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An Effective Technique for Matching Facial Composite to Mugshots using Face Sketch System

Vinayak P P[1], Nahala M A[2]

[1]Final year M. Tech Cyber Security, KMP College of Engineering, Odakkali, Aluva, Kerala, India

[2]Assistant Professor, Department of Computer Science and Engineering, KMP College of Engineering, Odakkali, Aluva, Kerala, India

Abstract: ***An Effective Technique For Matching FacialComposite To Mugshots using Face Sketch System is a tool that is used to match the sketches that is given as input to the system and by the series of procedures it matches with the mugshot database and shows the image which is having minimum mismatches .The sketches that we are provided will be of different form such as hand drawn , software developed sketch and so, by given it as input with to the two different algorithm such as Enhanced Holistic Algorithm and Enhanced Component Based Algorithm. This tool is an automatic tool, and there will be a mugshot database and by properly extracting the features from the face by the two algorithms a perfect comparison is made by the value obtained and the images that is most relevant to this is shown and here, introduces Genetic algorithm and also replacing the MLBP to RLBP and along with the image displayed some details such as the name, age can be displayed.***

Keywords: Enhanced Component-based face recognition, facial composite recognition, hand-drawn composite, Enhanced holistic face recognition, mugshot, software-generated composite, surveillance composite

1. Introduction

For the law enforcement purposes with the help of witness for identifying the suspect, normally we used to collect the facial composites, when there is no facial images of the suspects are available from the crime location. With the help of witness when the composites are created through media outlet with a hope that some will recognize the person and so. Facial composite are more valuable when only eye witness is there.Law enforcement agencies will have extensive mugshot databases and the successful matching of the mugshot and the composite will make them to identify the criminal. Here we include the effective technique for matching the facial composites to the mugshots.

Facial composites can generally being classified into three types. They are hand-Drawn Composites,software-Generated Composites,surveillance Composites. Hand drawn composites are drawn by the experts by the description provided by the witness. Software generated composites are developed by the help of software kit and here it includes different facial components. Majority of the law enforcement agencies uses software based composites. Surveillance based composites are developed by the forensic experts on the basis poor quality camera images. Surveillance composites are used in scenarios when COTS systems are expected to fail on query (probe) face images (due to poor lighting, off-pose faces, occlusion, etc.).

The face sketch system uses two Enhanced algorithm for matching the facial composite to mugshots .They are Enhanced holistic algorithm and Enhanced component based algorithm .The performance of this algorithm is evaluated on the basis of retrieval rate of matching the mugshot with respect to the existing system.The FaceSketch System also supports filtering the mugshot gallery via demographic information in the form of age range, race, and genderetc. The details of the matched person will also be displayed along with the image.

2. Related Work

The existing system includes two main algorithm for matching facial composites to their mugshot database such as holistic algorithm and component based algorithm. The main algorithm items used in this system are LDA and PCA, MLBP, SHIFT etc.

2.1 Holistic based algorithm

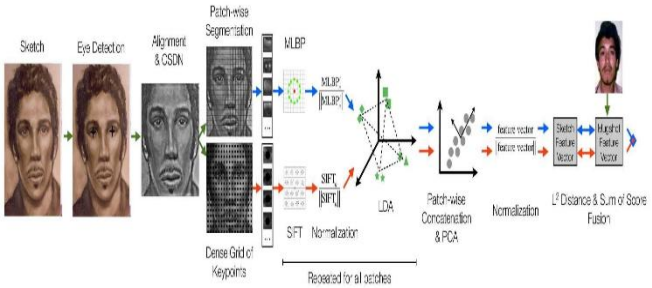

Figure 1: Holistic based algorithm

The holistic algorithm starts with the detection of the eyes of the sketch that we are giving as input. Then CSDN that is center surround division multiplication is applied for the differences in the change of modularity. CSDN technique boost the algorithm speed. Later by using MLBP, SHIFT features are extracted from the dense grid and the key points across theface. For both MLBP and SHIFT features their o subspace are learned using the LDA that is linear discriminant analysis. The overall value of the optimal subspace is concatenated to a single new vector and later PCA is used to decrease the template size and the resulting feature vector is normalized using the L^2norm.Scores from the SIFT and MLBP representations are fused via a sum-of-score fusion rule after the z normalization.

2.2 Component Based Algorithm

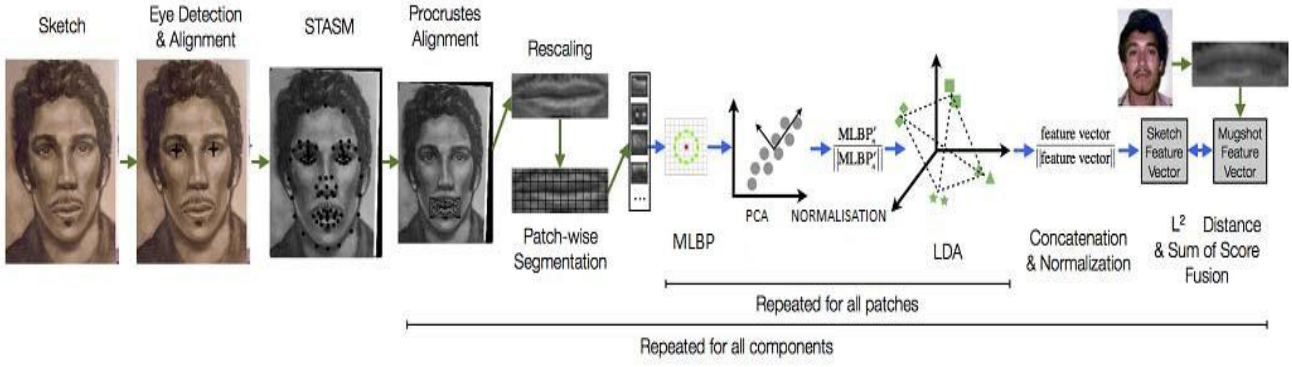

Figure2: Component based algorithm

In this system the facial components are localized by detecting the landmarks with and ASM named active shape model using the STASM collection.ASM is initialized using eye locations provided by a COTS eye detector.

After component alignment and texture mapping MLBP are used to extract the features and to reduce the noise of the noise that is present in the patch wise segmentation. Improved recognition accuracy and optimal subspace is done by the help of LDA and finally over all template size is minimized using the PCA. Using L^2norm the feature vector. Scores are normalizedprior to fusion using z-score normalization. Simple sum-fusion rule is used when fusing the matchscores from both algorithms.

3. Proposed System

The core sub algorithm used for the existing system was LDA (Linear Discriminant Analysis) and PCA (Principal Component Analysis), which is used for the matching of the composites of face and all. Here my proposed system is to change the exiting algorithm with Genetic algorithm which can give a good accuracy in matching the facial composite. Genetic Algorithms (GA's) are characterized as one search technique inspired by Darwin Evolutionist Theory. Genetic Algorithm is efficient in reducing computation time for a huge heap-space. Face recognition from a very huge Heap-space is a time consuming task hence genetic algorithm based approach is used to recognize the unidentified -image within a short span of time. To apply GA for face detection, an ellipse model is constructed.

The ellipse model is then moved through the whole image to find the location where the most suitable match exists. This process applies GA for the optimization of parameters of the ellipse.MlBP is replaced by RLBP that is used for feature extraction.

3.1Genetic Algorithm

Genetic algorithm is a method to solve optimization problem based on the method of evolution manly "survival of fittest". During the main part of feature selection stage is to reduce the dimensionality of the problem. This is used for selecting the optimal subspace in which the data gives the higher accuracy.Gentic algorithm is the best method in search space intelligently and works in an iterative order. In Genetic algorithm strings are represented in Binary codes and its fitness function will computes the fitness of all string.

The main operation present in Genetic algorithm are selection, mutation, and crossover. Genetic algorithm are good in searching very large space to converge to an optimal solution. This includes different computational methods as a part of artificial intelligence. This algorithm encodes a solution to a problem in a simple chromosome which is like a datastructure.The function optimization techniques included here are inheritance, mutation, selection etc.

The steps involved in Genetic Algorithm:
Genetic Encoding The length of a chromosome which is a string is equal to the tessellated facial region number. Every unit in the chromosome is a real number related to the corresponding weight of the facial region.

Initial Population: Generations are mainly populated by 100 chromosome's .the generation of initial population is done randomly and for the fast convergence of face recognition weights are almost proportional to the accuracy every region are used as initial chromosome.The remaining chromosome of 99 is generated randomly changing one or more units in the initial chromosome, finally the weights are normalized such that the sum of the all weight in a chromosome is 1.

Fitness: The effectiveness, recognition of the chromosome is evaluated by using the weight encoded by the individual chromosome and the weighted Chi square distance measure. On the taring set identification accuracy is set and 10 be the set performing chromosomes are chosen for mutation.

Mutation:In this step forma good preforming chromosome, it again populate a new generation of chromosome by altering one or more weight using its standard deviation from the previous generation.Up to convergence search process is repeated that is up tothe identification accuracy does not improve. Weight relating to the best chromosome gives best recognition accuracy.

Finally genetic algorithm gives optimal weights for each facial region. It enables to discard redundant and non-discriminating region. This leads to dimensionality reduction and better computational efficiency because then do not need to compute texture descriptors for poor performing facial regions during testing.

3.1.1 Enhanced Holistic based algorithm

This method is one of the best matching method. The process starts by first eye detection, eye is detected initially by locating the position of the eyes that is the facial transformed such that left and right eyes are at same position to the all composites. Then CSDN filtering is applied to neglect any change in the modularity between the mugshot and the composite. After this step the process like SHIFT, RLBP features are extracted at the same time .In the case of SHIFT dense grid is used as key points for the feature extraction. In RLBP patch wise segmentation is done for feature extraction.

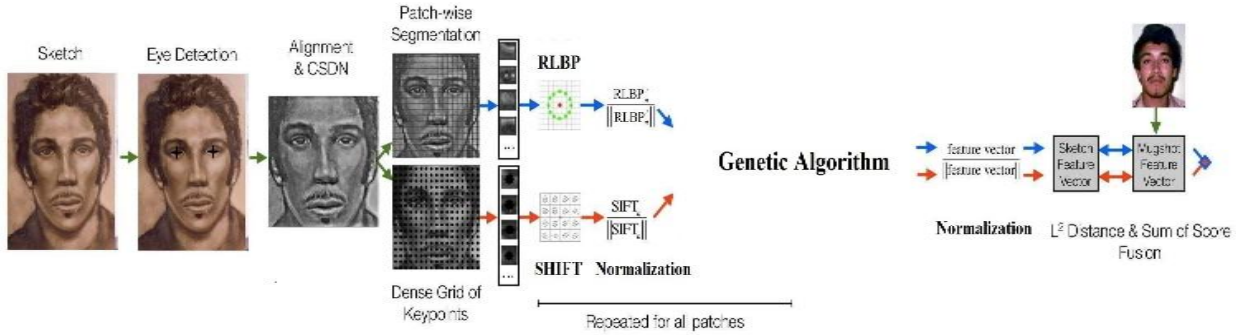

Figure 3: Enhanced holistic based algorithm

Both RLBP and SHIFT features are optimized by the use of Genetic Algorithm and it helps to reduce the template size and the resulting feature vector is normalized using L^2Norm. After z-score normalization, scores from the SIFT and RLBP representations are fused using a sum-of-score fusion rule.

Algorithm starts with the STASM which is a collection of active shape model ASM is initialized using eye locations provided by a COTS eye detector.STASM is generally used to detect the 77 different facial expression.to improve the matching accuracy.

3.1.2 Enhanced Component based algorithm

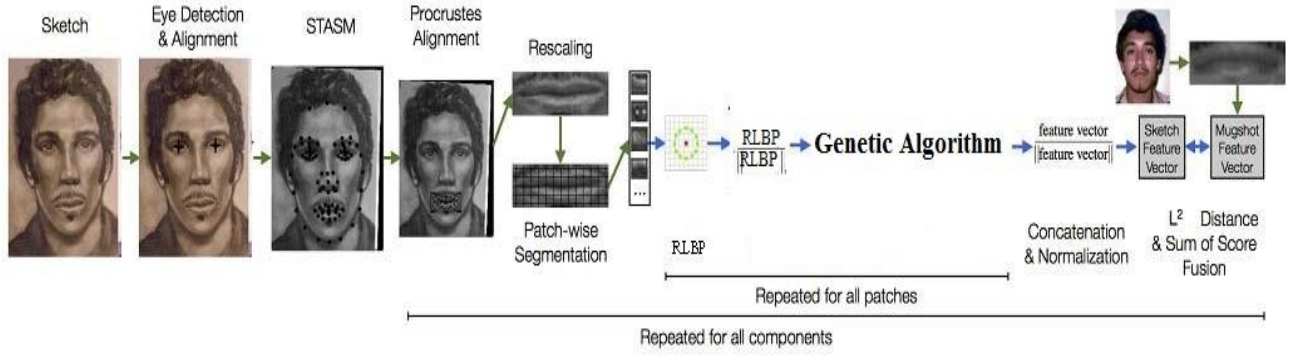

Figure 4: Enhanced Component based algorithm

Procrustes alignment procedure is made and later RLBP descriptor is used to capture the texture and structure of patches of face. Then similarly to holistic algorithm Genetic algorithm is used to normalize the feature and with help of L^2 normalization final feature vector is generated and the scores are normalized by using z normalization. A simple sum-fusion rule is used when fusing the match scores of both algorithms after z-score normalization is done.

Genetic algorithm is computationally intensive, the searching space is reduced and the required timing is greatly reduced. More over replacing MLBP (multi-scale local binary pattern) to RLBP (Rotation Invariant Local Binary Pattern Descriptors) can also improve the overall functioning of the existing system. Normally after the matching of the images the image with minimum mismatches will be shown and the name or other details of the image is not displayed in existing system but in proposed along with the image the details will also be displayed .

4. Experimental Protocol

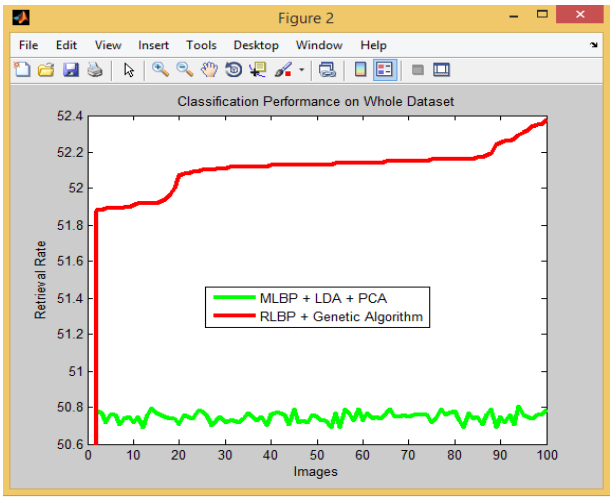

Figure 5: Graph comparing the existing system and the current system performance.

The graph is plotted on the basis of the efficiency of the current system and the existing system on behalf of the newly used methods such as Genetic algorithm and so.

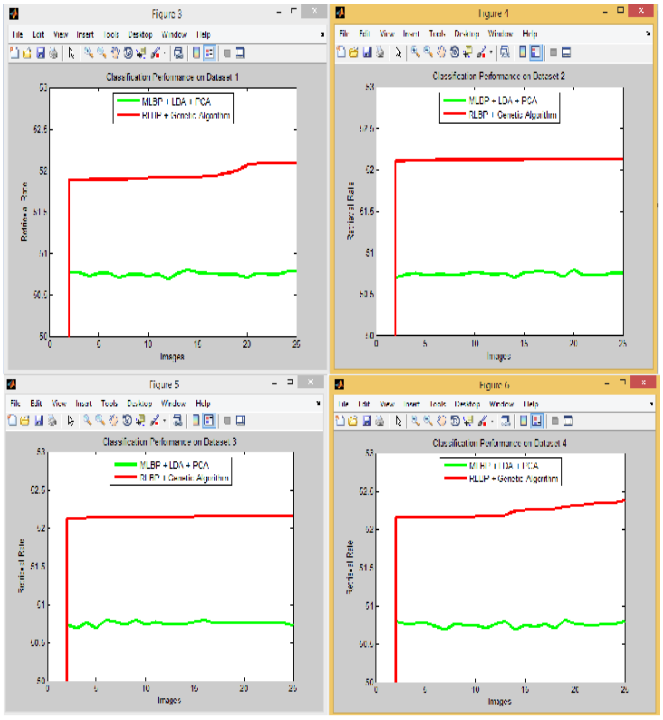

Figure 6: Graph comparing the matching rate of the mug shot by evaluating in four sets

Graph comparing the existing system algorithm and the current system performance and her we plotted the graphs based on taking 25 sketch each from the whole dataset of 100 sketch and mug shot.

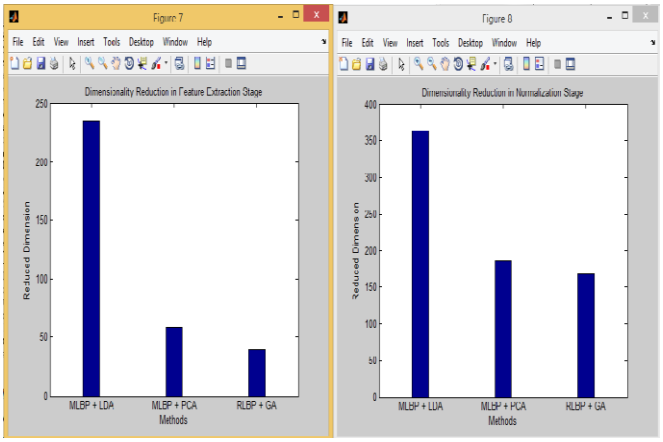

Figure 7: Graph comparing the dimensional reduction during the feature extraction stage and the reduction stage

This graph compares the change in dimensional reduction in the exiting algorithm and the present system its efficiency of the algorithms are compared here.

5. Conclusion

Here we conclude that our proposed system is very accurate in matching the sketch to the mug shots. It is basically done with two method such as Enhanced Holistic method and Enhanced Composite method. In the proposed scheme it is done by replacing the existingsystems key algorithms such as LDA and PCA withGenetic algorithm. Also replacing MLBP to RLBP. Finally along with the matched image some details such as name, age can be displayed.

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Author Profile

Vinayak.P.P received BTech degree in Information Technology from University Of Calicut in 2011 and currently pursuing final year M.Tech in Computer Science with specialization in Cyber security from KMP College of Engineering Perumbavoor.

Nahala M A received the B. Tech degree in Computer Science& Engineering from MG University Kottayam in 2010, M. Tech In Computer Science& Engineering from MG University Kottayam in 2014and currently working as Assistant Professor in Computer Science and Engineering Department KMP College of Engineering Perumbavoor.

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