CLAIMS

1. A method for detecting a game prop in a game region, comprising:

acquiring an image frame sequence collected from a game region at a game prop operating stage, the image frame sequence comprising at least two frames of game images;

performing target detection on each frame of game image in the image frame sequence to obtain a first set of recognition results belonging to a same game prop, each recognition result at least comprising a confidence of the game prop; ~~and~~

determining reliability of the first set of recognition results of the game prop based on all confidences in the first set of recognition results of the game prop and a confidence threshold,

wherein a number of frames of game images in the image frame sequence is a first preset frame number, the first preset frame number is more than or equal to 2, and wherein determining the reliability of the first set of recognition results of the game prop based on all confidences in the first set of recognition results of the game prop and the confidence threshold comprises:

determining a number of confidences satisfying the confidence threshold in the first set of recognition results of the game prop;

determining that the first set of recognition results of the game prop are reliable in a case that the number of the confidences satisfying the confidence threshold is more than or equal to a second preset frame number, the second preset frame number is less than the first preset frame number, and

determining that the first set of recognition results of the game prop are unreliable in a case that the number of the confidences satisfying the confidence threshold is less than the second preset frame number; and

wherein the method further comprises:

acquiring a third preset frame number of continuous game images satisfying a preset condition from the image frame sequence in a case of determining that the first set of recognition results of the game prop are unreliable, the third preset frame number is less than the first preset frame number;

acquiring a second set of recognition results of the game prop in the third preset frame number of continuous game images; and

determining that the second set of recognition results of the game prop are reliable,

wherein each recognition result comprises a detection box of the game prop, and wherein acquiring the third preset frame number of continuous game images satisfying the preset condition from the image frame sequence in the case of determining that the first set of recognition results of the game prop are unreliable comprises:

sequentially determining an Interaction over Union (IoU) between detection boxes of the game prop in every two adjacent frames of game images in the image frame sequence in the case of determining that the first set of recognition results of the game prop are unreliable;

in a case that the IoU between the detection boxes in two adjacent frames of game images satisfies an IoU threshold, determining any one of the two adjacent frames of game images as a still image frame, the still image frame is a game image representing that the game prop is in a still state; and

acquiring a third preset frame number of continuous game images, of which timestamps are later than a timestamp of the still image frame, from the image frame sequence.

~~2. The method of claim 1, wherein a number of frames of game images in the image frame sequence is a first preset frame number, the first preset frame number is more than or equal to 2, and wherein determining the reliability of the first set of recognition results of the game prop based on all confidences in the first set of recognition results of the game prop and the confidence threshold comprises:~~

~~determining a number of confidences satisfying the confidence threshold in the first set of recognition results of the game prop;~~

~~determining that the first set of recognition results of the game prop are reliable in a case that the number of the confidences satisfying the confidence threshold is more than or equal to a second preset frame number, the second preset frame number is less than the first preset frame number, and~~

~~determining that the first set of recognition results of the game prop are unreliable in a case that the number of the confidences satisfying the confidence threshold is less than the second preset frame number.~~

~~3. The method of claim 1 or 2, further comprising:~~

~~acquiring a third preset frame number of continuous game images satisfying a preset condition from the image frame sequence in a case of determining that the first set of~~

~~recognition results of the game prop are unreliable, the third preset frame number is less than the first preset frame number;~~

~~acquiring a second set of recognition results of the game prop in the third preset frame number of continuous game images; and~~

~~determining that the second set of recognition results of the game prop are reliable.~~

~~4. The method of claim 3, wherein each recognition result comprises a detection box of the game prop, and wherein acquiring the third preset frame number of continuous game images satisfying the preset condition from the image frame sequence in the case of determining that the first set of recognition results of the game prop are unreliable comprises:~~

~~sequentially determining an Interaction over Union (IoU) between detection boxes of the game prop in every two adjacent frames of game images in the image frame sequence in the case of determining that the first set of recognition results of the game prop are unreliable,~~

~~in a case that the IoU between the detection boxes in two adjacent frames of game images satisfies an IoU threshold, determining any one of the two adjacent frames of game images as a still image frame, the still image frame is a game image representing that the game prop is in a still state, and~~

~~acquiring a third preset frame number of continuous game images, of which timestamps are later than a timestamp of the still image frame, from the image frame sequence.~~

~~5~~2. The method of claim ~~4~~1, wherein sequentially determining the IoU between the detection boxes of the game prop in every two adjacent frames of game images in the image frame sequence based on the first set of recognition results of the game prop comprises:

determining a predicted covering score of the game prop in each frame of game image in the image frame sequence based on the first set of recognition results of the game prop, the predicted covering score represents a degree that the game prop is covered in the respective frame of game image; and

sequentially determining the IoU between the detection boxes of the game prop in every two adjacent frames of game images in the image frame sequence in a case that the predicted covering score of the game prop in each frame of game image does not satisfy a covering threshold.

63. The method of claim 52, wherein determining the predicted covering score of the game prop in each frame of game image in the image frame sequence based on the first set of recognition results of the game prop comprises:

determining a region image corresponding to the detection box of the game prop in each frame of game image based on the first set of recognition results of the game prop;

performing key point detection on the region image to obtain confidences of all key points in the region image; and

determining, in combination with the confidences of all the key points in the region image, the predicted covering score of the game prop in the respective frame of game image.

74. The method of any one of claims 1-63, wherein a recognition result of a game prop further comprises a tracking Identity (ID) of the game prop, and wherein performing the target detection on each frame of game image in the image frame sequence to obtain a first set of recognition results belonging to the same game prop comprises:

performing the target detection on each frame of game image in the image frame sequence to obtain initial recognition results of at least one game prop in all frames of game images, and

selecting, based on a tracking ID of each game prop, the first set of recognition results of the same game prop associated with the tracking ID from the initial recognition results of the at least one game prop.

85. The method of any one of claims 1-74, wherein the game prop is a playing card; and a recognition result of the playing card comprises at least one of: a tracking ID of the playing card, a detection box of the playing card, a suit of the playing card, a denomination of the playing card or a confidence of the playing card.

96. An apparatus for detecting a game prop in a game region, comprising:

a first acquisition module, configured to acquire an image frame sequence collected from a game region at a game prop operating stage, the image frame sequence comprising at least two frames of game images;

a detection module, configured to perform target detection on each frame of game image in the image frame sequence to obtain a first set of recognition results belonging to a same game prop, each recognition result at least comprising a confidence of the game prop;

~~and~~

a first determination module, configured to determine reliability of the first set of recognition results of the game prop based on all confidences in the first set of recognition results of the game prop and a confidence threshold,

wherein a number of frames of game images in the image frame sequence is a first preset frame number, and the first preset frame number is more than or equal to 2, and wherein the first determination module comprises:

a first determination submodule, configured to determine a number of confidences satisfying the confidence threshold in the first set of recognition results of the game prop;

a second determination submodule, configured to determine that the first set of recognition results of the game prop are reliable in a case that the number of the confidences satisfying the confidence threshold is more than or equal to a second preset frame number, the second preset frame number is less than the first preset frame number; and

a third determination submodule, configured to determine that the first set of recognition results of the game prop are unreliable in a case that the number of the confidences satisfying the confidence threshold is less than the second preset frame number; and

wherein the apparatus further comprises:

a second acquisition module, configured to acquire a third preset frame number of continuous game images satisfying a preset condition from the image frame sequence in a case of determining that the first set of recognition results of the game prop are unreliable, the third preset frame number is less than the first preset frame number;

a third acquisition module, configured to acquire a second set of recognition results of the game prop in the third preset frame number of continuous game images; and

a second determination module, configured to determine that the second set of recognition results of the game prop are reliable,

wherein each recognition result includes a detection box of the game prop, and the second acquisition module comprises:

a fourth determination submodule, configured to sequentially determine an IoU between detection boxes of the game prop in every two adjacent frames of game images in the image frame sequence in the case of determining that the first set of recognition results of the game prop are unreliable;

a fifth determination submodule, configured to, in a case that the IoU between the

detection boxes in two adjacent frames of game images satisfies an IoU threshold, determine any one of the two adjacent frames of game images as a still image frame, the still image frame is a game image representing that the game prop is in a still state; and

an acquisition submodule, configured to acquire a third preset frame number of continuous game images of which timestamps are later than a timestamp of the still image frame from the image frame sequence.

~~10. The apparatus of claim 9, wherein a number of frames of game images in the image frame sequence is a first preset frame number, and the first preset frame number is more than or equal to 2, and wherein the first determination module comprises:~~

~~a first determination submodule, configured to determine a number of confidences satisfying the confidence threshold in the first set of recognition results of the game prop;~~

~~a second determination submodule, configured to determine that the first set of recognition results of the game prop are reliable in a case that the number of the confidences satisfying the confidence threshold is more than or equal to a second preset frame number, the second preset frame number is less than the first preset frame number; and~~

~~a third determination submodule, configured to determine that the first set of recognition results of the game prop are unreliable in a case that the number of the confidences satisfying the confidence threshold is less than the second preset frame number.~~

~~11. The apparatus of claim 9 or 10, further comprising:~~

~~a second acquisition module, configured to acquire a third preset frame number of continuous game images satisfying a preset condition from the image frame sequence in a case of determining that the first set of recognition results of the game prop are unreliable, the third preset frame number is less than the first preset frame number~~

~~a third acquisition module, configured to acquire a second set of recognition results of the game prop in the third preset frame number of continuous game images ; and~~

~~a second determination module, configured to determine that the second set of recognition results of the game prop are reliable.~~

~~12. The apparatus of claim 11, wherein each recognition result includes a detection box of the game prop, and the second acquisition module comprises:~~

~~a fourth determination submodule, configured to sequentially determine an IoU~~

between detection boxes of the game prop in every two adjacent frames of game images in the image frame sequence in the case of determining that the first set of recognition results of the game prop are unreliable;

a fifth determination submodule, configured to, in a case that the IoU between the detection boxes in two adjacent frames of game images satisfies an IoU threshold, determine any one of the two adjacent frames of game images as a still image frame, the still image frame is a game image representing that the game prop is in a still state; and

an acquisition submodule, configured to acquire a third preset frame number of continuous game images of which timestamps are later than a timestamp of the still image frame from the image frame sequence.

137. The apparatus of claim 126, wherein the fourth determination submodule comprising:

a first determination unit, configured to determine a predicted covering score of the game prop in each frame of game image in the image frame sequence based on the first set of recognition results of the game prop, the predicted covering score represents a degree that the game prop is covered in the respective frame of game image; and

a second determination unit, configured to sequentially determine the IoU between the detection boxes of the game prop in every two adjacent frames of game images in the image frame sequence in a case that the predicted covering score of the game prop in each frame of game image does not satisfy a covering threshold.

148. The apparatus of claim 137, wherein the first determination unit comprises:

a first determination subunit, configured to determine a region image corresponding to the detection box of the game prop in each frame of game image based on the first set of recognition results of the game prop;

a key point detection subunit, configured to perform key point detection on the region image to obtain confidences of all key points in the region image; and

a second determination subunit, configured to determine, in combination with the confidences of all the key points in the region image, the predicted covering score of the game prop in the respective frame of game image.

159. The apparatus of any one of claims 96-8, wherein a recognition result of a game prop further comprises a tracking Identity (ID) of the game prop, and wherein the detection module

comprises:

a detection submodule, configured to perform the target detection on each frame of game image in the image frame sequence to obtain initial recognition results of at least one game prop in all frames of game images; and

a selecting submodule, configured to select, based on a tracking ID of each game prop, the first set of recognition results of the same game prop associated with the tracking ID from the initial recognition results of the at least one game prop.

~~16~~10. The apparatus of any one of claims ~~9~~6-~~15~~9, wherein the game prop is a playing card, and a recognition result of the playing card comprises at least one of: a tracking ID of the playing card, a detection box of the playing card, a suit of the playing card, a denomination of the playing card or a confidence of the playing card.

~~17~~11. An electronic device, comprising:

a memory; and

a processor, wherein the memory is used to store a computer program capable of running in the processor, and the processor is configured to execute the computer program to implement the steps in the method of any one of claims 1-~~8~~5.

~~18~~12. A computer-readable storage medium having stored therein a computer program, which when being executed by a processor, implements the steps in the method of any one of claims 1-~~8~~5.

~~19~~13. A computer program product comprising instructions which, when being executed by a processor of an electronic device, implement the steps in the method of any one of claims 1-~~8~~5.