A Novel Approach to Extract Region from Facial Expression Based on Mutation

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Abstract- The Mutation plays a very important role in the process of object (image) detection and its extraction. It has been considered in the form of matrices so that it can identify a space which is like that of a Euclidean-space. The covariance features' performance is superior and quicker than most of the procedure usually followed. This paper presents a new method for human face recognition by utilizing Mutation. Here Mutation based on region covariance matrices is used to simulate the effects of errors that happen with low probability during duplication. Both pixels locations and Mutation coefficients are employed to form the covariance matrices. Experimental outcomes reveal the advantages of this proposed method.

Keywords— Mutation Matrix, Face Detection, covariance.

I. INTRODUCTION

The selection of features is one of the most important steps for finding and classification of problems. Good quality features should be distinguishable, robust, and is very easy to compute. The proficient algorithms are needed for a diversity of tasks such as detection and tracking of any system. The raw pixel values portray color, gradient, image features, etc. But these features are lacking of robustness compared to enlightenment changes and dynamic motion. These are limited to high dimensional depiction. Lower dimensional projections are used to classify and keep track of it. Natural extensions of raw pixel values can be represented by histograms. Histograms were widely used for non-rigid object tracking. But it can be used in fast construction methods, too. In the recent era except tracking, histograms were also used for texture representation, matching and other problems in the field of computer science and computing. However, the joint representation of several different features through histograms is exponential with various features.

The integral image idea is first introduced for rapid computation of Haar-like features. Combined with cascaded Ada Boost classifier, superior performances were reported for face detection problem, but the algorithm requires extensive training time to learn the object classifiers. In scale space detected for key point localization and arrays of orientation histograms were used as key point descriptors. The descriptors are very effective in matching local neighborhoods but do not have global context information.

Here we proposed the covariance of several image statistics computed inside a region of interest as the region descriptor. To do this, we have taken help of images and watermarked them. From the RGB representation of an image we have used the blue matrix and broken the matrix in the form 8x8 matrices into 320 matrices. Instead of the joint distribution of the image statistics, after that use the covariance as our feature, so the dimensionality is much smaller. For the sack of fast way calculation of covariances, we have considered the integral images. Here we have introduced a new algorithm for object detection and texture classification using the covariance features. The covariance matrices are not elements of the Euclidean space; therefore we couldn't use most of the classical machine learning algorithms. We propose a nearest neighbor search algorithm. Here we describe the covariance features and explain the fast computation of the region covariance using integral image idea. Object detection problem is described in Section 3 and texture classification problem is described in Section 4. We demonstrate the superior performance of the algorithms based on the covariance features with detailed comparisons to previous methods and features.

II. PROPOSED METHODOLOGY

The final step is to apply random mutation: for each bit that we are to copy to the new population we should allow a small probability of error (for instance 0.1)

Before applying mutation:

m_1`` = 1110110101
m_2`` = 1111010101
m_3`` = 1110111101
m_4`` = 0111000101
m_5`` = 0100011101
m_6`` = 1110110011

After applying mutation:

m_1``` = 1110100101	$f(m_1$```$)$ = 6
m_2``` = 1111110100	$f(m_2$```$)$ = 7
m_3``` = 1110101111	$f(m_3$```$)$ = 8
m_4``` = 0111000101	$f(m_4$```$)$ = 5
m_5``` = 0100011101	$f(m_5$```$)$ = 5
m_6``` = 1110110001	$f(m_6$```$)$ = 6

This paper describes a novel approach for face detection and recognition based on image sequence. Motion information is used to find the moving regions, and probable eye region blobs are extracted by thresholding the image. These blobs reduce the search space for face verification, which is done by template matching. Eigen analysis of edginess representation of face is used for face recognition. One dimensional processing is used to extract the edginess image of face. Experimental results for face detection shows good performance even across orientation and pose variation to a certain extent. The face recognition is carried out by cumulatively summing up the Euclidean distance between the test face images and the imaged stored into the database that shows good discrimination for true and false subjects.

A. Achieving real-time object detection and tracking under extreme Conditions

In this survey, we present a brief analysis of single camera object detection and tracking methods. We have also given a comparison of their computational complexities. These methods are designed to accurately perform under difficult conditions such as erratic motion, drastic illumination change, and noise contamination.

$$\rho(X,Y)=\min_r[\sum_{c=1}^{k}\rho(m_r{}^2,m_c{}^T)-\rho(m_c{}^2,m_r{}^T)]$$

Here $m_c{}^T$ main mutation value of each faces and m_r is the mutation matrices.

B. Mutation Region Covariance Matrices for Face Recognition

This paper presents a new method for human face recognition by utilizing Mutation region covariance matrices as face descriptors. Both pixel locations and Mutation coefficients are employed to form the covariance matrices. Experimental results demonstrate the advantages of this proposed method.

$$F_s=\frac{1}{k-1}\sum_{r=1}^{m}(m_r-M_c)(m_r-M_c)^T$$

Where $M_c = 1/r \sum_{r=1}^{m} m_r$

C. A Master-Slave Approach for Object Detection and Matching With Fixed and Mobile Cameras

Typical object detection algorithms on mobile cameras suffer from the lack of a-prior knowledge on the object to be detected. The variability in the shape, pose, color distribution, and behavior affect the robustness of the detection process. In general, such variability is addressed by using a large training data.

$$H_{r,c}=\partial h(r,c)/\partial r$$
$$H_{r,c}=\partial^2 h(r,c)/\partial r^2$$

However, only objects present in the training data can be detected. This paper introduces a vision-based system to address such problem. A master-slave approach is presented where a mobile camera (the slave) can match any object detected by a fixed camera (the master). Features extracted by the master camera are used to detect the object of interest in the slave camera without using any of the training data.

A single observation is enough regardless of the changes in illumination, viewpoint, color distribution and image quality. A course to fine description of the object is presented that is built upon image statistics and robust to partial occlusions. Qualitative and quantitative results are presented in an indoor and an outdoor urban scene.

D. Object Detection and Matching in a Mixed Network of Fixed and Mobile Cameras

This work tackles the challenge of detecting and matching objects in scenes observed simultaneously by mobile cameras. No calibration between the cameras is needed, and no training data is used. A fully automated system is presented to detect if an object, observed by a camera, is seen by a mobile camera and where it is localized in its image plane. Only the observations from the cameras are used here

$$\rho(h_r, h_c) = \sqrt{\sum_{r=1}^{m} \ln^2 \lambda_r(h_r, h_c)}$$

An object descriptor based on grids of region descriptors is used in a cascade manner. Fixed and mobile cameras are collaborated to confirm detection. Detected regions in the mobile cameras are validated by analyzing the dual problem: analyzing their corresponding most similar regions in the camera to check if they coincide with the object of interest. Experiments show that objects are successfully detected even if the cameras have significant change on image quality, illumination, and viewpoint. Qualitative and quantitative results are presented in indoor and outdoor urban scenes.

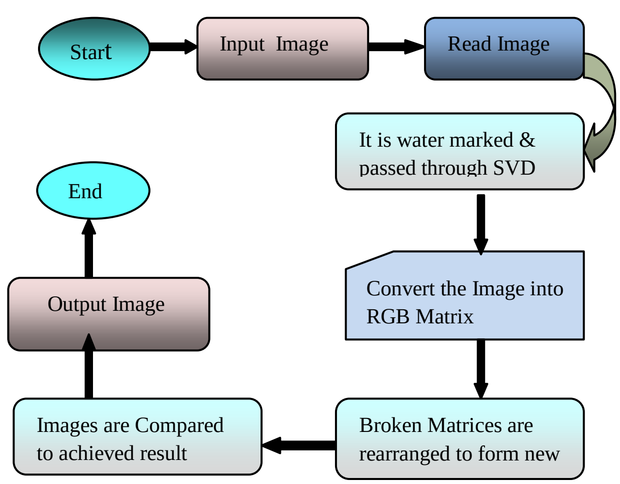
E. Human Face Detection and Segmentation using Eigen values of Mutation Matrix

In this paper we have proposed a novel method for human face segmentation using the elliptical structure of the human head. It makes use of the information present in the edge map of the image. In this approach we have used the fact that the Eigen values of covariance matrices represent the elliptical structure. The large and small Eigen values of covariance matrix are associated with major and minor axial lengths of an ellipse. The other elliptical parameters are used to identify the centre and orientation of the face. Since an Elliptical Mutation *Matrix* requires 5D Hough Space, the Mutation *Matrix* is used to evaluate the elliptical parameters. Sparse matrix technique is used to perform Mutation *Matrix*, as it squeezes zero elements, and have only a small number of non-zero elements, thereby, having an advantage of less storage space and computational time. Neighborhood suppression scheme is used to identify the valid Hough peaks. The accurate position of the circumference pixels for occluded and distorted ellipses is identified using Bresenham's Raster Scan Algorithm which uses the geometrical symmetry properties. This method does not require the evaluation of tangents for curvature contours; those are very sensitive to noise. This method has been evaluated on several images with different face orientations.

F. Face Detection

This paper describes a methodology for face detection and recognition from a sequence of images. Motion information is used to find the moving regions and probable eye region blobs are extracted by thresholding the image. These blobs reduce the search space for face verification, which is performed by matching of template. Eigen analysis of edginess representation of faces is used for face recognition. One dimensional processing is used to extract the edginess image of faces. Experimental results for face detection give better performance even across the orientations and variations of poses to a greater extent. The face recognition is carried out by cumulatively summing up the Euclidean distance between the test face images and the stored database, which shows good discrimination for true and false subjects.

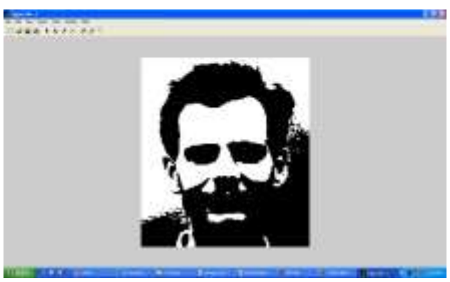
III. OVERVIEW OF THE SYSTEM



EXPERIMENTAL RESULTS

The experiment is conducted with the help of subject. For each subject one face is captured to form the training set. Similarly for testing the data set, one face per subject is collected. Each face image has been divided horizontally and vertically. To reduce the dimension of the vector, we can use the eigenvectors of the images. The test face pattern is simply classified here without taking any distance between the stored pattern and the test pattern.

Horizontal Division



IV. CONCLUSION

In this paper we have tried to incorporate the covariance features and related algorithms for object detection and texture categorization along with the Mutation. Better performance of the covariance features and algorithms are demonstrated on several examples with detailed comparisons to previous techniques and features by different experts. The method can be extended in several ways. For example, following automatically detection of an object in a video, it can be tracked in the following frames using this approach. As the object leaves the scene, the distance score will increase significantly which ends the tracking.

With the comparison of all types of mathematical functions along with the Mutation we have been able to draw the conclusion that its timing complexity is the least. In the present era with the view of classifications of the algorithms followed by Boost Euclidean, Eigen values, Raster Scan Algorithm and the Lie group structure of covariance matrices, etc. the cumulative sum of Euclidean distance for the test face patterns gives better discrimination than from a single test face pattern.

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