Review Paper on Human Detection for Surveillance System

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Abstract

Extracting high level features is an important field in video indexing and retrieving. Identifying the presence of human in video is one of these high level features, which facilitate the understanding of other aspects concerning people or the interactions between people. Our work proposes a method for identifying the presence of human in videos. The proposed algorithm detects the human face based on the colour and motion information extracted from frames over wide range of variations in lightning conditions, skin colour races, backgrounds and faces' sizes and orientations. Experimental results demonstrate the successfulness of the algorithm used and its capability in detecting faces under different challenges. The proposed work is crucial in lots of applications whose concern is mainly human activities and can be a basic step in such activities. So, for that an algorithm has been proposed to detect the presence of human in video sequence. The main technique used in building the proposed algorithm is motion detection technique. A series of stages were implemented in a certain order to promise maximizing the detection of Human Motion and eliminating the other objects (noise). The proposed algorithm detects Human Motion among Non-human objects.

Key words: Histogram Oriented Gradients, Human Detection, Human motion detection, Support Vector machine, Surveillance System

I. INTRODUCTION

Image processing is a rapidly growing field which deals with the manipulation of an image for the purpose of either extracting information from the image or producing an alternative representation of the image. Image analysis includes modeling and analysis of original image itself, i.e. from image space analysis, to different methods for representing an image. In video surveillance system, human detection is very crucial. In this thesis human detection is done form the different video stream for video surveillance system. The process of human detection in video is divided into two parts i.e. moving object detection and then objects classification. Object detection could be performed by background subtraction, optical flow and spatio-temporal filtering. The object classification methods could be divided into three categories: shape-based, motion-based and texture-based.

II. LITERATURE REVIEW

A. Human Detection in Surveillance Videos and Its Applications - A Review By:

Manoranjan Paul, Shah M E Haque and Subrata Chakraborty, Paul et al. EURASIP Journal on Advances in Signal Processing 2013, Springer

Human detection in a smart surveillance system aims at making distinctions among moving objects in a video sequence. The successful interpretations of higher level human motions greatly rely on the precision of human detection. The detection process occurs in two steps: object detection and object classification according to Reference [1]. There are many techniques to detect moving object from the video. There are three main techniques for moving object detection according to this paper. The advantages and disadvantages of different methods are described below.

1) Background Subtraction:

This method is a popular method to detect an object as a foreground by segmenting it from a scene of a surveillance camera. There are many methods like Gaussian Mixture modeling i.e. GMM, Warping background, Hierarchical Background Modeling etc. GMM is simple to implement and also give good result with fix background but it is not as good with dynamic background. Other two methods need higher computational time for higher accuracy.

2) Optical Flow:

Optical flow presents an apparent change of a moving object's location or deformation between frames. There are two different methods for optical flow i.e. 1) Lucas-Kanade and 2) Horn-Schunck. Optical flow method can detect the moving object even when the camera moves, but it needs more time for its computational complexity, and it is very sensitive to the noise. The motion area usually appears quite noisy in real images and optical flow estimation involves only local computation.

B. Multi-Class Moving Target Detection with Gaussian Mixture Part Based Model by:

Jie Yang, Ya-Dong Sun, Mei-Jun Wu, and Qing-Nian Zhang, IEEE International Conference on Consumer Electronics (ICCE), 2014

There are many methods for detecting a moving object from the video sequences. Also there are many methods for tracking of the detected objects. In this paper, Gaussian mixture modeling is used for detecting the moving object. Here Kalman tracker is used for tracing the moving object. For recognition of object and also for counting the recognized objects, Histogram Oriented gradients (HOG) and then after Principal Component Analysis (PCA) is used.

In the proposed algorithm, first of all input sequence is given to background subtraction modeling. Gaussian Mixture Modeling is used to detect foreground from by subtracting the background. Then using ROI i.e. Region of Interest and Kalman filter, object is detected and tracked. Here the Kalman filters are used to predict and track targets in successive frame. Histogram of Oriented Gradients (HOG) is a particularly effective image feature for object detection. In this stage, HOG decomposes the ROIs into square cells on a regular 2D grid. Local gradients are computed in each cell by finite difference filters, and then binned into one of 9 orientation histograms. Finally, these orientation histograms are normalized by looking into adjacent cells and adjacent cells are aggregated into blocks. To reduce computational cost, firstly, PCA is performed on these feature vectors, which leads to model fewer parameters and speeds up the detection. Secondly, since the computation procedures of individual HOG descriptor are independent of each other, these computations can be run simultaneously with a multi-threading system according to Reference [2].

C. People Detection in Low-Resolution Video with Non-Stationary Background By:

Jianguo Zhang, Shaogang Gong, Image and Vision Computing 27 (2009) 437–443, SciVerse ScienceDirect.

In public place scene people detection is very crucial challenge for the researchers. There are many problems regarding the people detection like, changing object appearance, diversity of pose and scale, moving background, occlusion, imaging noise, and lighting change. Distance between camera and the scene resulting in lack of pixel details on the objects of interest [3]. There are two types of body work for people detection 1) Static People Detector and 2) Dynamic People Detector. In this paper, a framework for robust people detection in highly cluttered public scenes with non-stationary background by utilizing both human integral gradient appearance and their long-term motion information according to Reference [3].

Orientation of local image gradients can be sampled by a set of bins. Here 8 bins are used as in SIFT 8 bins. Furthermore, gradient orientation at each pixel location can be weighted by its gradient magnitude. In general, orientation histogram can be computed on any type of images. Thus, a motion orientation histogram can also be considered as an extension to the appearance gradient orientation histogram representation. To that end, we created and summarized several types of pedestrian features on these images. Because the appearance and local motion do not take into account the propagating dependencies between different frames. To address this problem, a typical approach is to deploy Bayesian temporal filtering to propagate the conditional dependencies.

In this paper, integral gradient orientation histogram map to represent both appearance and short-term motion features. Tracking is also considered for correcting misdetections by appearance and short-term motion information alone. Furthermore, long-term motion is utilized to further remove false alarms in detection. But there is still improvement in this algorithm.

D. Human detection based on motion object extraction and head–shoulder feature by:

Qing Ye, Rentao Gu, Yuefeng Ji, Optik 124 (2013) 3880– 3885, SciVerse ScienceDirect.

For detection of human, the head shoulder feature is used in this paper. Connected component detection algorithm is chosen to mark the binary foreground image, which is used to find all the pixels which belong to the same connected region and to give the same marking to the same connected region pixels before the object classification. The next relevant algorithms need use vertical projection histogram of each connected marking region to judge the shape and size of each connected marking region and the related properties. Then scan the whole image and find the top point of each connected marking region through the last vertical projection histogram. Because scanning is from top to bottom, the first found non-zero point in each vertical projection histogram of connected marking region is the vertex, whose vertical coordinate is the vertical coordinate of calvarias. Choosing 2.5 times head width position as model and scanning this region from neck position to 2.5 times head width position that is regarded as shoulder model because usually regard the position from calvarias to 2.5–3 times head width as the position of head and shoulder when choosing the head and shoulder feature according to Reference [4]. This method is good for detection but there is some problem n some situation like change in weather condition, illumination, more crowded places etc.

E. Fast Human Detection using Motion Detection and Histogram of Oriented Gradients By:

Hou Beiping, Zhu Wen, JOURNAL OF COMPUTERS, VOL. 6, NO. 8, AUGUST 2011

Human detection has some of its own characteristics. Humans usually have many different appearances in pose and style, and the background of the images or videos is often cluttered and has on general describable structure. The work of detecting human from images or video can be divided into three stages; the first stage is Region of Interest i.e. ROI selection; the second stage is the selection of effective features; the third stage is objects classification.

In this proposed algorithm, the main purpose of motion detection is to decrease image regions which will be scanned by sliding windows; the detection of moving, objects is valuable under the surveillance condition. In this algorithm, Histogram Oriented Gradients i.e. HOG is used to reflect the human body features. After motion detection, sliding windows can be used

to shift on detected regions. Each window means an individual image region, and corresponding HOG feature vector will be calculated, which reflect the edge and gradient information of image region according to Reference [5]. After that Support Vector Machine i.e. SVM is used for the classification purpose. SVM computes a high-dimensional hyper-plane to separate the different object categories. To compute the plane, the chosen image feature space or a kernel of this feature space is used.

This algorithm is successfully applied on the still image and also in real time video. For still images the algorithm was tested on the different images and the accuracy for detection of image is near about 96%. Same data is compared with neural network and accuracy is near about 86%. This algorithm is also applied on the video sequences and the average accuracy for different videos is near about 90%. But this algorithm has one limitation; that this algorithm can give this recognition accuracy only under the laboratory setting otherwise accuracy can be decreased.

REFERENCES

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