DESCRIPTION

TITLE OF INVENTION: INFORMATION BINDING METHOD AND APPARATUS, AND ELECTRONIC DEVICE AND COMPUTER-READABLE STORAGE MEDIUM

TECHNICAL FIELD

[0001] The disclosure relates to the field of computer technologies, and in particular to an information binding method and apparatus, and electronic device and computer-readable storage medium.

BACKGROUND

[0002] With the development of logistics industry and computer technology, image-code information binding technology has emerged. The image-code information binding technology refers to the corresponding binding of an image information and an identification information, can be applied in technical field such as item security check.

[0003] In related technologies, a time difference is usually preset for the determining on information binding. The problem with the related technologies is that if there is a significant difference between device times of devices used for capturing information, and time synchronization is inaccurate, there will be a large discrepancy between the calculated time difference and the actual time difference. This affects the information binding, and hinders the improvement of the accuracy of the information binding.

SUMMARY

[0004] The disclosure provides information binding method and apparatus and an electronic device and a computer-readable storage medium, which are configured to resolve the technical problem in existing information binding solutions where significant time discrepancies and inaccurate time synchronization between devices adversely affect information binding, thereby hindering the improvement of binding accuracy.

[0005] In a first aspect, the disclosure provides an information binding method, including: acquiring a first image information and a second image information captured by first device, and a first identification information and a second identification information captured by

second device; calculating a first capture-time difference between the first image information and the second image information, and a second capture-time difference between the first identification information and the second identification information; and binding the first image information and the first identification information based on the first capture-time difference, the second capture-time difference, and a preset first time-difference interval to obtain an image-identification group, where the preset first time-difference interval is determined based on the difference between the first capture-time difference corresponding to the image information in a historically bound image-identification group and the second capture-time difference corresponding to the identification information in the historically bound image-identification group.

[0006] In a second aspect, embodiments of the disclosure provide an information binding device, including: a data acquisition module, configured to acquire a first image information and a second image information captured by the first device, and a first identification information and a second identification information captured by the second device; a calculation module, configured to calculate the first capture-time difference between the first image information and the second image information, and the second capture-time difference between the first identification information and the second identification information; and a binding module, configured to bind the first image information and the first identification information based on the first capture-time difference, the second capture-time difference, and a preset first time-difference interval to obtain an image-identification group, the preset first time-difference interval is determined based on the difference between the first capture-time difference corresponding to the image information in historically bound image-identification groups and the second capture-time difference corresponding to the identification information in historically bound image-identification groups.

[0007] In a third aspect, the embodiments of the disclosure also provide an electronic device, including memory and processor; the memory stores application program, and the processor is configured to run the application program in the memory to execute steps in the information binding method of the first aspect.

[0008] In a fourth aspect, the embodiments of the disclosure further provide a computer-readable storage medium, the computer-readable storage medium stores instructions, and the instructions are adapted to be loaded by the processor to execute steps in the information binding method of the first aspect.

[0009] From the above content, it may be concluded that the disclosure has following beneficial effects:

[0010] In the related art, when data binding is performed based on the time difference between the image information captured by the first device and the identification information captured by the second device, there may be a great difference between the calculated time difference and the actual time difference due to inaccurate time synchronization between the first device and the second device, thereby adversely affecting the information binding. In the embodiments of the disclosure, the first capture-time difference between two image information captured by the first device and the second capture-time difference between two identification information captured by the second device are first calculated; and the information binding is then performed based on the first capture-time difference, the second capture-time difference and the preset first time-difference interval. This helps mitigate the impact of time discrepancies or inaccurate synchronization between the first and second devices, thereby improving accuracy of the information binding.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a schematic diagram of a scenario of the information binding method provided in an embodiment of the disclosure.

[0012] FIG. 2 is a schematic flowchart of the information binding method provided in an embodiment of the disclosure.

[0013] FIG. 3 is a schematic diagram of a scenario of the security check provided in an embodiment of the disclosure.

[0014] FIG. 4 is a schematic diagram of the device network topology provided in an embodiment of the disclosure.

[0015] FIG. 5 is a schematic diagram of a scenario of the shipment information capture provided in an embodiment of the disclosure.

[0016] FIG. 6 is a schematic flowchart of the information binding provided in an embodiment of the disclosure.

[0017] FIG. 7 is a schematic structural diagram of the information binding device provided in an embodiment of the disclosure.

[0018] FIG. 8 is a schematic structural diagram of the electronic device provided in an embodiment of the disclosure.

[0019] FIG. 9 is a schematic structural diagram of the storage medium provided in an embodiment of the disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] In the related art, data binding may be directly performed based on the time difference between the time of capturing image information by first device and the time of capturing identification information by second device. For example, if the time difference is less than a certain value, the image information and the identification information may be considered successfully bound.

[0021] A problem with the related art lies in that the time when the first device captures the image information is generally determined based on a device time of the first device. Similarly, the time when the second device captures the identification information is generally determined based on a device time of the second device. If there is a significant discrepancy between the device times and time synchronization is inaccurate, it will result in a great difference between the calculated time difference and the actual time difference, thereby affecting the information binding, hindering the improvement of information binding accuracy.

[0022] To solve the above problem, the embodiments in the disclosure provides the information binding method and apparatus, a device and a computer-readable storage medium, which will be described in detail below.

[0023] The method for the information binding in the embodiment of the disclosure is applied to the apparatus for the information binding. The apparatus for the information binding is disposed in an electronic device. One or more processors, a memory, and one or more application programs are disposed in the electronic device, and the one or more application programs are stored in the memory and configured to be executed by the processor to implement the method for the information binding. The electronic device may be a terminal, such as a mobile phone or a tablet computer. Alternatively, the electronic device may also be a server or a service cluster composed of a plurality of servers.

[0024] As shown in FIG. 1, FIG. 1 is a schematic diagram of a scenario of the information binding method provided by an embodiment of the disclosure. An electronic device 100 is included in the scenario of the information binding in the embodiment of the disclosure.

[0025] In an example embodiment, an information binding apparatus is integrated in the electronic device 100, and a computer-readable storage medium corresponding to the information binding method is run in the electronic device 100 to execute steps of the information binding method.

[0026] It can be understood that the electronic device in the scenario of the information binding shown in FIG. 1, or the apparatus included in the electronic device, do not constitute limitations on the embodiment in the disclosure. i.e., the number or types of devices included

in the scenario of the information binding, or the number or types of apparatuses included in each device, do not affect an overall implementation of a technical solution in the embodiment of the disclosure, and may be considered as equivalent substitutions or derivatives of the technical solution claimed in the embodiments of the disclosure.

[0027] The electronic device 100 in the embodiment of the disclosure is primarily configured to execute the information binding method described in following embodiment.

[0028] The electronic device 100 in the embodiment of the disclosure may be an independent electronic device, or an electronic device grid or an electronic device cluster composed of electronic devices. For example, the electronic device 100 described in the embodiment of the disclosure, which includes but is not limited to a computer, a grid host, a single grid electronic device, a plurality of grid electronic device sets, or a cloud electronic device composed of a plurality of electronic devices. The cloud electronic device consists of a large number of computers or grid electronic devices based on cloud computing.

[0029] Those skilled in the art can understand that an application environment shown in FIG. 1 is only one application scenario of the solution of the disclosure and does not constitute restriction on the application scenario of the solution of the disclosure. Other application environments may include more or fewer electronic devices than shown in FIG. 1, or more or fewer mesh connection relationship of electronic devices than shown in FIG. 1. For example, only an electronic device is shown in FIG. 1. It can be understood that the scenario for the information binding may also include one or more other electronic devices, which is not specifically limited herein. The electronic device 100 may also include a memory.

[0030] In addition, in the scenario of the information binding of the disclosure, the electronic device 100 may be equipped with a display apparatus. Alternatively, the electronic device 100 may not be equipped with the display apparatus but instead be in communication connection with an external display device 200, the display device 200 is used for outputting a result of executing the information binding method in the electronic device. The electronic device 100 may access a backend database 300 (the backend database may be a local memory of the electronic device, or may also be located in the cloud), and the backend database 300 stores information related to the information binding.

[0031] It should be noted that the schematic diagram of the scenario of the information binding method shown in FIG. 1 is merely an example. The scenario for the information binding described in the embodiment in the disclosure is intended to explain the technical solution of the embodiment in the disclosure more clearly and does not constitute restriction on the technical solution provided in the embodiment in the disclosure.

[0032] With reference to FIG. 2 to FIG. 6, a more detailed example will be provided to illustrate the information binding method provided in the embodiment of the disclosure.

[0033] Based on the above scenario of the information binding, the embodiment of the method for the information binding is proposed. In the embodiment, the method for the information binding is applied in the electronic device, and the type of the electronic device is not specifically limited herein. For example, the electronic device may be a terminal or a server. In the embodiment, the server is taken as an example for description.

[0034] FIG. 2 is a schematic flowchart of an information binding method provided in an embodiment of the disclosure. As shown in FIG. 2, the information binding method in the embodiment of the disclosure includes following contents.

[0035] S201: acquiring first image information and second image information captured by a first device, and first identification information and second identification information captured by a second device.

[0036] The first device and the second device are devices used for capturing information about the items to be detected. A plurality of items to be detected are sequentially conveyed to the first device and the second device through a conveying device. Image information is obtained by taking photos with the first device, and identification information is obtained by scanning with the second device.

[0037] In an example embodiment, designating the above information binding method applied to the field of express parcels security check as an example for illustration. For example, during the security check, the express parcels will sequentially pass through the first device used for the image capture and the second device used for the identification capture, and the express parcels continuously pass through the first device and the second device in a queue. In this case, it is necessary to bind the image information with the identification information corresponding to the image information, so as to promptly confirm the abnormal parcel when a certain express parcel is found to be abnormal.

[0038] The first image information is obtained through the first device capturing an image of an item to be detected, and the second image information is obtained through the first device capturing an image of another item to be detected. Similarly, the first identification information is obtained through the second device capturing an image of an item to be detected, and the second identification information is obtained through the second device capturing an image of another item to be detected.

[0039] It should be noted that an interval between the items to be detected corresponding to the first image information and the second image information is the same as an interval between

the items to be detected corresponding to the first identification information and the second identification information.

[0040] For example, an item interval value *a* is preset (its specific value may be set and adjusted according to actual needs). When the items to be detected sequentially pass through the first device and the second device according to the queue, the first device captures the image of two items to be detected to obtain the first image information and the second image information, and the two items to be detected are separated by *a* items to be detected; similarly, the two items to be detected corresponding to the first identification information and the second identification information are also separated by *a* items to be detected.

[0041] In an example embodiment, the above item interval value *a* may be 0, i.e., the first image information and the second image information are the image information corresponding to two adjacent items to be detected, and the first identification information and the second identification information are the identification information corresponding to two adjacent items to be detected.

[0042] S202: calculating a first capture-time difference between the first image information and the second image information, and a second capture-time difference between the first identification information and the second identification information.

[0043] The first capture-time difference is a difference between a capture time of the first image information and a capture time of the second image information, and the second capture-time difference is a difference between a capture time of the first identification information and a capture time of the second identification information.

[0044] In an example embodiment, the capture time of the first image information and the capture time of the second image information are determined based on the device time of the first device, and the capture time of the first identification information and the capture time of the second identification information are determined based on the device time of the second device. In this way, there is no need to perform the time synchronization, which is beneficial to reduce error impact brought by a time synchronization process.

[0045] In another application scenario, each capture time may be a time after the time synchronization, i.e., the first capture-time difference and the second capture-time difference are not directly calculated using the device time. Due to the use of the difference between capture times, the error impact brought by the time synchronization process may also be reduced to a certain extent.

[0046] S203: binding the first image information and the first identification information based on the first capture-time difference, the second capture-time difference, and the preset first

time-difference interval to obtain an image-identification group, the preset first time-difference interval is determined based on the difference between the first capture-time difference corresponding to the image information in the historically bound image-identification group and the second capture-time difference corresponding to the identification information in the historically bound image-identification group.

[0047] The preset first time-difference interval is a pre-configured range of time differences, configured to determine whether the image information and the identification information that need to be bound belong to the same item to be detected. If they belong to the same item to be detected, the information binding can be performed to obtain a set of matching image information and identification information as the image-identification group.

[0048] It should be noted that the preset first time-difference interval is determined based on the difference between the first capture-time difference and the second capture-time difference that correspond to the historically successfully bound image information and identification information.

[0049] It should be noted that the position of the first image information in the image information queue is the same as the position of the first identification information in the identification information queue. For example, if the first image information is the b-th image information in the image information queue, then the first identification information is the b-th identification information in the identification information queue. A value of b may be set and adjusted according to actual needs, which is not specifically limited herein.

[0050] When binding information, the first capture-time difference is the time difference between two adjacent items to be detected passing through the first device, and the second capture-time difference is the time difference between two adjacent items to be detected passing through the second device. If a difference between a current corresponding first capture-time difference and second capture-time difference falls within the preset first time-difference interval (which is close to zero), it indicates that no abnormalities occurred in the conveying device during an information capture process, such as no temporary pauses of the conveying device or no mid-way dropping of any item to be detected. In this case, the first image information in the image information queue and the corresponding first identification information in the identification information queue may be considered to belong to the same item to be detected, and the first image information and the corresponding first identification information can be bound.

[0051] Thus, binding information based on the first capture-time difference, the second capture-time difference and the preset first time-difference interval is beneficial in reducing

impact caused by time difference between the first device and the second device or inaccurate time synchronization, thereby improving the accuracy of the information binding.

[0052] In an example embodiment, a scenario where the first image information is captured prior to the second image information is described as an example, but in an actual application, the first image information may be image information captured after the second image information. The same principle applies to the identification information, and details will not be described herein again.

[0053] In an example embodiment, if the second image information is the last image information in the image information queue, and the second identification information is the last identification information in the identification information queue, and if the first image information and the first identification information are successfully bound, the second image information and the second identification information can be considered successfully bound.

[0054] In an example embodiment, the preset first time-difference interval is pre-constructed according to following steps: obtaining an image-identification queue, the image-identification queue includes at least two successfully bound image-identification groups, and each image-identification group in the at least two image-identification groups includes the image information and the identification information; designating each image-identification group in the at least two image-identification groups as the target image-identification group to obtain at least two target image-identification groups, and obtaining a time difference historical queue based on a capture-time difference between each target image-identification group in the at least two target image-identification groups and a reference image-identification group corresponding to the target image-identification group, a positional relationship between the target image-identification group and the reference image-identification group corresponding to the target image-identification group is adjacent or at a fixed interval; and constructing the preset first time-difference interval based on statistical features of each capture-time difference in the time difference historical queue, the statistical features include at least one of median, mode, and mean.

[0055] The preset first time-difference interval may be determined based on the historically successfully bound image-identification group. It should be noted that when constructing the preset first time-difference interval, the positional relationship between the target image-identification group and the reference image-identification group corresponding to the target image-identification group is the same as the positional relationship between the first image information and the second image information in the image information queue when binding information. The positional relationship may be adjacent or at a fixed interval, and a

corresponding interval value may be set according to actual needs, which is not specifically limited herein.

[0056] In an example embodiment, the capture-time difference between the target image-identification group and the reference image-identification group corresponding to the target image-identification group is the difference between the corresponding image capture-time difference and identification capture-time difference, the image capture-time difference is the difference between the capture time of the image information in the target image-identification group and capture time of the image information in the reference image-identification group, and the identification capture-time difference is a difference between the capture time of the identification information in the target image-identification group and the capture time of the identification information in the reference image-identification group.

[0057] For example, in a specific application scenario, obtaining the time difference historical queue based on the capture-time difference between each target image-identification group in the at least two target image-identification groups and the reference image-identification group corresponding to the target image-identification group includes: calculating a first historical capture-time difference between the image information in the target image-identification group and the image information in the reference image-identification group corresponding to the target image-identification group, and a second historical capture-time difference between the identification information in the target image-identification group and the identification information in the reference image-identification group corresponding to the target image-identification group; calculating a target time difference between the first historical capture-time difference and the second historical capture-time difference, and associating the target time difference with the target image-identification group; and sorting at least two target time differences associated with at least two target image-identification groups according to the order of at least two target image-identification groups to obtain the time difference historical queue.

[0058] After the time difference historical queue is obtained, the statistical features of each capture-time difference (i.e., each target time difference) are calculated, for example, an average value is calculated to obtain an average capture-time difference, then expand the interval based on the average capture-time difference to obtain the preset first time-difference interval. A specific interval expansion range may be preset and adjusted according to actual needs, and no specific restrictions are made here.

[0059] It should be noted that, in order to further improve the success rate of information binding, information binding is performed based on two information binding solutions in the

embodiment of the disclosure. The selection of which solution to use for information binding is determined according to a membership relationship between the target time difference and the preset first time-difference interval. For example, when a first information binding solution can be used for successful binding, the first information binding solution is employed preferentially. If the first information binding solution fails to bind, then a determination is made on whether the second information binding solution can succeed in binding. Specific two information binding solutions are described as follows.

[0060] 1. The difference between the first capture-time difference and the second capture-time difference is calculated, and the difference between the first capture-time difference and the second capture-time difference is taking as the target time difference; and in a case that the target time difference falls within the preset first time-difference interval, the first image information and the first identification information are bound to obtain the image-identification group.

[0061] 2. In a case that the target time difference does not fall within the preset first time-difference interval, a preset second time-difference interval is acquired, the preset second time-difference interval is determined based on the item transmission time between the first device and the second device; the difference between the capture time of the first image information and the capture time of the first identification information is calculated, and the difference between the capture time of the first image information and the capture time of the first identification information is taken as a transportation time difference; in a case that the transportation time difference falls within the preset second time-difference interval, the first image information and the first identification information are bound to obtain the image-identification group; and in a case that the transportation time difference does not fall within the preset second time-difference interval, binding failure label is added to the first image information and the first identification information.

[0062] The binding failure label is a preset binding failure prompt label, and adding the binding failure label facilitates user verification and removal of erroneous data.

[0063] Thus, the first information binding solution, which performs information binding based on the preset first time-difference interval and by combining the difference between the capture-time differences corresponding to adjacent (or fixed interval) image information and identification information, is first employed, so as to reduce impact of device time discrepancies and time synchronization discrepancies, improving the accuracy of the information binding.

[0064] If the binding fails, then the second information binding solution, which performs information binding based on the preset second time-difference interval and by combining the capture-time differences corresponding to image information and identification information, is further used, so as to improve the success rate of the information binding.

[0065] In the second solution, the preset second time-difference interval may be obtained by expanding the interval based on a historical capture-time differences of the items to be detected passing through the first device and the second device (a specific expansion value is preset according to actual needs). And the preset second time-difference interval may be updated based on the image-identification group that have been successfully bound in real time.

[0066] In an example embodiment, after binding the first image information and the first identification information to obtain the image-identification groups, the method further includes: acquiring the information time difference of each image-identification group (i.e., each successfully bound image-identification group); and updating the preset second time-difference interval according to statistical features of the information time difference, the statistical features include at least one of median, mode, and mean.

[0067] The information time difference of each image-identification group is the difference between the capture times corresponding to the image information and the identification information in the image-identification group. A statistical value of the information time difference (e.g., an average information time difference) may obtained by calculating the statistical features (e.g., an average) of the information time difference. An updated preset second time-difference interval may be obtained by expanding the interval based on the average information time difference.

[0068] In an application scenario, a statistical value deviation between a newly calculated statistical value of the information time difference and an original statistical value of the information time difference (i.e., a statistical value of the information time difference corresponding to a non-updated preset second time-difference interval) is first determined. Only if the statistical value deviation is excessively large (e.g., exceeding a preset deviation range) will the range of the preset second time-difference interval be updated.

[0069] In this way, the range of the preset second time-difference interval corresponding to the second solution is dynamically updated to adapt to changes in the device environments, improving robustness of the information binding method, and thereby increasing the success rate of the information binding. Moreover, for the cases where time synchronization frequencies are inconsistent (e.g., the first device synchronizes time with the server once per minute, while the second device synchronizes time with the server once every five minutes) or

the time synchronization fails, time inaccuracies tend to slowly drift in a certain direction rather than abruptly change. A method of dynamically updating a binding interval (i.e., the preset second time-difference interval) can address such abnormal situations, thereby improving the accuracy of the information binding.

[0070] In an example embodiment, items are transmitted between the first device and the second device by means of the conveying device, the first device is a security check device and the second device is a scanning device.

[0071] After obtaining the first image information and the second image information captured by the first device, and the first identification information and the second identification information captured by the second device, the method also includes: determining a timeout first image information based on the capture time of the first image information and the preset timeout threshold, and determining a timeout first identification information based on the capture time of the first identification information and the preset timeout threshold, and clearing the timeout first image information that has not been performed the information binding and the timeout first identification information that has not been performed the information binding; and/or, upon detection of start-stop information corresponding to the conveying device, clearing the first image information, the second image information, the first identification information, and the second identification information.

[0072] For example, the working status of the entire system for current information capturing is determined, so as to clear the historical data left in the binding queue. This ensures that when new data arrives, the entire binding queue has been cleared, which is equivalent to returning to the initial operation state. This periodic reset strategy can prevent interference from falsely triggered data and enhances the robustness of the information binding program. Data clearing is correspondingly performed in the following two scenarios.

[0073] 1. If the start-stop information of the conveying device can be collected, clear all current image information and identification information.

[0074] 2. If the start-stop information of the conveying device cannot be collected, determine whether there is long-unbound residual data in a current information queue, and clear the long-unbound residual data to reduce its interference with subsequent information binding.

[0075] In an example embodiment, the above information binding method is further described based on a specific application scenario. FIG. 3 is a schematic diagram of a scenario of security check provided in an embodiment of the disclosure. It should be noted that in FIG. 3, an example is used for illustration where the first device is a security check device, the second device is a six-sided scanning device, and the first device is arranged behind the second device.

In actual use, the first device can also be arranged before the second device, and the second device may include any one or both of the security check device and a radio frequency identification (RFID) device, which is not specifically limited herein.

[0076] As shown in FIG. 3, during the security check, a centralized security check method may be adopted. The centering machine 310 controls the items to be detected to stay near the center line of the conveyor belt 320, and a plurality of items to be detected pass through the second device 330 and the first device 350 in sequence. The waybill number is bound to the X-ray image of the item to be detected through the information binding, which facilitates automated interception or searching when a certain item to be detected as risky through AI in during subsequent processes.

[0077] FIG. 4 is a schematic diagram of a device network topology provided in an embodiment of the disclosure. It should be noted that the second device may include at least one of the six-sided scanning device and the RFID device. The security check device 420, the six-sided scanning device 440, and the RFID device 450 are independent devices, with each having an independent system time. Information captured by the six-sided scanning device 440 and the RFID device 450 is first transmitted to the master control or Warehouse Control System (WCS) 430, and then uploaded to a centralized security check system server (a time synchronization server) 410 from the master control or the WCS 430. The security check device 420, the six-sided scanning device 440, the RFID device 450, and the master control or the WCS 430 will all perform periodic time synchronization with the centralized security check system server (the time synchronization server) 410.

[0078] As shown in FIG. 3, when an item to be detected passes through a six-sided scanning device 330, the scanning time is recorded as Time1, and when the item to be detected passes through a security check device 350, an image information is generated, security inspection device 350, the capture time of the image information is recorded as Time2. Meanwhile, the speed of the conveyor belt 320 (i.e., a transmission device) during uniform motion is recorded as Vec, and the distance between the six-sided scanning device 330 and the security check device 350 is recorded as DistanceXRayObr. Therefore, in an ideal condition where errors are not considered, an ideal actual operating time required for the item to be detected to pass through the security check device 350 and the six-sided scanning device 330 is as shown in the following formula (1):

[0079] $$deltaT = DistanceXRayObr/Vec \quad (1)$$

[0080] In actual use, the time for the item to be detected to pass through the security check device and the scanning device is determined using the scanning time corresponding to the

identification information and the capture time corresponding to the image information, as shown in following formula (2):

[0081] $$timeDiff = Time2 - Time1 \quad (2)$$

[0082] Meanwhile, to maintain a certain level of compatibility (e.g., accounting for actual differences in the time differences triggered by the same package passing through a plurality of times due to the factors such as package orientation and package size), an interval may be determined based on the *timeDiff*, i.e., the preset second time-difference interval, denoted as (*timeRangeMin, timeRangeMax*). A value range of the interval may be finely adjusted around the theoretical value range. For example, if the distance between the security check device 350 and the six-sided scanning device 330 is 5 meters and the speed of the conveyor belt 320 is 2 meters/second, a theoretical *deltaT*=5/2=2.5s (2500 milliseconds), then (*timeRangeMin, timeRangeMax*) may be measured in milliseconds, and may be set to (2200, 2800).

[0083] In the embodiments of the disclosure, the first information binding solution based on the preset first time-difference interval and the second information binding solution based on the preset second time-difference interval are employed.

[0084] For the second information binding solution, following situations exist.

[0085] 1. If *timeRangeMin* < *timeDiff* < *timeRangeMax*, the image information and the identification information are considered to belong to the same item to be detected, and the corresponding image information and identification information may be performed information binding.

[0086] 2. If *timeDiff* < *timeRangeMin*, it generally falls into one of following two situations. A: when the previous item to be detected passes through the security check device, if an extra captured image is generated in addition to the normal image information, in other words, an additional piece of image information is generated. The situation where *time2'* - *time1* < *rangeMin* will occur when the additional piece of image information is bound to the next identification information in the identification information queue. In this case, the additional piece of image information should be discarded (a scenario of "image exists but no corresponding code"). B: when the current item to be detected passes through the scanning device, if one piece of identification information falls to be generated, when the image information in the image information queue searches for the corresponding identification information, the actual identification information found for the current image information is the identification information of the next item to be inspected, in this case, the time difference *time2'* - *time1* < *rangeMin* will occur. The corresponding image information should be

discarded, or a piece of identification information with a preset marker for distinguishing from abnormal situations should be added to the image information (a scenario of “image exists but no corresponding code”).

[0087] 3. If *timeDiff* > *timeRangeMax*, it generally falls into one of following two situations. A: If the scanning device is falsely triggered when the item to be detected passes through, in other words, an extra piece of identification information is generated by scanning, when the next item to be detected passes through, the extra piece of identification information is still in the queue and will be matched with the image information corresponding to the next item to be detected, causing the time difference *timeDiff* to be greater than *timeRangeMax*. In this case, the extra identification information should be discarded, or a piece of image information with preset marker should be added for binding (a scenario of “code exists but no corresponding image”). B: when the current item to be detected passes through the security check device, if the corresponding image information fails to generate, the image information corresponding to the next item to be detected is evaluated for binding with the identification information of the current item to be detected, in this case, the corresponding time difference will be greater than *timeRangeMax*. An extra piece of identification information should be discarded, or the image information with preset marker should be added for binding (a scenario of “code exists but no corresponding image”).

[0088] It should be noted that when *timeDiff* = *timeRangeMax* or *timeDiff* = *timeRangeMin*, it may also be considered as binding success, with no specific limitiation here.

[0089] Based on the second information binding solution, occasional over-triggered data or under-triggered data may be filtered out to ensure effectiveness of the overall binding queue. However, it imposes higher requirements on operational status of the device (such as network condition, device time synchronization frequency, or whether device time synchronization is successful).

[0090] When time difference and preset range interval are directly used for the information binding, this process relies on normal operational status of the devices and automatic time synchronization between each associated device and main server. If the time synchronization fails, as the timestamp data sources for image-code binding originate from different devices, the time difference will gradually deviate from the preset range interval, leading to errors in code binding. However, if the belt becomes loose due to long-term operation, resulting in the speed of the belt not reaching a preset speed, and thus binding constraint conditions based on an original preset time interval range-derived from dividing the constant distance by the fixed speed-will also become invalid. Although this solution can filter out some incorrectly bound

data through time interval, it has low fault tolerance rate, and device abnormalities will lead to a decrease in a success rate of the binding.

[0091] For example, the time difference *deltaT* for an actual package passing through the scanning device and the security check device is calculated by dividing the fixed distance by the constant speed. The fixed distance generally remains unchanged once the devices are installed and deployed, but the speed of the conveyor belt may vary due to factors such as an actual energy consumption control requirements of the transfer station or aging of the conveyor belt. For example, the speed is set to operate at a high-speed mode, such as 1.5 meters per second, but an actual operating speed may not reach the speed in a preset high-speed mode, and such variation is difficult to be detected without adding additional sensor for monitoring.

[0092] In addition, *timeDiff=time2-time1* is actually an ideal formula. It has a premise, i.e., both time2 and time1 should be times synchronized with the centralized security check server or the time synchronization server. It does not take into account the discrepancy caused by time synchronization.

[0093] When the time synchronization is taken into consideration, if the time of the time synchronization server is *ServerTime* at a certain moment, the time of the security check device after time synchronization is *XTime*, and the time of the scanning device after time synchronization is *ObrTime*, combining the above formula (1) and formula (2) with the time difference between the *XTime* and the *ObrTime*, the following formula (3) may be obtained:

[0094] $$timeDiff = XTime - OrbTime = (ServerTime - XTime) - (ServerTime' - ObrTime) + DistanceXRayObr/Vec \quad (3)$$

[0095] Here, because the security check device and the scanning device are connected to the same time synchronization server, the *ServerTime* and the *ServerTime'* can be considered the same value. According to formula (3), the value of the *timeDiff* also depends on the accuracy of the time *XTime and ObrTime of the* synchronized security check device and the scanning device.

[0096] Although the interval range for the preset second time-difference interval can be relaxed to a certain extent (with the maximum width not exceeding 1.5 times the value obtained by dividing the gap between two packages by the belt speed), in actual use, due to a relatively high frequency of X-ray time synchronization, the XTime may remain accurate while the ObrTime may be inaccurate owing to system, network, or time-synchronization frequency settings. Consequently, after a period of operation (e.g., one day), the overall time range interval

observed in data statistics may exceed the originally preset interval, leading to errors in barcode binding.

[0097] In view of the above problems of the second information binding solution, the embodiment of the disclosure proposes initially employing the first information binding solution for the information binding. Only if this initial binding fails, will the second information binding solution be employed for further binding. When using the first information binding solution for the information binding, the device times of each device can be directly employed, without relying on a synchronized time, thereby reducing impact of time synchronization and improving the accuracy of information binding.

[0098] FIG. 5 is a schematic diagram of a scenario of capturing the shipment information provided in an embodiment of the disclosure. Each of the shipments 1, 2, 3, ..., n in FIG. 5 represent an individual items to be inspected. A six-sided scanning photoelectric sensor is a photoelectric sensor arranged inside a six-sided scanning device 510. The six-sided scanning device 510 proceeds to capture identification information, if the six-sided scanning photoelectric sensor is triggered and records the corresponding capture time. The same principle applies to a security check device 520, and details will not be described here again. Specifically, in FIG. 5, from top to bottom, the states depicted respectively correspond to: the state where the identification information capture is performed on the shipment 1 (corresponding to Time1, which is determined by the device time of the six-sided scanning device 510), the state where the identification information capture is performed on the shipment 2 (corresponding to Time2, which is determined by the device time of the six-sided scanning device 510), the state where the image information capture is performed on the shipment 1 (corresponding to Time3, which is determined by the device time of the security check device 520), and a state where the image information capture is performed on the shipment 2 (corresponding to Time4, which is determined by the device time of the security check device 520). It should be noted that intervals between the shipments shown in FIG. 5 are for illustrative purposes only and do not constitute specific limitations.

[0099] For the above capture times, there is *deltaTObr=Time2-Time1*, the *deltaTObr* represents the time difference between the moment when the shipment 2 passes through the six-sided scanning device 510 and the moment when the shipment 1 passes through the six-sided scanning device 510, the *deltaTObr* is also referred as the second capture-time difference corresponding to the shipment 1. Similarly, *deltaTXRay=Time4-Time3*, the *deltaTXRay* represents the time difference between the moment when the shipment 2 passes through the security check device 520 and the moment when the shipment 1 passes through the security

check device 520, the *deltaTXRay* is also referred as the first capture-time difference corresponding to the shipment 1.

[0100] With constant conveyor belt speed, deltaTObr should be equal to deltaTXRay. In actual use, however, the speed of the conveyor belt may vary, since the interval between two shipments is relatively small, and impact of short-term speed variations in the conveyor belt is also minimal. Therefore, time interval constraints may be applied, as shown in formula (4) below:

[0101] $$rangeMin < deltaTXRay - deltaTObr < rangeMax \quad (4)$$

[0102] the *deltaTXRay-deltaTObr* is the target time difference, and the interval range defined by the *rangeMin* and the *rangeMax* is the preset first time-difference interval. Thus, whether the information binding can be performed is determined based on formula (4). In actual use, for shipment 2 and shipment 1, *deltaTXRay* is theoretically equal to *deltaTObr*, that is, the value of *deltaTXRay-deltaTObr* approaches zero. During a calculation process based on formula (4), the Time2 and the Time1 are both derived from the device time of the scanning device (for example, the six-sided scanning device 510), and the *Time4* and the *Time3* are both derived from the device time of the security check device 520. By using time differences corresponding to the device time of the same device, discrepancy caused by time synchronization can be avoided, thereby improving the accuracy of information binding. Thus, even if the security check device 520 and the scanning device (for example, the six-sided scanning device 510) have not undergone time synchronization, it will not cause any impact.

[0103] FIG. 6 is a schematic flowchart of information binding provided in an embodiment of the disclosure. As shown in FIG. 6, to improve the success rate of information binding, the first information binding solution mentioned above is prioritized, and the information binding is performed based on formula (4). If binding fails, the second information binding solution aforementioned is then employed, and the information binding is performed based on the difference between the capture times and the preset second time-difference interval. If the binding still fails, abnormal data will be discarded, i.e., error tolerance processing (referring to the aforementioned scenarios of "code exists but no image" or "image exists but no code"). It should be noted that the preset second time-difference interval is also updated in real time based on successfully bound image-identification group, thereby improving subsequent binding success rate. Specifically, as shown in FIG. 6, the information binding method includes following steps.

[0104] S610: capturing the identification information and save it to the identification information queue, and capturing the image information and save it to the image information queue;

[0105] S620: calculating the time difference *deltaTObr* between the capture time of current identification information and the capture time of previous identification information, and calculating the time difference *deltaTXRay* between the capture time of current image information and the capture time of previous image information;

[0106] S630: determining whether *deltaTXRay-deltaTObr* (value of *deltaTXRay* minus *deltaTObr*) is greater than *rangeMin* and less than *rangeMax*;

[0107] in a case that the *deltaTXRay-deltaTObr* is greater than the rangeMin and less than the *rangeMax*, proceed to step S650: the information is successfully bound, and updating the preset second time-difference interval based on the successfully bound image-identification group;

[0108] in a case that the *deltaTXRay-deltaTOb*r is less than *rangeMin* and/or the *deltaTXRay-deltaTObr* is greater than the *rangeMax*, proceed to step S640: determining whether the difference between the capture time of the current identification information and the capture time of the image information falls within the preset second time-difference interval;

[0109] in a case that the difference between the capture time of the current identification information and the capture time of the image information falls within the preset second time-difference interval, proceed to step S650: the information binding is successfully bound, and updating the preset second time-difference interval based on the successfully bound image-identification group;

[0110] in a case that the difference between the capture time of the current identification information and the capture time of the image information does not fall within the preset second time-difference interval, proceed to step S660: the information binding fails, and determining whether it is a case of "code exists but no image" or "image exists but no code", and discard abnormal data;

[0111] Step S670: storing and recording the binding results.

[0112] It should be noted that although the information binding method in the embodiment of the disclosure is applied to the field of security check systems, the method may also be applied to other technical fields in practical use. with specific limitations imposed herein. For example, the method may also be applied to a barcode scanning capture system in logistics field. A waybill information of the logistics shipment may be obtained by scanning Shipping Label pasted on the shipment by a six-sided scanning device, or by reading RFID label affixed

to the parcel with an RFID device. The six-sided scanning device and the RFID device are two separate devices, and the shipment passes through the six-sided scanning device or the RFID device at different times. When the barcode scanning capture system captures waybill data of the shipment, the information binding method in the embodiments of the disclosure can also be used for integrating six-sided scanning data and RFID data. This integration enables the system to feed back, to the upper-level system, the integrated waybill data (combining the six-side scanning data and the RFID data) for each shipment.

[0113] In the related art, when binding data based on the time difference between the image information captured by the first device and the identification information captured by the second device, there may be a significant discrepancy between the calculated time difference and the actual time difference due to inaccurate time synchronization for the first device and the second device, thereby affecting information binding. In the embodiments of the disclosure, the first capture-time difference between two image information captured by the first device and the second capture-time difference between two identification information captured by the second device are first calculated, and the information binding is carried out based on the first capture-time difference, the second capture-time difference, and the preset first time-difference interval, which is beneficial to reduce impact caused by time discrepancies and inaccurate time synchronization between the first device and the second device, thereby improving the accuracy of the information binding.

[0114] A method embodiment of the disclosure has been described in detail with reference to FIG. 1 to FIG. 6. Below, apparatus embodiment of the disclosure will be described in detail with reference to FIG. 7 and FIG. 8. It should be understood that description of the method embodiment corresponds to description of the apparatus embodiment. Therefore, for portions not described in detail, reference may be made to the previous method embodiment.

[0115] To better implement the method for the information binding in the embodiments of the disclosure, based on the information binding method, the information binding apparatus is provided in the embodiment of the disclosure. FIG. 7 is a schematic structural diagram of the information binding apparatus provided in an embodiment of the disclosure. As shown in FIG. 7, the information binding apparatus includes:

[0116] data acquisition module 701, configured to acquire the first image information and the second image information captured through the first device, and the first identification information and the second identification information captured through the second device;

[0117] calculation module 702, configured to calculate the first capture-time difference between the first image information and the second image information, and the second capture-

time difference between the first identification information and the second identification information; and

[0118] binding module 703, configured to bind the first image information and the first identification information based on the first capture-time difference, the second capture-time difference, and the preset first time-difference interval to obtain the image-identification group, the preset first time-difference interval is determined based on the difference between the first capture-time difference corresponding to the image information in historically bound image-identification groups and the second capture-time difference corresponding to the identification information in historically bound image-identification groups.

[0119] In an example embodiment, the information binding apparatus further includes a first time-difference interval construction module, which is configured to: acquire an image-identification queue, the image-identification queue includes at least two successfully bound image-identification groups, and each image-identification group in the at least two image-identification groups includes: image information and identification information; sequentially designating each image-identification group among the at least two image-identification groups as a target image-identification group to obtain at least two target image-identification groups, and obtaining the time difference historical queue based on the capture-time difference between each target image-identification group among the at least two target image-identification groups and a reference image-identification group corresponding to the target image-identification group, the positional relationship between the target image-identification group and the reference image-identification group corresponding to the target image-identification group is adjacent or at a fixed interval; and construct a preset first time-difference interval based on the statistical features of each capture-time difference in the time difference historical queue, the statistical features include at least one of median, mode, and mean.

[0120] In an example embodiment, when obtaining the time difference historical queue based on the capture-time difference between each target image-identification group in the at least two target image-identification groups and the reference image-identification group corresponding to the target image-identification group, the first time-difference interval construction module is specifically configured to: calculate a first historical capture-time difference between the image information in the target image-identification group and the image information in the reference image-identification group corresponding to the target image-identification group, and a second historical capture-time difference between the identification information in the target image-identification group and the identification information in the reference image-identification group corresponding to the target image-

identification group; calculate a target time difference between the first historical capture-time difference and the second historical capture-time difference, and associate the target time difference with the target image-identification group; and sort the at least two target time differences associated with the at least two target image-identification groups according to the order of the at least two target image-identification groups to obtain the time difference historical queue.

[0121] In an example embodiment, the binding module 703 is specifically configured to: calculate a difference between the first capture-time difference and the second capture-time difference, and designate the difference between the first capture-time difference and the second capture-time difference as the target time difference; and bind the first image information and the first identification information based on a membership relationship between the target time difference and the preset first time-difference interval to obtain the image-identification group.

[0122] In an example embodiment, when binding the first image information and the first identification information based on the membership relationship between the target time difference and the preset first time-difference interval to obtain the image-identification group, the binding module 703 is specifically configured to: bind the first image information and the first identification information to obtain the image-identification group if the target time difference falls within the preset first time-difference interval.

[0123] In an example embodiment, when binding the first image information and the first identification information based on the membership relationship between the target time difference and the preset first time-difference interval to obtain the image-identification group, the binding module 703 is specifically configured to: acquire a preset second time-difference interval if the target time difference does not fall within the preset first time-difference interval, the preset second time-difference interval is determined based on an item transmission time between the first device and the second device; calculate a difference between the capture time of the first image information and the capture time of the first identification information, and designate the difference between the capture time of the first image information and the capture time of the first identification information as the transportation time difference; and bind the first image information and the first identification information to obtain the image-identification group if the transportation time difference falls within the preset second time-difference interval.

[0124] In an example embodiment, the binding module 703 is further configured to: add a binding failure label to the first image information and the first identification information if the transportation time difference does not fall within the preset second time-difference interval.

[0125] In an example embodiment, the information binding apparatus further includes an interval updating module, configured to: acquire an information time difference between the successfully bound image-identification groups; and update the preset second time-difference interval based on statistical features of the information time difference, the statistical features include at least one of median, mode, and mean.

[0126] In an example embodiment, items are transmitted between the first device and the second device through a conveying device, the first device is security check device and the second device is scanning device.

[0127] In an example embodiment, the information binding apparatus further includes a data cleanup module, which is configured to: determine a timeout first image information based on the capture time of the first image information and a preset timeout threshold, and determine a timeout first identification information based on the capture time of the first identification information and the preset timeout threshold, and clear the timeout first image information that has not been performed the information binding and the timeout first identification information that has not been performed the information binding.

[0128] In an example embodiment, the data cleanup module is further configured to: clear the first image information, the second image information, the first identification information, and the second identification information if a start-stop information corresponding to the conveying device is detected.

[0129] In addition, FIG. 7 merely shows an embodiment of the information binding device rather than all of the embodiments. Based on the embodiments of the information binding apparatus in the disclosure, all other embodiments obtained by those skilled in the art without making creative efforts shall fall within the protection scope of this disclosure.

[0130] An electronic device is further provided in the embodiments of the disclosure, as shown in FIG. 8. FIG. 8 is a schematic structure diagram of an electronic device provided by an embodiment of the disclosure.

[0131] In an example embodiment, the electronic device integrates any one of information binding apparatus provided in the embodiments of the disclosure.

[0132] The electronic device includes: one or more processors; a memory; and one or more application programs, the one or more application programs are stored in the memory and

configured to be executed by the processor to perform steps of the information binding methods according to any one of the embodiments described above.

[0133] The electronic device may include components such as a processor 801 with one or more processing cores, a memory 802 with one or more computer-readable storage mediums, a power supply 803, and an input unit 804. It can be understood by those skilled in the art that the structure of the electronic device shown in FIG. 8 does not constitute a limitation on the electronic device, the electronic device may include more or fewer components than shown in the figure 7, or combine certain components, or have a different arrangement of components.

[0134] The processor 801 serves as the control center of the electronic device. The processor 801 connects various parts of the entire electronic device by various interfaces and circuits, perform various functions and data processing of the electronic device by running or executing the software program and/or the module stored in the memory 802, and invoking data stored in the memory 802, thereby performing overall monitoring of the electronic device. Optionally, the processor 801 may include one or more processing cores; preferably, the processor 801 may integrate an application processor and a modem processor, the application processor mainly handles the operating system, user interface, and application programs, etc., and the modem processor mainly handles wireless communication. It can be understood that the aforementioned modem processor may not be integrated into the processor 801.

[0135] The memory 802 may be configured for storing the software program and the module. The processor 801 performs various functional applications and data processing by running the software program and the module stored in memory 802. The memory 802 may mainly include a program storage area and a data storage area. The program storage area may store the operating system or the application programs required for at least one function (such as sound playback function, image playback function, or the like); the data storage area may store data created based on the use of the electronic device. In addition, the memory 802 may include a high-speed random-access memory and may further include a non-volatile memory, such as at least one of a disk storage device, a flash memory device, or other volatile solid-state storage devices. Correspondingly, the memory 802 may further include a memory controller to provide the processor 801 with access to the memory 802.

[0136] The electronic device may further include the power supply 803 that supplies power to various components. Preferably, the power supply 803 may be logically connected to the processor 801 through a power management system, thereby implementing functions such as charging management, discharging management, and power consumption management via the power management system. The power supply 803 may further include one or more DC or AC

power sources, recharging system, power failure detection circuit, power converter or inverter, or power status indicator, and the like.

[0137] The electronic device may further include the input unit 804. The input unit 804 may be configured to receive the input digital or a character information, and generate keyboard, a mouse, a joystick, optical, or a trackball signal input related to user settings and function control.

[0138] Although not shown, the electronic device may further include display unit, and the like, details will be not described herein again. In an example embodiment, the processor 801 in the electronic device will load executable files corresponding to processes of one or more applications into the memory 802 according to following instructions, and the processor 801 will run the application programs stored in the memory 802, thereby implementing the information binding method described in any of the aforementioned embodiments.

[0139] In addition, FIG. 8 merely shows an embodiment of the electronic device, rather than all of the embodiments. Based on the embodiments of the electronic device in the disclosure, all other embodiments obtained by those skilled in the art without making creative efforts shall fall within the protection scope of the disclosure.

[0140] Those skilled in the art can understand that all or portion of steps in the various methods in the aforementioned embodiments may be completed through instructions, or through hardware related to instruction controlling. The instructions may be stored in a computer-readable storage medium and loaded and executed by a processor.

[0141] For this purpose, as shown in FIG. 9, a computer-readable storage medium 900 is provided in the embodiments of the disclosure. The computer-readable storage medium 900 may include: a read only memory (ROM), a random-access memory (RAM), a disk or an optical disk, or the like. A computer program 910 is stored on the computer-readable storage medium 900, and the computer program 910 is loaded by the processor to execute steps in any one of the information binding method provided in the embodiments of the disclosure.

[0142] In addition, FIG. 9 merely shows one embodiment of the computer-readable storage medium, rather than all the embodiments. Based on the embodiments of the computer-readable storage medium in the disclosure, all other embodiments obtained by those skilled in the art without making creative efforts shall fall within the protection scope of the disclosure.

[0143] In the aforementioned embodiments, description of each embodiment focuses on different aspects. For portions not detailed in a certain embodiment, reference may be made to detailed descriptions of other embodiments above, which will be not described herein again.

[0144] In specific implementation, each of the above-mentioned units or structures may be implemented as an independent entity, or may be combined arbitrarily as a same entity or

several entities. The specific implementation of each of the above-mentioned units or structures may be referred to the previous method embodiments, which will be not described herein again.

[0145] A specific implementation of the above-mentioned operations may refer to previous embodiments, which will be not described herein again.

[0146] The information binding method, apparatus, electronic device and computer-readable storage medium provided in the disclosure have been described in detail above. Specific examples are used in this disclosure to explain a principle and implementing manner of the disclosure. The description of the embodiments above is merely intended to help understand the method and core ideas of the disclosure. Meanwhile, for those skilled in this field, based on ideas of the disclosure, there will be variations in the specific implementation methods and application scope. In summary, the content of this specification should not be construed as a limitation to the disclosure.

CLAIMS

What is claimed is:

1. A method for information binding, comprising:

acquiring a first image information and a second image information captured by a first device, and a first identification information and a second identification information captured by a second device;

calculating a first capture-time difference between the first image information and the second image information, and a second capture-time difference between the first identification information and the second identification information; and

binding the first image information and the first identification information based on the first capture-time difference, the second capture-time difference, and a preset first time-difference interval to obtain an image-identification group, wherein, the preset first time-difference interval is determined based on a difference between the first capture-time difference corresponding to an image information in a historically bound image-identification group and the second capture-time difference corresponding to an identification information in the historically bound image-identification group.

2. The method for information binding according to claim 1, wherein the preset first time-difference interval is pre-constructed according to following steps:

acquiring an image-identification queue, wherein, the image-identification queue comprises at least two successfully bound image-identification groups, and each image-identification group in at least two image-identification groups comprises the image information and the identification information;

designating each image-identification group in the at least two image-identification groups as a target image-identification group in sequence to obtain at least two target image-identification groups, and obtaining a time difference historical queue based on a capture-time difference between each target image-identification group in the at least two target image-identification groups and a reference image-identification group corresponding to the target image-identification group, wherein, a positional relationship between the target image-identification group and the reference image-identification group corresponding to the target image-identification group is adjacent or at a fixed interval; and

constructing the preset first time-difference interval based on statistical features of each capture-time difference in the time difference historical queue, wherein, the statistical features

comprise at least one of a median, a mode, and a mean.

3. The method for information binding according to claim 2, wherein the obtaining the time difference historical queue based on the capture-time difference between each target image-identification group in the at least two target image-identification groups and the reference image-identification group corresponding to the target image-identification group comprises:

calculating a first historical capture-time difference between an image information in the target image-identification group and an image information in the reference image-identification group corresponding to the target image-identification group, and a second historical capture-time difference between the identification information in the target image-identification group and the identification information in the reference image-identification group corresponding to the target image-identification group;

calculating a target time difference between the first historical capture-time difference and the second historical capture-time difference, and associating the target time difference with the target image-identification group; and

sorting the at least two target time differences associated with the at least two target image-identification groups according to the order of the at least two target image-identification groups to obtain the time difference historical queue.

4. The method for information binding according to any one of claims 1 to 3, wherein the binding the first image information and the first identification information based on the first capture-time difference, the second capture-time difference, and the preset first time-difference interval to obtain the image-identification group comprises:

calculating a difference between the first capture-time difference and the second capture-time difference, and designating the difference between the first capture-time difference and the second capture-time difference as a target time difference; and

binding the first image information and the first identification information based on a membership relationship between the target time difference and the preset first time-difference interval to obtain the image-identification group.

5. The method for information binding according to claim 4, wherein the binding the first image information and the first identification information based on the membership relationship between the target time difference and the preset first time-difference interval to

obtain the image-identification group comprises:

in a case that the target time difference falls within the preset first time-difference interval, binding the first image information and the first identification information to obtain the image-identification group.

6.The method for information binding according to claim 4, wherein the binding the first image information and the first identification information based on the membership relationship between the target time difference and the preset first time-difference interval to obtain the image-identification group comprises:

in a case that the target time difference does not fall within the preset first time-difference interval, acquiring a preset second time-difference interval, wherein the preset second time-difference interval is determined based on an item transmission time between a first device and a second device;

calculating a difference between a capture time of the first image information and a capture time of the first identification information, and designating the difference between the capture time of the first image information and the capture time of the first identification information as a transportation time difference; and

in a case that the transportation time difference falls within the preset second time-difference interval, binding the first image information and the first identification information to obtain the image-identification group.

7. The method for information binding according to claim 6, further comprising:

in a case that the transportation time difference does not fall within the preset second time-difference interval, adding a binding failure label to the first image information and the first identification information.

8. The method for information binding according to claim 6 or 7, further comprising:

acquiring an information time difference between successfully bound image-identification groups; and

updating the preset second time-difference interval based on statistical features of the information time difference, wherein the statistical features comprise at least one of a median, a mode, and a mean.

9. The method for information binding according to any one of claims 1 to 8, wherein items

are transferred between the first device and the second device by a conveying device, wherein the first device is a security check device, and the second device is a scanning device.

10. The method for information binding according to claim 9, further comprising:

determining a timeout first image information based on the capture time of the first image information and a preset timeout threshold, and determining a timeout first identification information based on the capture time of the first identification information and the preset timeout threshold; and

clearing the timeout first image information that has not undergone the information binding and the timeout first identification information that has not undergone the information binding.

11.The method for information binding according to claim 9 or 10, further comprising:

in a case that a start-stop information corresponding to the conveying device is detected, clearing the first image information, the second image information, the first identification information, and the second identification information.

12. An apparatus for information binding, comprising:

a data acquisition module, configured to acquire a first image information and a second image information captured by a first device, and a first identification information and a second identification information captured by a second device;

a calculation module, configured to calculate a first capture-time difference between the first image information and the second image information, and a second capture-time difference between the first identification information and the second identification information; and

a binding module, configured to bind the first image information and the first identification information based on the first capture-time difference, the second capture-time difference, and a preset first time-difference interval to obtain an image-identification group, wherein the preset first time-difference interval is determined based on a difference between a first capture-time difference corresponding to an image information in a historically bound image-identification group and a second capture-time difference corresponding to an identification information in the historically bound image-identification group.

13. An electronic device, comprising a memory and a processor; the memory stores an application program, and the processor is configured to according to any one of claims 1 to 11.

14. A computer-readable storage medium, wherein the computer-readable storage medium stores instructions, and the instructions are to be loaded by a processor to execute steps in the method for the information binding according to claim 1.