the second image sample to the CycleGAN model for training to obtain the loss of the CycleGAN model, the training module 301 is configured to perform the following operations. A loss of the first image generative network is determined according to the first image sample, the first generator, the first discriminator and the

second discriminator. A loss of the second image generative network is determined according to the second image sample, the second generator, the first discriminator and the second discriminator. A cycle consistency loss is determined according to the first image sample, the second image sample, the first generator and the second generator. The loss of the CycleGAN model is determined according to the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss.

[00105] In some embodiments, in determining the loss of the first image generative network according to the first image sample, the first generator, the first discriminator and the second discriminator, the training module 301 is configured to perform the following operations. The first image sample is input to the first generator to generate a first image. The first image sample is discriminated with the first discriminator to obtain a first discrimination result. The first image is discriminated with the second discriminator to obtain a second discrimination result. The loss of the first image generative network is determined according to the first discrimination result and the second discrimination result.

[00106] In some embodiments, in determining the loss of the second image generative network according to the second image sample, the second generator, the first discriminator and the second discriminator, the training module 301 is configured to perform the following operations. The second image sample is input to the second generator to generate a second image. The second image sample is discriminated with the second discriminator to obtain a third discrimination result, and the second image is discriminated with the first discriminator to obtain a fourth discrimination result. The loss of the second image generative network is determined according to the third discrimination result and the fourth discrimination result.

[00107] In some embodiments, in determining the cycle consistency loss according to the first image sample, the second image sample, the first generator and the second generator, the training module 301 is configured to perform the following operations. The first image sample is input to the first generator to generate a first image, and the first image is input to the second generator to generate a third image. The second image

sample is input to the second generator to generate a second image, and the second image is input to the first generator to generate a fourth image. The cycle consistency loss is determined according to a difference between the first image sample and the third image and a difference between the second image sample and the fourth image.

[00108] In some embodiments, in expanding the game platform image sample set by use of the trained CycleGAN model, the expansion module 302 is configured to perform the following operations. An extra labeled game platform image is acquired. The extra labeled game platform image is input to the trained first generator or second generator to generate a new game platform image. The game platform image sample set is expanded by use of the new game platform image.

[00109] In some embodiments, in acquiring the pre-labeled game platform image sample set, the acquisition module 300 is configured to perform the following operations. Multiple acquired game platform images are labeled to obtain multiple labelled game platform images. The multiple labelled game platform images are clipped according to a set size to obtain the pre-labeled game platform image sample set.

[00110] In some embodiments, the target object may include at least one of following: a fund substitute, a poker card, cash, or a marker.

[00111] In actual application, the acquisition module 300, the training module 301 and the expansion module 302 may all be implemented using a processor in an electronic device. The above processor may be at least one of an application specific integrated circuit (ASIC), a digital signal processor (DSP), a digital signal processing device (DSPD), a programmable logic device (PLD), a field programmable gate array (FPGA), a central processing unit (CPU), a controller, a microcontroller, and a microprocessor.

[00112] In addition, functional modules in the embodiments may be integrated into a processing unit, or each module may exist independently, or two or more than two modules may also be integrated into a unit. The integrated unit may be implemented in a hardware form or may be implemented in form of a software functional module.

[00113] When the integrated unit is implemented in the form of software function module and is not sold or used as an independent product, it can be stored in a computer

readable storage medium. Based on such an understanding, the technical solutions of the embodiment essentially, or the part contributing to the prior art, or all or some of the technical solutions may be implemented in a form of a software product. The computer software product is stored in a storage medium and includes several instructions for instructing a computer device (which may be a personal computer, a server, a network device, or the like) or a processor (processor) to perform all or some of the actions of the methods described in the embodiments. The foregoing storage medium includes any medium that can store program code, such as a USB flash drive, a removable hard disk, a Read Only Memory (ROM), a Random Access Memory (RAM), a magnetic disk, or an optical disc.

[00114] Specifically, computer program instructions corresponding to a data generation method in the embodiment may be stored on storage media, such as a compact disc, a hard disc, and a USB flash drive. When the computer program instructions corresponding to the data generation method in the storage medium are read or executed by an electronic device, any data generation method in the foregoing embodiments is implemented.

[00115] Based on the same technical concept of the foregoing embodiments, referring to FIG. 4, the embodiments of the disclosure provide an electronic device 4, which may include: a memory 401 and a processor 402.

[00116] The memory 401 is configured to store a computer program and data.

[00117] The processor 402 is configured to execute the computer program stored in the memory, so as to implement any data generation method of the foregoing embodiments.

[00118] In practical application, the above-mentioned memory 401 may be a volatile memory, for example, a Random-Access Memory (RAM); or a non-volatile memory, for example, a Read-Only Memory (ROM), a flash memory, a Hard Disc Driver (HDD), or a Solid-State Drive (SSD); or a combination of both; and provides instructions and data for the processor 402.

[00119] The above processor 402 may be at least one of an ASIC, a DSP, a DSPD, a PLD, an FPGA, a CPU, a controller, a microcontroller, and a microprocessor. It can be

understood that other electronic devices may also be configured to realize functions of the processor for different devices, which is not specifically limited in the embodiments of the disclosure.

[00120] Embodiments of the disclosure further provide a computer program product including processor-executable instructions that, when executed by a processor, cause the processor to perform any data generation method of the foregoing embodiments. The computer program product may be specifically implemented by using hardware, software, or a combination thereof. In some embodiments, the computer program product is specifically implemented as a computer storage medium. In some embodiments, the computer program product is specifically implemented as a software product, for example, a software development kit (SDK).

[00121] In some embodiments, the functions or modules of the apparatus provided in the embodiments of the disclosure can be used to execute the method described in the above method embodiments, and its specific implementation may refer to the description of the above method embodiment, which will not be elaborated herein for simplicity.

[00122] The above description of various embodiments tends to emphasize the differences between the various embodiments, and their similarities may be referred to each other, which will not be elaborated herein for simplicity.

[00123] The methods disclosed in various method embodiments provided in the disclosure may be arbitrarily combined without conflict to obtain a new method embodiment.

[00124] The characteristics disclosed in various product embodiments provided in the disclosure may be arbitrarily combined without conflict to obtain a new product embodiment.

[00125] The characteristics disclosed in the various method or device embodiments provided in the disclosure may be arbitrarily combined without conflict to obtain a new method embodiment or device embodiment.

[00126] According to the description of the foregoing implementations, those skilled in

the art can clearly understand that the method in the foregoing embodiments may be implemented by software plus a necessary universal hardware platform or by hardware only of course. In most cases, the former is a more preferred implementation. Based on such an understanding, the technical solutions of this disclosure essentially or a part thereof that contributes to a conventional art may be embodied in a form of a software product. The computer software product is stored in a storage medium (for example, a ROM/RAM, a magnetic disk, or an optical disc), and includes several instructions for instructing a terminal (which may be a mobile phone, a computer, a server, an air conditioner, a network device, or the like) to perform the methods in the embodiments of this disclosure.

[00127] The embodiments of the disclosure are described above with reference to the accompanying drawings, but the disclosure is not limited to the above-mentioned detailed description. The detailed description only illustrative rather than restrictive. Inspired by the disclosure, those of ordinary skill in the art can still derive many variations without departing from the essence of the disclosure and the protection scope of the claims, which shall fall within the protection of the disclosure.

CLAIMS

1. A data generation method, comprising:

acquiring a pre-labeled game platform image sample set, wherein the game platform image sample set comprises a first image sample and a second image sample, and the first image sample and the second image sample contain a same target object as each other and contain different image backgrounds respectively;

inputting the first image sample and the second image sample to a cycle-consistent generative adversarial network (CycleGAN) model for training to obtain a loss of the CycleGAN model, and adjusting parameters of the CycleGAN model based on the loss of the CycleGAN model until training of the CycleGAN model is completed; and

expanding the game platform image sample set by use of the trained CycleGAN model.

2. The method according to claim 1, wherein the CycleGAN model comprises a first image generative network and a second image generative network, the first image generative network comprising a first generator and a first discriminator, and the second image generative network comprising a second generator and a second discriminator, and wherein inputting the first image sample and the second image sample into the CycleGAN model for training to obtain the loss of the CycleGAN model comprises:

determining a loss of the first image generative network according to the first image sample, the first generator, the first discriminator and the second discriminator;

determining a loss of the second image generative network according to the second image sample, the second generator, the first discriminator and the second discriminator;

determining a cycle consistency loss according to the first image sample, the second image sample, the first generator and the second generator; and

obtaining the loss of the CycleGAN model according to the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss.

3. The method of claim 2, wherein determining the loss of the first image generative network according to the first image sample, the first generator, the first discriminator and the second discriminator comprises:

inputting the first image sample to the first generator to generate a first image;

discriminating the first image sample with the first discriminator to obtain a first discrimination result;

discriminating the first image with the second discriminator to obtain a second discrimination result; and

determining the loss of the first image generative network according to the first discrimination result and the second discrimination result.

4. The method of claim 2, wherein determining the loss of the second image generative network according to the second image sample, the second generator, the first discriminator and the second discriminator comprises:

inputting the second image sample to the second generator to generate a second image;

discriminating the second image sample with the second discriminator to obtain a third discrimination result;

discriminating the second image with the first discriminator to obtain a fourth discrimination result; and

determining the loss of the second image generative network according to the third discrimination result and the fourth discrimination result.

5. The method of claim 2, wherein determining the cycle consistency loss according to the first image sample, the second image sample, the first generator and the second generator comprises:

inputting the first image sample to the first generator to generate a first image, and inputting the first image to the second generator to generate a third image;

inputting the second image sample to the second generator to generate a second image, and inputting the second image to the first generator to generate a fourth image; and

determining the cycle consistency loss according to a difference between the first image sample and the third image and a difference between the second image sample and the fourth image.

6. The method of claim 2, wherein expanding the game platform image sample set by use of the trained CycleGAN model comprises:

acquiring an extra labeled game platform image;

inputting the extra labeled game platform image to the trained first generator or second generator to generate a new game platform image; and

expanding the game platform image sample set by use of the new game platform image.

7. The method of claim 1, wherein acquiring the pre-labeled game platform image sample set comprises:

labeling a plurality of acquired game platform images to obtain a plurality of labelled game platform images; and

clipping, according to a set size, the plurality of labeled game platform images to obtain the pre-labeled game platform image sample set.

8. The method of any one of claims 1-4, wherein the target object comprises at least one of following:

a fund substitute,

a poker card,

cash, or

a marker.

9. A data generation apparatus, comprising:

an acquisition module, configured to acquire a pre-labeled game platform image sample set, wherein the game platform image sample set comprises a first image sample and a second image sample, and the first image sample and the second image sample contain a same target object as each other and contain different image backgrounds respectively;

a training module, configured to input the first image sample and the second image sample to a cycle-consistent generative adversarial network (CycleGAN) model for training to obtain a loss of the CycleGAN model, and adjusting parameters of the CycleGAN model based on the loss of the CycleGAN model until training of the CycleGAN model is completed; and

an expansion module, configured to expand the game platform image sample set by use of the trained CycleGAN model.

10. The apparatus according to claim 9, wherein the CycleGAN model comprises a first image generative network and a second image generative network, the first image generative network comprising a first generator and a first discriminator, and the second image generative network comprising a second generator and a second discriminator, and in inputting the first image sample and the second image sample into the CycleGAN model for training to obtain the loss of the CycleGAN model, the training module is configured to:

determine a loss of the first image generative network according to the first image sample, the first generator, the first discriminator and the second discriminator;

determine a loss of the second image generative network according to the second image sample, the second generator, the first discriminator and the second discriminator;

determine a cycle consistency loss according to the first image sample, the second image sample, the first generator and the second generator; and

obtain the loss of the CycleGAN model according to the loss of the first image generative network, the loss of the second image generative network and the cycle consistency loss.

11. The apparatus of claim 10, wherein in determining the loss of the first image generative network according to the first image sample, the first generator, the first discriminator and the second discriminator, the training module is configured to:

input the first image sample to the first generator to generate a first image;

discriminate the first image sample with the first discriminator to obtain a first discrimination result;

discriminate the first image with the second discriminator to obtain a second discrimination result; and

determine the loss of the first image generative network according to the first discrimination result and the second discrimination result.

12. The apparatus of claim 10, wherein in determining the loss of the second image generative network according to the second image sample, the second generator, the first discriminator and the second discriminator, the training module is configured to:

input the second image sample to the second generator to generate a second image;

discriminate the second image sample with the second discriminator to obtain a third discrimination result;

discriminate the second image with the first discriminator to obtain a fourth discrimination result; and

determine the loss of the second image generative network according to the third discrimination result and the fourth discrimination result.

13. The apparatus of claim 10, wherein in determining the cycle consistency loss according to the first image sample, the second image sample, the first generator and the second generator, the training module is configured to:

input the first image sample to the first generator to generate a first image, and inputting the first image to the second generator to generate a third image;

input the second image sample to the second generator to generate a second image, and inputting the second image to the first generator to generate a fourth image; and

determine the cycle consistency loss according to a difference between the first image sample and the third image and a difference between the second image sample and the fourth image.

14. The apparatus of claim 10, wherein in expanding the game platform image sample set by use of the trained CycleGAN model, the expansion module is configured to:

acquire an extra labeled game platform image;

input the extra labeled game platform image to the trained first generator or second generator to generate a new game platform image; and

expand the game platform image sample set by use of the new game platform image.

15. The apparatus of claim 9, wherein in acquiring the pre-labeled game platform image sample set, the acquisition module is configured to:

label a plurality of acquired game platform images to obtain a plurality of labelled game platform images; and

clip, according to a set size, the plurality of labeled game platform images to obtain the pre-labeled game platform image sample set.

16. The apparatus of any one of claims 9-12, wherein the target object comprises at least one of following:

a fund substitute,

a poker card,

cash, or

a marker.

17. An electronic device, comprising:

a processor, and

a memory configured to store a computer program capable of running on the processor, wherein the processor is configured to run the computer program to execute the data generation method of any one of claims 1-8.

18. A computer storage medium having stored thereon a computer program that, when executed by a processor, implements the data generation method of any one of claims 1-8.

19. A computer program product comprising processor-executable instructions that, when executed by a processor, cause the processor to implement the data generation method of any one of claims 1-8.