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Research on Multi-Channel Information Tracking Method

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Abstract: This project provides a trajectory tracking method, device and computer storage medium, including associating the bottom database features of each target object with at least one trajectory feature to construct the identity association information of each target object; According to at least one track feature of each target object, each detection feature obtained from different target videos is identified, and the target object corresponding to each detection feature is determined; According to the identity association information of each target object and the target object of each detection feature, all detection features of the object to be queried are obtained by using any one of the track code and the base code of the object to be queried, and then the trajectory tracking results of the object to be queried are generated. According to this, the project can support the track tracking of multi-channel monitoring video, And it can effectively improve the accuracy and integrity of trajectory tracking results.

Keywords: Trajectory, Tracking, Detection.

1. Introduction

In recent years, monitoring equipment has been widely used in our life.In many scenes of road traffic, shopping malls and stores, multiple monitoring devices are often used in different locations to cover the whole area.

The current trajectory tracking technology is mostly based on a single surveillance video. In practical applications, in order to find and locate a specific target, it usually needs to view multiple surveillance videos to determine. Therefore, it needs to spend a lot of time and labor costs to integrate the tracking results of multi-channel monitoring video.

In order to overcome the problems existing in the existing technologies, a trajectory tracking technology that can integrate multiple surveillance videos is needed.

2. Project Content

This project provides a track tracking method, device and computer storage medium, which can support the track tracking of multi-channel monitoring video and the accuracy of track tracking results.

The first aspect of this project provides a trajectory tracking method, which includes: associating the bottom database features of each target object with at least one trajectory feature to construct the identity association information of each target object; According to at least one track feature of each target object, each detection feature obtained from different target videos is identified, and the target object corresponding to each detection feature is determined; According to the characteristics of the object to be detected, each object to be detected is associated with the track of each object to be detected, and is generated according to the characteristics of the object to be detected.

The second aspect of the project is to provide a trajectory tracking device, which includes: association module, which is used to associate the bottom database features of each target object with at least one track feature, so as to construct the identity association information of each target object;The recognition module is used to recognize each detection feature obtained from different target videos according to at least one track feature of each target object, and determine the target object corresponding to each detection feature; The tracking module is used to obtain all detection features of the object to be queried according to the identity association information of each target object and the target object corresponding to each detection feature, so as to generate the trajectory tracking result of the object to be queried by using any one of the trajectory characteristics and the base library feature of the object to be queried.

The third aspect of the project provides a computer storage medium in which instructions for executing the steps of the method described in the first aspect are stored in the computer storage medium.

3. Specific Implementation Mode

The current trajectory tracking technology is mostly based on a single surveillance video. In practical applications, in order to find and locate a specific target, it is usually necessary to view multiple surveillance videos to determine.In view of this, this project provides a trajectory tracking method, which can integrate multiple surveillance videos to generate the trajectory tracking results of the object to be queried.

Fig. 1 is the flow diagram of the trajectory tracking method of the exemplary embodiment of the project.As shown in the figure, the track tracking method of the embodiment mainly includes the following steps:

In step S102, the bottom database feature of each target object is associated with at least one trajectory feature to construct the identity association information of each target object.

Each base feature has a corresponding base code, and each track feature has a corresponding track code.

A target object can have a base database feature (base code), and a base base feature (base code) can be associated with one or more track features (track codes), that is, the identity association information of the target object can be one-to-one or one to many corresponding relationship.

Specifically, when the same target object appears in

multiple target regions, the target object may have multiple trajectory features (track codes).

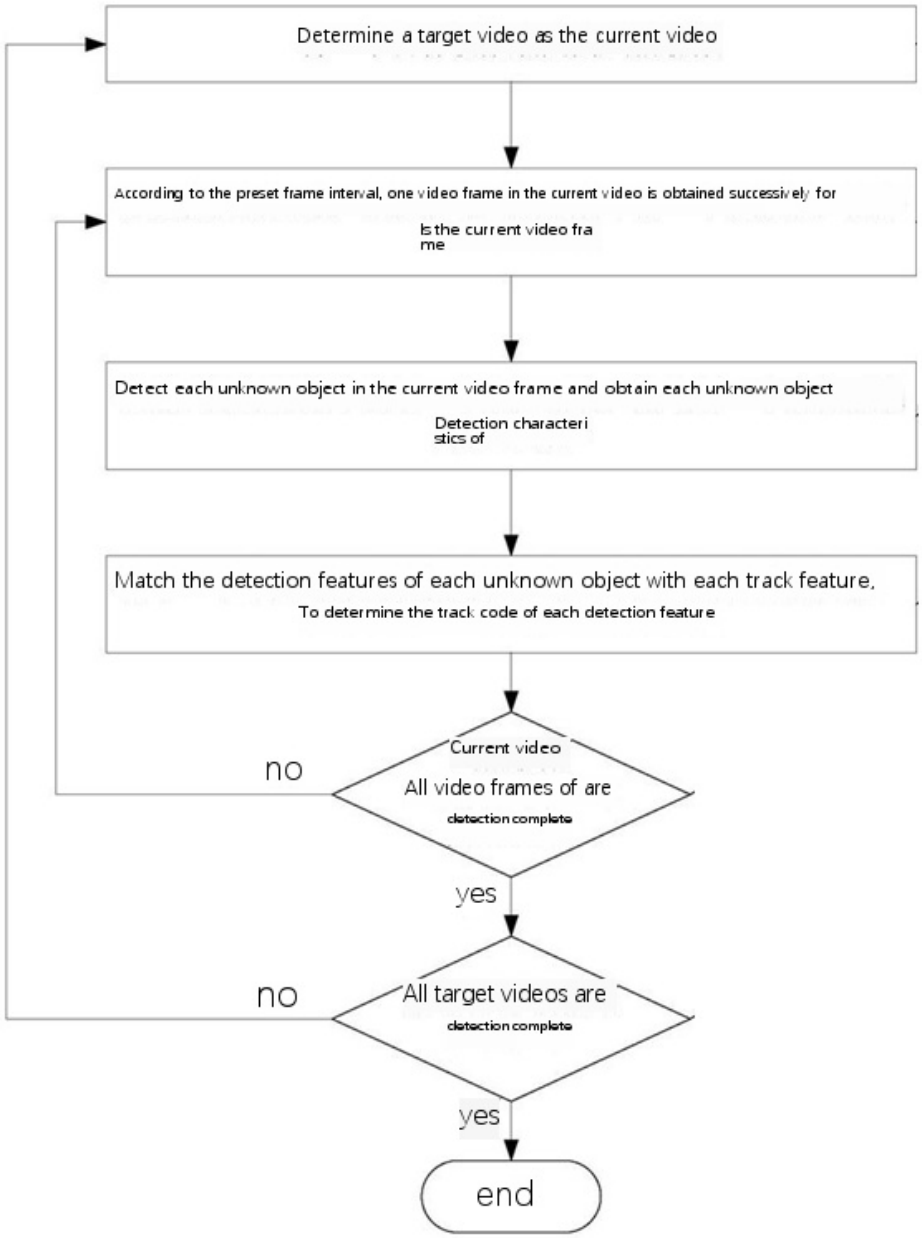

Figure 1. The flow diagram of the trajectory tracking method of the exemplary embodiment of the project

For example, in the example shown in the figure, the track feature a and track feature D in the track pool match with the base library feature a of the target object A. therefore, the track code a of the track feature a and the track code D of the track feature D can be associated with the base library code a of the base library feature a to form the identity association information of the target object a;The track feature B and track feature C in the trajectory pool are matched with the base library feature B of the target object B. therefore, the track code B of the track feature B and the track code c of the track feature C can be associated with the base library code B of the base library feature B to form the identity association information of the target object B;The track feature E in the trajectory pool matches the base library feature C of the target object C. Therefore, the track code e of the trajectory feature e can be associated with the base library code c of the base library feature C to form the identity association information of the target object C.

In step S104, each detection feature obtained from different target videos is recognized according to at least one track feature of each target object, and the target object corresponding to each detection feature is determined.

Alternatively, each target video corresponding to each target area can be obtained by using each monitoring device set in each target area.

For example, the monitoring device a set in the target area a can obtain the target video a corresponding to the target area a, use the monitoring device B set in the target area B to obtain the target video B corresponding to the target area B, and so on.

Alternatively, the unknown object in the target video can be identified, and the detection features of the unknown object can be obtained. Then, the unknown object in the detection feature can be identified by using each track feature in the track pool to determine the track code corresponding to the detection feature.

In step S106, according to the identity association information of each target object and the target object

corresponding to each detection feature, all the detection features of the object to be queried are obtained by using any one of the trajectory features and the bottom database feature of the object to be queried, so as to generate the trajectory tracking results of the object to be queried.

According to the feature of each object to be detected, it can be obtained by querying the target's track or any feature of the object to be detected,So as to obtain the complete moving track of the object to be queried.

To sum up, the trajectory tracking method provided by the embodiment associates the bottom database feature of the target object with at least one track feature, and identifies the identity of the unknown object in different target videos based on each track feature, so as to determine each target object corresponding to each target video, and input any one of the trajectory characteristics and the base database feature of the object to be queried,We can query the moving track of all the target areas that have been visited.Therefore, the track tracking scheme of this project can support the track tracking of multi-channel monitoring video, so as to improve the integrity and accuracy of track tracking results.

The track tracking method of another exemplary embodiment of the project.The embodiment is the specific implementation scheme of the above-mentioned step S104.The embodiment mainly includes the following steps:

In step S302, a target video is determined as the current video.

For example, the target video (E. G., any one of the target video a to the target video d) input by a monitoring device (E. G., any one of the target video a to the target video d) is determined to be the current video.

In step S304, according to the preset frame interval, one video frame in the current video is successively obtained as the current video frame.

Alternatively, one video image may be successively intercepted from the current video stream according to a preset frame interval (E. G., 5 seconds / frame) as a current video frame.

Step S306 detects each unknown object in the current video frame and obtains the detection features of each unknown object.

A current video frame may contain one or more unknown objects.

For example, the SSD detector (monocular multi-target detector) can detect each unknown object in the current video frame, and the object detection frame of each unknown object can be obtained. The image information in each object detection frame is extracted by using the trained Reid (pedestrian recognition) model, and the feature vector with fixed dimension is output as the feature representation of the unknown object,The detection feature of each unknown object is obtained.

Detection can be performed according to the current video frame obtained from the target video a to obtain the detection feature a of the unknown object a and the detection feature B of the unknown object B;According to the current video frame obtained from the target video B, detection is performed to obtain the detection feature C of the unknown object C, and so on.

In step S308, the detection feature of each unknown object is matched with each track feature to determine the trajectory code of each detection feature.

Alternatively, the detection feature of an unknown object can be obtained in turn as the current detection feature, and the current detection feature is matched with each track feature in the track pool, and the trajectory code of the current detection feature is determined according to the trajectory code of the track feature matching the current detection feature.

For example, if the current detection feature is the detection feature D, the matching track feature D is obtained by matching the detection feature d with each track feature in the trajectory pool, and the track code D of the trajectory feature D (i.e., the unknown object d) is determined based on the trajectory code D of the trajectory feature D.

Step S310 is used to determine whether all video frames of the current video have been detected. If so, proceed to step S312. If not, return to step S304 to continue.

If S312 is used to detect the target, all the steps are completed, otherwise, whether to continue the process is judged.

To sum up, the trajectory tracking method of the embodiment can identify the identity information of the unknown object by matching the detection features of the unknown object with each track feature, and has the advantages of accurate recognition results and high recognition processing efficiency.

The embodiment is the specific implementation scheme of the above-mentioned step S308, and the embodiment mainly includes the following steps:

In step S402, based on the first matching threshold and the second matching threshold, the first matching result and the second matching result of each detection feature are obtained by performing two matching for each detection feature and each trajectory feature.

Alternatively, according to the detection feature of each unknown object and each trajectory feature, the two matches performed may be Hungarian matching.

Alternatively, the similarity between each detection feature and each trajectory feature can be calculated to obtain the similarity value between each detection feature and each trajectory feature, and the similarity cost matrix can be obtained according to the similarity value between each detection feature and each trajectory feature, and then the first Hungarian matching is performed according to the similarity cost matrix and the first matching threshold,The first matching result is obtained, and according to the similarity cost matrix and the second matching threshold, the second Hungarian matching is performed to obtain the second matching result.

For example, if the number of track features is m and the number of detection features is n, then M can be formed according to the similarity value between each detection feature and each track feature×The similarity cost matrix of n.

Alternatively, the cosine similarity between each detection feature and each trajectory feature can be calculated to obtain the cosine similarity value between each detection feature and each trajectory feature, and the similarity generation value between each detection feature and each trajectory feature can be obtained according to the cosine similarity value between each detection feature and each trajectory feature,Each matrix element in the similarity cost matrix is constructed.

The value of similarity between each detection feature and each trajectory feature can be expressed as follows:

Among them, it represents the cosine similarity value between a detection feature and a trajectory feature.

It should be noted that other similarity algorithms, such as Euclidean distance algorithm, can also be used to obtain the

similarity value between each detection feature and each trajectory feature.

The second matching threshold is higher than the first matching threshold.

Alternatively, the first matching threshold may be between 0.2 and 0.45, and preferably, the first matching threshold may be set to 0.4.

Alternatively, the second matching threshold may be between 0.6 and 0.9, and preferably, the second matching threshold may be set to 0.65.

In step S404, the first matching result and the second matching result of one detection feature are obtained, and one of step s4061, step s4071 and step s4081 is continued.

Step s4061, if the same track feature matched with the detection feature is obtained according to the first matching result and the second matching result of the detection feature, the trajectory code of the obtained track feature is determined as the trajectory code of the detection feature.

Specifically, if the first Hungarian matching result and the second Hungarian matching result obtain the same track feature matching with the detection feature, which represents that the unknown object in the detection feature has appeared in the previous target video, then the track code of the matched track feature is determined as the trajectory code of the detection feature.

For example, for the detection feature a, if the first matching result and the second matching result of the detection feature a are both matched by the trajectory feature a in the trajectory pool, then the track code a of the track feature a is determined as the trajectory code of the detection feature a.

The different detection features obtained by the same target object in different target regions may match the same trajectory feature. For example, the detection feature B obtained by the target object B in the target area a and the detection feature C obtained in the target area B match the track feature B,This may be due to the small difference of dress characteristics or shooting angle of target object B in target area a and target area B.

The different detection features obtained by the same object in different regions may also match different trajectory features. For example, the detection feature e obtained by the target object C in the target area C matches the trajectory feature D, and the detection feature f obtained in the target area D matches the track feature C,This may be due to the difference of dressing characteristics or shooting angle of target C in target area C and target area D.

In step s4062, feature fusion is performed for detection features and trajectory features, and trajectory features are updated based on feature fusion results.

When the trajectory features matching the detection features are found in the trajectory pool, the track features in the trajectory pool can be updated by fusing the detection features with the trajectory features, so that the updated trajectory features can identify the unknown objects in the detection features more accurately.

For example, when the target object in the target video has a large range of actions, such as turning action, the front body detection feature, the side body detection feature and the back body detection feature of the target object may be obtained in turn. In this case, if the same trajectory feature is used, only the target object in the front body detection feature can be recognized, but the target object in the back body detection feature can not be recognized.Based on this, the embodiment dynamically fuses and updates the matched trajectory features and detection features, which is conducive to continuous recognition of different detection features of the target object with large range of actions, so as to improve the tracking and recognition effect of the target object.

Step s4071, if the first matching result and the second matching result of the detection feature do not obtain the trajectory feature matching the detection feature, a new trajectory feature and a new trajectory feature trajectory code are generated according to the detection feature.

If the first matching result and the second matching result of the detection feature do not find the track feature matching the detection feature from the track pool, which means that the object is a new object, the detection feature can be added to the trajectory pool to generate a new trajectory feature, and a corresponding trajectory code is assigned to the newly generated trajectory feature.

For example, if the track feature matching the detection feature D cannot be found in the track pool, the detection feature D is added to the track pool to generate the track feature D and the track code D in the track pool.

In step s4072, the track code of the new track feature is determined as the trajectory code of the detection feature.

In step s4081, if the first matching result does not obtain the trajectory feature matching the detection feature, and the second matching result obtains the trajectory feature matching the detection feature, the detection feature is discarded.

To sum up, in the prior art, it is easy to cause the problem that the same pedestrian is assigned multiple tags by using the single threshold method.In view of this, the embodiment adopts a double threshold method to perform matching twice for each detection feature and each track feature, which can effectively filter the ambiguous detection features and greatly reduce the possibility of track breaking and string following.

In order to improve the tracking effect of the object, the feature of the object can be detected by the feature of the continuous object.

4. Track Tracking Method of Another Embodiment of The Project

The embodiment is the specific implementation scheme of the above-mentioned step S102.

In step s502, the bottom base feature of each target object is matched with each track feature, and the base base feature matching with each trajectory feature is determined.

Alternatively, based on the third matching threshold and the fourth matching threshold higher than the third matching threshold, Hungary matching can be performed twice for each track feature and each base feature to obtain the third matching result and the fourth matching result of each track feature.

For each trajectory feature, if the same base feature matching with the trajectory feature is obtained according to the third matching result and the fourth matching result of the trajectory feature, the obtained bottom base feature is matched with the trajectory feature.

For each track feature, if the same base feature matching with the track feature is obtained from the bottom database according to the third matching result and the fourth matching result of the track feature, then the bottom library feature and the track feature are matched.

Alternatively, the third matching threshold may be between

0.2 and 0.45, and preferably, the third matching threshold may be set to 0.4.

Alternatively, the fourth matching threshold may be between 0.6 and 0.9, and preferably, the fourth matching threshold may be set to 0.65.

For each target object's base feature and each track feature, the detection feature for each unknown object is basically the same as the two Hungarian matching for each track feature, so it is not necessary to elaborate here.

It should be noted that if multiple trajectory features are generated simultaneously for a video frame, a cost matrix should be established for each newly generated track feature and each base feature, and a preset algorithm (such as greedy algorithm) should be used to match each newly generated track feature, and the two features with the highest similarity should be matched first,Then the two features with the second highest similarity are matched, and so on until the similarity of the remaining features is lower than the preset threshold.In order to avoid multiple pedestrians in the same video frame of the same target video being matched by the same base features, the accuracy of the base database data is ensured.

Step S504, for each track feature, associate the bottom library code of the bottom library feature matched with the track feature with the track code of the track feature.

The base code of the base feature matching the track feature found in the base library can be associated with the track code of the track feature.

For each track feature, if no base feature matching the trajectory feature is obtained according to the third matching result and the fourth matching result of the trajectory feature, a new base feature and a new base base code are generated in the base library according to the trajectory feature, and the base code of the newly generated bottom library feature is associated with the trajectory code of the track feature.

For example, if the base feature matching the track feature e cannot be found in the base library, the track feature e is added to the base base base to generate the base feature C and its corresponding base library code C.

In step S506, the identity association information of the target object corresponding to the base library code is constructed according to at least one track code associated with the bottom library code of the same base library feature.

For example, the trajectories A and D associated with the base code a can be integrated to form the identity association information of the target object a corresponding to the base library code a.

Conclusion

The trajectory tracking method provided by each embodiment of the project is to construct the identity association information used to identify the association relationship between the bottom database feature of the target object and at least one track feature, and determine the target object corresponding to each detection feature obtained from different target videos according to the different track characteristics of the target object,Any one of the track code and base code of the object to be queried can be used to obtain all the detection features of the object to be queried, and then the trajectory tracking results of the object to be queried can be generated.According to this, the tracking results of this project can improve the accuracy of tracking objects.

According to the identity association information of each target object, this project can directly query the track code of the object to be queried in all target videos by directly inputting the base code of the object to be queried, so as to obtain the complete track tracking results of the object to be queried.Or, by inputting any track code of the object to be queried, the base code of the object to be queried can be queried, and then the track code of the object to be queried in other target videos can be associated to obtain the complete track tracking results of the object to be queried.Therefore, this project can not only improve the flexibility of the track tracking query of the target object, but also obtain the track tracking results of all the target videos associated with the object to be queried, so as to improve the accuracy and integrity of the track tracking results.

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