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Identity Recognition Using Edge Suppression Method

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Abstract: There are multiple crimes happening even in the presence of cctv cameras still we couldn't able to find the identity due to shadows in the image. In this work, we have used edge suppression method and affine transformation to recognize identity even under severe shadow. We also used gradient field to calculate the position of light sources in the place. For classification of identity from the databases we use k-nearest neighbor rule. Additionally we also were using this principal component analysis for feature extraction. Classification can be done in real time environments by accessing authorized databases or also by standard databases.
Keywords: K-NN Classifier, Tensors, flash image, shadow removing, Feature extraction

1. INTRODUCTION

Face recognition is one of the applications for automatically identifying and recognizing the face of an human by an computer. This kind of image processing applications are used in many ways, in this work face recognition system is used not only recognizing face also taken upto his chest which increases multiple reference points such as neck, shoulder and more. The another important issue is shadow presence in the image due to this there is a chance of error occurrence in finding the correct person. So, to reduce the impact of shadow on the image diagonally projecting sensors[2] are used this suppresses the edges of the image. Here we also were accounting the chromaticity[8] of the environment lighting. Ramesh Raskar[1] had mentioned that the chromaticity of the environment lightning will be approximately as same as the chromaticity of the diffused light. And it is found that for different magnitude in the chromaticity of differently exposed regions has different rgb, hue and hsv color values[5].We proposing that along with face recognition recognizing of other identities also important because the identity database like aadhar card are capturing images up to chest level not only up to face. So it will be useful when using it with real databases. As compared with thresholding we clear the textures in the scene by approaching principled way. Here we are not accounting any assumptions on the environment lightning, mapping of exposure or reflection. The diagonally projecting tensors helps us to remove those shadows by using an highly exposed image as an reference called as flash image.

2. EXISTING METHODOLOGY:

All images are a combination of primary colors like red, blue, green. All the image processing process uses RGB images which has more number of color components and it makes the processing slower. In recovering the illumination map, we make the usual assumption that the scene texture edges do not coincide with the illumination edges. But the foreground layer, edges of the foreground object which exactly align with the background edges cannot be recovered. And the existing systems has face recognition only, which may fail in case of twins and people having similar faces and also in usage of mask.

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3. PROPOSED METHODOLOGY:

To predict the presence of light source the two pictures are converted into YUV format which reduces the color components for processing it into a gradient pictures with x and y-axis components. That helps in finding the position of light sources which in turn helps in removing shadows. Then those diagonally projecting tensors are applied on the pictures to analyze the vector and scalar values of two pictures(real image and flash image) then affine transformation uses those values to correct the pictures like rotating and aligning. Thus a shadow free image is obtained as a result. This resulted picture is used to search in databases. Here we are proposing a id recognition instead of regular face recognition which uses the principal component analysis to feature extract the face, neck, shoulders from the images. By using the calculated eigen vectors and values KNN classifier produce the result by comparison.

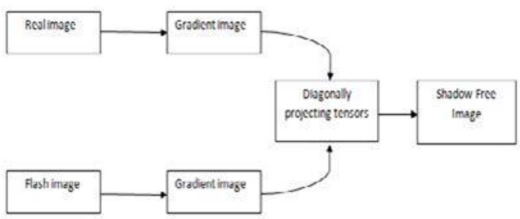

Fig.1 Block diagram

4. GRADIENT COMPUTATIONS:

This computations are existing mathematical functions only. This is used to obtain the gradient value in the image environment. The gradient magnitude and direction are encoded by computing. By [9]adding partial derivatives of X and Y directions gradient vector is formed.

$$\Delta I = (\partial I/\partial x, \partial I/\partial y) \quad \ldots(1)$$

we could write this continuous function, I(x, y) as:

(∂I(x,y)/∂x) = limΔx→0 (I(x+Δx,y)-I(x,y))/Δx …(2)

While if it is an discrete case, only one pixel intervals can be taken. Hence we can take the difference between pixel before or one pixel after the I(x,y).By the usage of correlation we can define the pixels after and before I(x,y) symmetrically, and compute:

(∂I(x,y) /∂x) = (I(x+1,y) - I(x-1,y)) /2 ...(3)

5. ARCHITECTURE DIAGRAM:

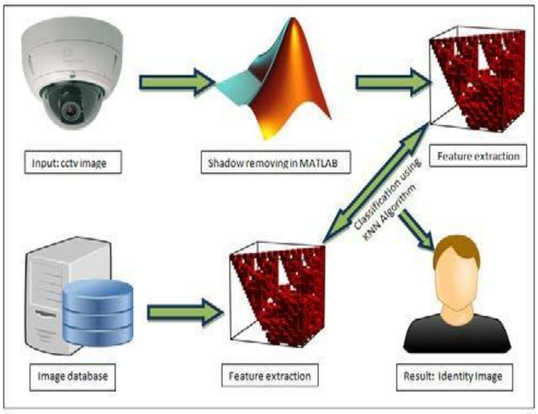

Fig.2 Architecture Diagram

6. AFFINE TRANSFORMATION ON GRADIENT:

Let intensity image and denote each pixels gradient vector at I. The Gσ smoothed structure tensor is defined as

$$\mathbf{G}_\sigma = (\nabla I \nabla I^T) * K_\sigma = \begin{bmatrix} g_x^2 & g_x g_y \\ g_x g_y & g_y^2 \end{bmatrix} * K_\sigma$$

where ∗ denotes convolution and Kσ is a normalized 2D Gaussian kernel of variance σ. The matrix Gσ can be de-composed as

$$\mathbf{G}_\sigma = V \Sigma V^T = \begin{bmatrix} \mathbf{v}_1 & \mathbf{v}_2 \end{bmatrix} \begin{bmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{bmatrix} \begin{bmatrix} \mathbf{v}_1^T \\ \mathbf{v}_2^T \end{bmatrix},$$

here the eigen-vectors v1,v2 are corresponding to the Eigen-values λ1, λ2 respectively and λ2 ≤ λ1. The eigen-values and eigen-vectors of Gσ give information about the local intensity structures in the image[8]. For homogeneous regions, λ1 = λ2= 0. If λ2= 0 and λ1 > 0, it signifies the presence of an intensity edge. The eigen-vector v1 (corresponding to the higher eigen-value λ1) corresponds to the direction of the edge.

7. TENSORS:

$$D^{self} = \begin{bmatrix} \mathbf{v}_1 & \mathbf{v}_2 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} \mathbf{v}_1^T \\ \mathbf{v}_2^T \end{bmatrix}$$

$$D^{self}\mathbf{v}_1 = \begin{bmatrix} \mathbf{v}_1 & \mathbf{v}_2 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} \mathbf{v}_1^T \\ \mathbf{v}_2^T \end{bmatrix} \mathbf{v}_1 = \begin{bmatrix} \mathbf{v}_1 & \mathbf{v}_2 \end{bmatrix} \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

Here we have used tensors to find out the difference between the scalars and vectors of real image and flash image. These tensors are idely used mathematical component to derivethe scalar and vectors, actually it'san generalization of scalars and vectors; a zero rank tensor is a scalar,and a first ranktensor is a vector and a tensor also include linear map, dotproduct and cross product.

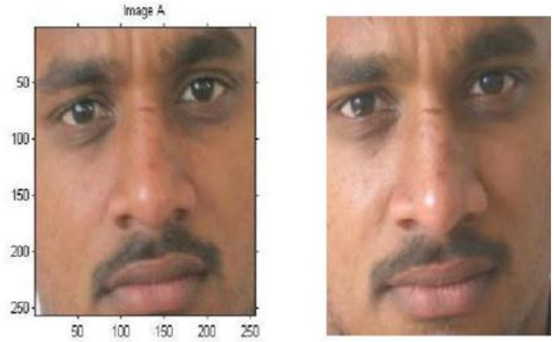

Fig.3 (i) Obtained image (ii) Shadow free image

8. SELF PROJECTION TENSORS:

We removed edges from a single image by using this already proven diagonally projecting tensors from the image itself. The idea is to project the image gradient vector onto its own orthogonal direction and hence the name self-projection tensors. This analysis will lead us to our main idea of cross projection tensors is to estimate these tensors from a second image and apply them to suppress edges in the given image. As Amit Agarwal [7] proposed the technique of gradient projection to remove artifacts from flash image using a non-flash real image. They project the flash image gradient onto the direction of the ambient image gradient to remove spurious edges from flash image due to glass reflections. They use the idea that the direction of the image gradient remains stable under illumination changes. We first show that taking a projection can also be defined by an affine transformation of the gradient field. The Eigen-vector v1 of the structure tensor matrix G correspond to the Direction of the edge. Suppose by an affine transformation of the gradient field. The Eigen Vector v1 of the structure tensor matrix G correspond to the direction of the edge. Suppose we define the self-projection tensor D^{self} as $u_1=v_1$ $u_2=v_2$,$\mu_1=0$ $\mu_2=1$. It is easy to see that an affine transformation of the image gradient using D^{self} will remove the local edge

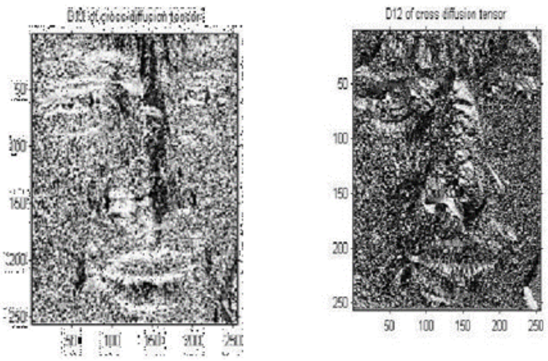

Fig.4 YUV Image from RGB image

9.DIAGONALLY PROJECTING TENSOR:

To remove the scene texture edges from an image by transforming its gradient field using diagonally projecting tensors obtained from a second image of the same scene. The final image is obtained by a 2D integration. If A is also homogeneous ($\lambda A1 = 0$), set $\mu 1 = \mu 2 = 0$. These results in If A is also homogeneous ($\lambda A1$ $= 0$), set $\mu 1 = \mu 2 = 0$. These results in

$$D(x,y) = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

If A is not homogeneous ($\lambda A1 > 0$), set $\mu 1 = \mu 2 = 1$

$$D(x,y) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

This result in and edges which are in A but not in B can be retained. Else, if there is an edge in B ($\lambda B1 > 0$), remove that edge by setting $\mu 1 = 0$, $\mu 2 = 1$.

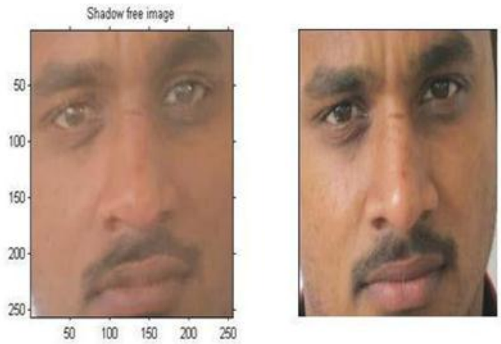

Fig.5(i) shadow free image (ii)illuminated image

10.FEATURE EXTRACTION:

Feature extraction is one of the image processing processes which can be used to extract the information from the image. This information must be valuable to the later step of identifying the subject with an acceptable error rate. This process is proved to be efficient in computing time and usage of memory. Again here we extracting more details rather than the usual information extraction of faces. The optimized output is obtained for the classification.

11. PRINCIPLE COMPONENT ANALYSIS:

Again we are using the proven principle component analysis which is widely used in all the sectors to analysis the form from computer image processing to neural analysis due to its extraction of confusing datasets using non-parametric method which is an simpler one. And it is well known as most reliable results from applied linear algebra. The Reason for using PCA in this identity recognition is to express the 2-D facial image into the large 1-D vector of pixels in the compact principal components of the feature space. Sometimes it also helps us in revealing hidden, simplified structure by reducing the complex dataset into the lower dimensions.

12. CLASSIFICATION:

Classification is one of the data mining process of analyzing and finding the similar things to group under some keyword. Here we done the classification of the test images with the images in the present database. For this, we go for the reliable KNN classifier**.**

13. K-NN CLASSIFIER:

While looking for the algorithm to search the match in database K-NN classifier seems to be the proven algorithm especially in searching images, recognizing patterns and data mining. K-NN algorithm uses the similarity measures to classifies the matches in a database. A case is arranged by a lion's share vote of its neighbors, with the case being allocated to the class most normal amongst its K closest neighbors measured by a separation capacity. On the off chance that $K = 1$, then the case is essentially allotted to the class of its closest

14. RESULTS:

We cleared shadows from the Real-environment (no-flash) image A by using the image with flash. From the real image, flash image was created using the separate photo editor tool like lumia creative∇ studio. Using F and trans-form the gradient field A the cross projection tensor Df. the shadow removed image has less color artifacts and less illuminated map when compared with the previous highly textured one. Always there will be some difference in color tones due to the environment lightning. Our edge suppression method requires no color calibration or artifacts and when compared to the result using gradient projection. while converting the image into flash image there will be some variations in lighting and this doesn’t provide any illumination mapping. The illumination map obtained by our approach better represents the diffuse ambient illumination. Even the white balance in real and flash images is different but Our resulted image has no color artifacts. We can proceed to classification process after getting the shadow free image. Image will be given as a query input and the matches are searched in the database. The output is shown in figure 6.

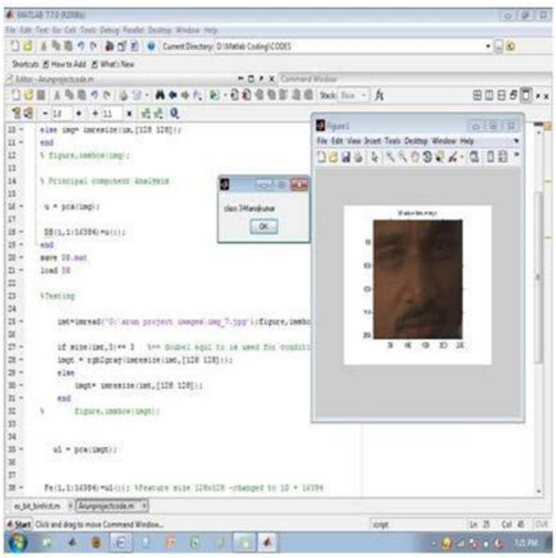

Fig.6 Output

15. CONCLUSION:

To remove shadow in a image, a tensor-based identity recognition method is proposed the illuminations is effectively reduced by edge suppression method. We presented an approach for edge-suppressing operations on an image. The light sources are found by applying the gradient field effect. In the recognition phase, Principal component analysis is used for feature extraction. The K-nearest-neighbor rule is applied for classification. Experiments are carried out upon standard databases and if access available can be done in real-time too. The results reveal that the proposed method achieves satisfactory recognition rates under varying illumination conditions. We hope that it can be able to use in verification and identity authentication processes etc because of its easy handling.

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