

METHOD FOR DETECTING FREQUENT PASSER-PASSING IN MONITORING VIDEO

TECHNICAL FIELD

The present invention relates to the field of video security, especially relates to a method for
5 detecting frequent passer-passing in monitoring video.

BACKGROUND

Nowadays, camera devices are installed in many locations. However, videos captured by
these camera devices are generally only worked for post-inquiry, because the preventive analysis
10 of the videos is generally done by way of manual analysis, especially for the analysis on frequent
passer-passing, which lacks of related method due to the challenges on algorithm accuracy and
speed caused by complexity and high computational load on the video scene. In addition, in the
prior art there are no technologies to explore the same passer-passing in the video, wherein, the
passer-passing indicates that a passer passes the area monitored by the monitoring camera
15 device.

SUMMARY

The purpose of the present invention is to provide a method for detecting frequent
passer-passing in monitoring video to overcome above defect in prior art.

20 The purpose of the present invention can be achieved by the following technical solution:

A method for detecting frequent passer-passing in monitoring video includes steps:

S1: loading a video stream captured by a monitoring camera, obtaining a human face image
of a passer and creating a passer-passing record;

S2: extracting portrait features from the human face image, and storing the portrait features
25 and the passer-passing record to a data storage module;

S3: retrieving in the data storage module according to a portrait feature descriptor, and exporting a number of times each passer passes the monitoring camera area in a predetermined period of time.

In the step S1, the human face image of the passer is obtained by using AdaBoost classifier.

5 In the step S2, 35 feature points are obtained in the process of extracting the portrait features from the human face image.

The step S3 specifically comprises steps:

S31: performing similarity matching on the passer-passing records stored in the data storage module, and classifying the passer-passing records having similar portrait features;

10 S32: filtering the classified passer-passing records according to preset attribute features;

S33: exporting the number of times that each passer passed the monitoring camera area in a predetermined period of time.

In the step S32, the preset attribute features comprise: mask, sunglasses, age, and gender.

15 In the step S33, after exporting the number of times each passer passed the monitoring camera area in a predetermined period of time, outputting the human face image of the passer, whose appearance number of times in a unit time is greater than a predetermined number of times.

Compared with the prior art, the present invention has following advantages:

20 1) A mature method for matching human face passer-passing in a processing video is proposed, it has a high matching accuracy, and for a million-level human face database, it can achieve more than 60% hit rate while keep false alarm rate below 0.1%.

2) It has a high speed as a passer-passing record of each passer-passing can be obtain within 3 minutes.

3) It has a strong robustness and can be used in various scenes.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is flow chat of the main steps of the present invention.

5 DETAILED DESCRIPTION

Detailed description of the present invention will be described below with reference to the drawings and specific embodiments. This embodiment is implemented based on the technical solution of the present invention, and provides detailed implementation and specific operation process. However, the scope of the present invention is not limited to the following embodiment.

10 As shown in figure 1, a method for detecting frequent passer-passing in monitoring video includes following steps:

S1: loading a video stream captured by a monitoring camera, obtaining a human face image of a passer and creating a passer-passing record, wherein the human face image of the passer is obtained by using AdaBoost classifier;

15 S2: extracting portrait features from the human face image, and storing the portrait features and the passer-passing record to a data storage module, wherein, 35 feature points are obtained in the process of extracting the portrait features from the human face image;

S3: retrieving in the data storage module according to a portrait feature descriptor, and exporting a number of times each passer passes the monitoring camera area in a predetermined
20 period of time, which specifically comprises steps:

S31: performing similarity matching on the passer-passing records stored in the data storage module, and classifying the passer-passing records having similar portrait features;

S32: filtering the classified passer-passing records according to preset attribute features, wherein the preset attribute features comprise: mask, sunglasses, age, gender;

25 S33: exporting the number of times that each passer passed the monitoring camera area in a

predetermined period of time, and outputting the human face image of the passer, whose appearance number of times in a unit time is greater than a predetermined number of times.

In the technology of the present invention, input is video stream and output is frequent passer-passing record.

5 Implementation process: software comprises following 5 processes (modules):

1. Portrait detection and tracking module: the human face in the inputted video stream is detected, and the human face detection uses general AdaBoost classifier, the human face tracking uses optical flow method. The module borrows the concepts of "main frame" and "auxiliary frame" in the video stream to reduce calculation amount of the algorithm by more than 80%,
10 compared to doing full calculations for each frame; meanwhile, detection and tracking are combined and optimized, when referencing detection and tracking algorithms, obtained mutual local area are used to extrapolate the algorithm so as to accelerate.

2. Portrait feature extraction module: for every passer-passing in the video, human face size, positions of facial features and human face pose information are obtained to determine whether
15 they are suitable for human face comparison; a dynamic approach is used to ensure that there are at least N frames of feature extraction for every passer-passing. For portrait features, multiple feature operators, such as LBP, SIFT and Neural Networks, etc. are chosen, so that the human face features can be expressed to maximum.

3. Portrait storage module: multi-machine consistency portrait storage is provided, it saves
20 cameras capturing each passer-passing, time, position of each passer-passing in a video, portrait features, human face screenshots, etc. it can access data through interface and provide data support to retrieval module directly.

4. Portrait retrieval module: based on a human face similarity model obtained by offline training, a similarity matching between each passer-passing and the history record is performed,
25 so that a one-to-many similar list is obtained. In order to increase the retrieval speed, a preprocessing of the clustering algorithm, such as Kmeans , is used, so that single retrieval speed can keep in 1s even in levels of tens of millions.

5. Frequent passer-passing post-processing module: in order to increase the hit rate, two or more expended retrieval are strategically made by following the general practice of search engines; at the same time in order to reduce the false alarm rate, the attribute information of human face, such as age, gender, gesture, and whether wear a sunglasses and the like is extracted, and the type with a higher false alarm rate is filtered.

1. Portrait feature extraction module: firstly, the module locates key points on the human face (a total of 35 feature points), and then more than 100,000 dimensions of features are sampled and extracted in high-density by using different feature operators (LBP, SIFT, Neural Networks) on the key points. Secondly, the module reduces the dimensions to about 100 to obtain small volume feature vector.

2. Portrait retrieval module: the similarity between two features is calculated using L2 similarity. In order to accelerate the calculation, an index for the portrait features is pre-established, the index is the class center obtained by using Kmeans approach. To ensure the recall rate, a randomization method is used to obtain multiple class centers. After this process, the acceleration rate of retrieval can reach more than 30 times.

3. Frequent passer-passing post-processing module: this module includes two sub-modules. One executes expanded query on preliminary similar person list. This process can bring certain false alarms while improve hit rate, therefore, a strict restriction condition is performed, for example, the expanded query only can be executed when a similar score is larger than a high threshold. The other one filters common types of the false alarms, such as, the common types are elderly people, children, same hairstyle, wearing masks. The filter method determines whether types of the false alarms belong to these types by executing attribute classification, and then cuts off the false alarms using higher score threshold.

CLAIMS

1. A method for detecting frequent passer-passing in monitoring video, the method including steps of:

5 S1: loading a video stream captured by a monitoring camera, obtaining a human face image of a passer, and creating a passer-passing record;

S2: extracting portrait features from the human face image, and storing the portrait features and the passer-passing record to a data storage module;

10 S3: retrieving in the data storage module according to a portrait feature descriptor, and exporting a number of times each passer passes the monitoring camera area in a predetermined period of time,

wherein step S3 comprises steps of:

15 S31: performing similarity matching on passer-passing records stored in the data storage module, and classifying the passer-passing records having similar portrait features;

S32: filtering the classified passer-passing records according to preset attribute features;

S33: exporting the number of times that each passer passed the monitoring camera area in a predetermined period of time;

20 wherein the method is implemented by a portrait detection and tracking module, a portrait feature extraction module, a portrait storage module, a portrait retrieval module, and a frequent passer-passing post-processing module, in which:

25 the portrait detection and tracking module uses general AdaBoost classifier and human face tracking uses optical flow method, the portrait detection and tracking module borrowing concepts of "main frame" and "auxiliary frame" in the video stream, wherein detection and tracking are combined and optimized, and wherein when referencing detection and tracking algorithms, obtained mutual local area are used to extrapolate the detection and tracking algorithms;

30 the portrait feature extraction module firstly locates key points on the human face (a total of 35 feature points), and then more than 100,000 dimensions of features are sampled and extracted in high-density by using different feature operators on the key

points, wherein the portrait feature extraction module reduces the dimensions to about 100 to obtain small volume feature vector;

the portrait retrieval module uses L2 similarity to calculate similarity between two features, wherein an index for the portrait features is pre-established, the index being a class center obtained by using Kmeans approach, and wherein a randomization method is used to obtain multiple class centers; and

the frequent passer-passing post-processing module includes two sub-modules, a first sub-module executing an expanded query on a preliminary similar person list and a second sub-module filtering common types of false alarms.

10

2. The method for detecting frequent passer-passing in monitoring video according to claim 1, wherein 35 feature points are obtained in the process of extracting portrait features from the human face image.

15

3. The method for detecting frequent passer-passing in monitoring video according to claim 1, wherein, in the step S32, the preset attribute features comprise: mask, sunglasses, age, and gender.

4. The method for detecting frequent passer-passing in monitoring video according to claim 1, wherein in the step S33, after exporting the number of times each passer passed the monitoring camera area in a predetermined period of time, outputting the human face image of the passer, whose appearance number of times in a unit time is greater than a predetermined number of times.

20