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ENHANCING SECURITY USING POSE INVARIANT TECHNIQUE WITH OCCLUSION DETECTION

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ABSTRACT:

Face Recognition is one of the most commonly used security mechanism in many organization. Comparing to other numerous techniques a lot of attention is required for face recognition. Sparse Representation Classifier (SRC) is dealing with occlusion and Kernel Discriminant Analysis (KDA) is dealing with intra-class variation. These are the methods for successful face recognition, which used Kernel Extended Dictionary (KED), to fuse different features in the kernel space. It handles occlusion in a single gallery sample without overfitting. Merging the KED with multi-pose invariant technique is simple to implement and acquire higher results. In this paper, we tend to propose a unique framework to perform face recognition by systematically joining the KED with pose invariant technique which uses multi-task learning to provide better security.

Keywords— Face recognition, pose invariant, kernel extended dictionary (KED), Multi-task learning

I. INTRODUCTION

An image processing is filed for processing images using mathematical equations, algorithms for which an input is an image or a set of images ;the output may be either an image or a collection of characteristics or parameters associated with them. Face recognition has much attention in image processing. Face recognition is still very challenging due to dramatic intra class variations such as expressions , viewing angle , lighting conditions and occlusions.Face identification becomes is significant for security access in verification system. Multitask pose invariant model is successful method for face recognition. It is combined with Kernel Extended Dictionary(KED) which has a combination of occlusion detection and intraclass variations for giving a better performance.

II. RELATED WORKS

Face recognition has been investigated over more than three decades. During this period many problems related to face recognition have been addressed.

This paper proposes a face identification framework capable of handling the full range of pose variations within + or – 90^0 yaw . It first transforms the original pose invariant face recognition problem into a partial frontal face recognition problem . Patch Based Partial Representation(PBPR) face representation scheme is used that makes use of unoccluded face textures only .It can be applied to face images in arbitrary pose . MtFTL is used for learning compact feature transformations by utilizing correlation between poses.

This paper proposed a general classification algorithm for face recognition called Sparse Representation Classifier(SRC) where an input image is coded as linear combination of training images via l1 minimisation . It leads to higher classification accuracy . Another method is Kernel Discriminant Analysis(KDA) projects data onto non linear discriminant subspace to suppress intraclass variations and maximize the gap between the images from different persons . The key of Kernel Extended Dictionary is how to construct and compute the extended dictionary , so that it can represent possible occlusion variation efficiently in kernel space.

III. EXISTING SYSTEM

Sparse representation classifier (SRC) and Kernel Discriminant Analysis(KDA) were considered as two successful methods for face recognition. While Sparse Representation Classifier (SRC) was good in occlusion , Kernal Discriminant Analysis(KDA) was good in suppressing intraclass variations . Both the functionalities were combined in a single methodology named Kernel Extended

Dictionary(KED) which was most efficient . Experiments were done on several large-scale data sets, demonstrating that KED was not only acheiving good results for unoccluded samples,but it also handled occlusion well without overfitting even when there was a single gallery sample per subject.Face images captured in unconstrained environment contained single pose variation which was dramatically degrading the performance of algorithms that were designed to recognize frontal faces . In order to overcome that drawback a face identification framework which used Multi task Feature Transformation Learning (MtFTL) with PBPR was introduced(figure. 1)

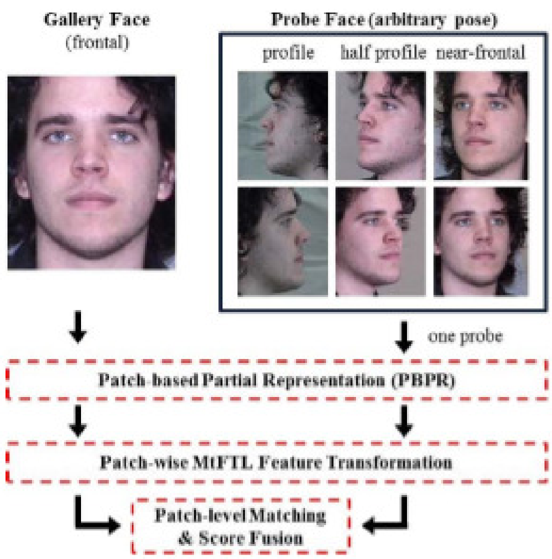

Figure. 1.Face recognition with PBPR and MtFTL

This technique was capable of handling the full range of pose variations within 90 degree . That framework first converted the pose-invariant face recognition into partial frontal face recognition problem . A patch based face representation scheme was then developed. For each patch, transformation dictionary was learnt under the proposed multitask learning scheme. Finally face matching was performed at patch level rather than at holistic level.

IV. PROPOSED SYSTEM

We propose a framework which will combine the functionalities of Kernel Extended Dictionary(KED) which was the combination of Sparse Representation Classifier(SRC) and Kernel Discriminant Analysis(KDA) and Multi-Task Pose Invariant Face Recognition(MtFTL) which involves face matching at patch level. The main functionality acheived through our approach is Face Recognition both for environments that include occlusion and which are unconstrained. The procedure includes implementation of Kernel Extended Dictionary(KED) which is acheived by implementing the Sparse Representation Classifier(SRC) and Kernel Discriminant Analysis(KDA) for achieving Face Recognition inspite of occlusion and pose invariant face recognition . Our Approach not only combines the above methodologies but also enables us to acheive Face Recognition accurately and efficiently inspite of occlusion and pose invariance.In the KED methodology we first learnt about many kernel principal elements then model is projected by KDA to KED which is computed by same kernel trick . Finally we use structured SRC for classification . In Multi-Task Face Recognition we would transform original pose-invariant into partial frontal face recognition where patch based face representation scheme was then developed . Extensive experiments and demos which have been done on this previously shows that the proposed framework is capable of acheiving Face Recognition in case of occlusion and pose invariance .

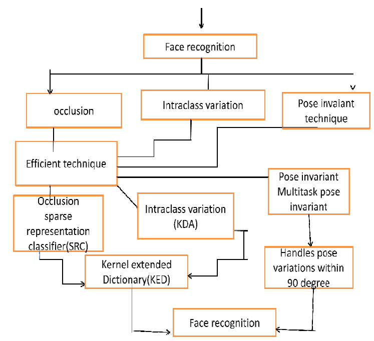

Figure . 2.Architecture diagram

In figure .1,we explain the flow of our process . The face recognition problem is split into three sub problems of dealing with occlusion , intraclass variations and pose variance . These three subproblems are dealt separately using SRC , KDA and MtFTL techniques respectively . The results of these sub problems are combined to get the final solution .

V.FACE REPRESENTATION

Patch-based Partial Representation(PBPR)[1] technique is used , in which the length of the face is related to the pose of the face. For face pose normalization we adopt a 3D method[3] which involves the detection of the five most stable facial feature points , i.e . , the centers of both eyes , the tip of the nose and the two mouth corners first .Now this 3D generic shape model is aligned to a 2D face image and it is back projected again to 3D model . This 3D model is used to render the frontal face. Using Pose normalization we can correct the deformation of the facial texture caused by pose variations. Multi-Task Feature Transformation Learning (MtFTL)[1] is introduced for feature transformation where learning for each pose type is regarded as a task . This approach learns a common transformation dictionary for each task , instead of learning a separate matrix for each of the task[4] . The given problem is first transformed into a frontal face recognition problem. The features of different poses are transformed into a discriminative subspace by the transformation dictionary. In order to reflect the difference between the tasks , different projection vectors are selected in the transformation dictionary . This technique of feature transformation learning is effective in case of pose variations , but fails in case of occlusion . In order to overcome this drawback , Kernel Extended Dictionary(KED)[2] is introduced. KED extracts non-linear discriminant features by combining Sparse Representation Classifier(SRC) [2]and Kernel Discriminant Analysis(KDA) [2]. In SRC each image pixel is associated with a small patch surrounding it . These patches are used to train a dictionary for each class in a supervised fashion . Redundant dictionaries are trained and a linear combination of only a few of the dictionary elements are used to sparsely represent the image patches . KDA learns a non-linear discriminant subspace inorder to suppress the intraclass variations among different subjects and maximize the gap between them . This combination of SRC with KDA as KED helps to overcome occlusion in the image.

VI. EXPERIMENTAL EVALUATION

A list of experiments are conducted to present the effectiveness of PBPR- MtFTL . The subjects in the training data are divided randomly into two subsets of equal size for each identification experiment . Among the two subsets one is for model training and the other is for validation .

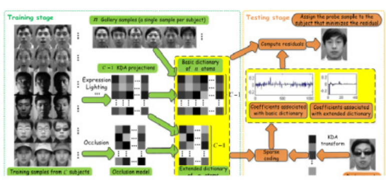

Figure. 3.Training set and Testing set

There may be multiple samples per subject in the training set . Now , the values of model parameters are calculated .On the validation subset , the optimal values of the model parameters are estimated . These values are applied on the test data.While considering face recognition with a single sample per subject there are so many issues .This problem is addressed by Deng et al , through the equidistant prototypes embedding for single sample based face recognition .In this technique the gallery samples are mapped to equally distant locations .Three kinds of subsets are considered ,namely a training set , a gallery set and a probe set to evaluate the performance. The face images are aligned and cropped before feature extraction and class variation.

VII. CONCLUSION

Enhancing face recognition problem to deal with different face poses and occlusion is a challenging task. We handle this problem by combining few techniques .

1. At first we make use of PBPR technique which makes use of unoccluded images only. Next we apply MtFTL model for generalization of estimated models. Then KED is applied which combines SRC and KDA .

2. KED not only achieves better performance over occlusion ,but also achieves higher accuracies for intraclass variations .

3. On comparison with other kernel based methods such as MOST , KED yields much better recognition accuracies in case of occlusion.

VIII.REFERENCES

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