Face detection and recognition of human face using contour generation and matchin...

Law, Security

Abstract:

Face detection, tracking of human face and recognition is a great challenge in security, surveillance and law enforcement systems with greater accuracy. There are many reasons behind in this problem. Such as position of the human face, pose variation, poor environmental conditions, poor lightning and image tilt etc. So we have to find some feasible solutions to solve these issues by implementing a new system. Our proposed project might be improving the issues on Face detection, tracking of human face and recognition problems.

Introduction:

Face detection, tracking of human face and recognition is a great challenge in security, surveillance and law enforcement systems with greater accuracy. There are many reasons behind in this problem. Such as position of the human face, pose variation, poor environmental conditions, poor lightning and image tilt etc. So we have to find some feasible solutions to solve these issues by implementing a new system. First we will grab frames from the webcam, and draw them rapidly onto a panel. At the same time, a detector analyzes the frames to find a face and highlight it in the panel. The application, called Face Tracker is shown in action in the pictures at the top of the page. The tracker draws a yellow rectangle around the face, and red crosshairs entered inside the rectangle.

The detection code is fast when there’s a face present in the image (around 40ms), but may take substantially longer to decide there’s no face (as much as 200ms). Two important aspects of the coding are finding ways to speed

up the detection, and making sure that lengthy detection processing don’t slow down the rest of the program (in particular, the rapid rendering of successive images onto the panel). Detection is carried out by a contours matching algorithm, pre-trained to find facial features (when viewed front-on). The classifier’s training requires a great deal of time.

The next processing will extend to recognize the tracked face. The distinction between face detection and recognition is that recognition returns a name for the face. The control software for the launcher could then decide whether the person is a friend or for before firing a missile. Reorganization is implemented by Connected Component Operators. Contour matching algorithm used for identification of faces. The feasibility of using contour matching for human face identification is presented through experimental investigation. The advantage of using contour matching is that the structure of the face is strongly represented in its description along with its algorithmic and computational simplicity that makes it suitable for hardware implementation. The input contour is matched with registered contour using simple matching algorithms. The matching results obtained show that with a small degree of panning and tilting, the results are quite good.

Literature survey

SHU Chang & et al., 2011, in this paper the histogram of oriented gradient has been successfully applied in many research fields with excellent performance especially in pedestrian detection. However, the method has rarely been applied to face recognition. 2. Tong Chen & et al., 2014, in this paper, we propose a non-contact detection method that uses a physiological

signal. This method enables measurement of a physiological feature at standoff distances, which offers more comfort for test subjects and more covertness for testers.

TAN Chunlin & et al., 2010 . In this paper, the scale invariant feature transform (SIFT) feature descriptor is invariant to image scale and location, and is robust to affine transformations and changes in illumination, so it is a powerful descriptor used in many applications, such as object recognition, video tracking, and gesture recognition

YI-CHEN et al., 2015. In this work to recognize people in unconstrained video, one has to explore the identity information in multiple frames and the accompanying dynamic signature. These identity cues include face, body, and motion. Our approach is based on video-dictionaries for face and body. Video-dictionaries are a generalization of sparse representation and dictionaries for still images.

Siyang Yan & et al., 2016. This paper proposes an automatic and robust method to detect human faces from background that is capable of processing frames of video sequence rapidly while achieving high detection rates regardless of scale, rotation and shelter.

MA Yong & et al., 2003. In this paper describe locating multi-view faces in images with a complex background remains a challenging problem. In this paper, an integrated method for real-time multi-view face detection and pose estimation is presented. A simple-to-complex and coarse-to-fine view-based detector architecture has been designed to detect multi view faces

and estimate their poses efficiently. Both the pose estimators and the view-based face/non-face detectors are trained by a cost-sensitive AdaBoost algorithm to improve the generalization ability.

Methodology

This block diagram can be explain by three steps they are

1. Image Processing and Normalization.
2. Contour Generation.
3. Matching Algorithm.

The images are divided into two mutually exclusive sets: the training set and the test set. The training set is used to initialize and prepare the system to recognize arbitrary images and to fine tune the algorithm parameters. The test set is the set of images which is used to evaluate the performance of the system after training is completed. The images are preprocessed to improve the recognition performance. After the pre-processing stage, all the new images should have same dimension, so after cropping the face from the entire image, these new images are resized to 150 x 112 pixels. Another issue specific to faces, is that of facial expression, complexion and whether the subject is wearing glasses or has a moustache and/or a beard. The system should be able to identify faces whether they are smiling, sad, wearing glasses, not wearing glasses. Hence it is important to use a training face database that includes different images of same subject. The images have to be preprocessed to make them suitable for recognition purposes. This generally consists of the following tasks:

Histogram Equalization: Histogram equalization is performed which enhances the contrast of images by transforming the values in an intensity image so that the histogram of the output image approximately matches a specified histogram.

Noise Elimination: This step is used to estimate and remove any noise if present in the image.

Normalization: This is used to compensate for any illumination variations or relative sizes between two sets of faces. This is done using pixel value normalization. In this stage the mean pixel value of all the pixels in the image is calculated. Also the standard deviation of pixel values is calculated. Using these values normalize the pixel values of the image by using the following formula Pixel value normalized image = (Blurred image pixel -Pixel mean) / Standard deviation

Contour Generation

This is the core of the system in which the contour of a face is generated from the image. The whole face is treated as a contour map, with the areas of constant gray level brightness (i. e. the plains) enclosed by the contour lines. Thus contour lines for a given face can be generated.

1. Learning face appearance models and models for real-time visual motion estimation and clustering
2. Learning Gaussian mixture based color models for both tracking skin tone objects

and multi-color based foreground and background segmentation and tracking.

3. Learning an adaptive temporal color model to cope with extreme lighting changes.

   The main difficulty in modeling color robustly is the color constancy problem which arises due to variation in color values brought about by lighting changes. Data fusion in object detection and tracking using both motion and color cues was used to bring about the required consistency in face tracking . The system is able to perform face detection and tracking in the following manner.

4. Real-time detection and tracking of moving faces in cluttered scenes.
5. Robust tracking of multiple moving faces.
6. Robust tracking under changes in lighting, scale and image resolution,
7. Robust tracking under “ facial distortions” such as spectacle, facial hair and hair-style changes. Related to face detection and tracking, we also addressed the issue of real-time head pose estimation which is important in tracking moving faces across views. We introduced a composite Gabor wavelet transform as a representation scheme for capturing pose changes. We derived a pose Eigen-space based on the principal components analysis to represent and interpret the distribution of pose changes from continuous sequences of face rotation in depth.

An image-based tracking system can detect the correct position of the moving human face. Tracking accuracy, processing time and applicability to

surgical environment is the novelty of this method. Consequently, this research enables the performance of the tracking system to be simplified with no separate tracking system. The new algorithm was also found to be able to successfully detect the fall event prior to the impact with an average response time to be within 255ms. Response time has great implications in designing a wearable injury protection system. Being able to detect falls faster (i. e., shorter response time) or in other words, being able to provide more time (i. e., more lead-time) for a wearable protection system to function before the fall impact occurs is very critical to prevent/reduce impact-related injuries. Due to the safety concerns, no actual fall impact was allowed in this study. The new algorithm, in essence, is a threshold technique. Other classification techniques can supplement in developing a fall detection algorithm. These techniques may include neural networks, wavelet technique etc. However the real-time and prior-to-impact nature of fall detection task imposing several real time constraints (on choosing a classification technique) have been included in the algorithm design. The fall detection algorithm (State Machine Based) is investigates the features in a sequential manner. Once the corresponding feature is verified by the current state, it can proceed to next state; otherwise, the system resets to the initial state and waiting for the appearance of another feature sequence. The efficiency of classification process is improved as; the early states are composed of simple and important features that allow a large number of negative samples to be quickly excluded from being regarded as a false alarm. The computational and power consumption burden of the system can be rectified. Moreover, a distinguished performance up to 92% on the

sensitivity and 99. 75% on the specificity is obtained with a set of 450 test activities when the proposed cascaded classifier with SVM.

Conclusion

Use of our proposed work we can detect, track the human with higher efficiency is 10% better than the existing methods of image detection and tracking techniques. In terms of face recognition also it will provide better response over the available methods. Also this technique reduces the delay of response considerably. Because of these advantages it will be useful in Security systems, Classification of images, Image enhancement, Automatic image rotation, Portrait / passport photography, Law Enforcement Surveillance etc. This work is not a location specific and it can be used by everywhere.