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Strategy of Intelligent System for Recognizing Surgically Modified faces

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ABSTRACT: Plastic surgery face recognition is important for any security and biometrics application. There are number of technique available for recognition of plastic surgery faces. Person face gives detail information about age, gender, expression. Now days plastic surgery popularity is increased. Basically, plastic surgery procedure introduces skin texture variations between images of the same person (intraface) thereby making recognition more difficult than in normal scenario. Since the shape of significant face features such as eyes, nose, eyebrow and mouth remains unchanged even after plastic surgery. Intelligent system is one of system in facial detection algorithm that raised challenges in detection. In this research, a multimodal approach (PCA & LBP algorithm) is proposed to match face images before and after plastic surgery. The algorithm first generates non-disjoint face granules at multiple levels of granularity. In this system raspberry pi model is used which faster operation performance as compare to other. Memory requirement is also less, difference in before and after face image is shown in LBP histogram. Raspberry pi model 2 has been used for exploration of algorithm.

KEYWORDS: Feature extraction, Raspberry pi2 model, Face Recognition, Feature Extraction.

I. INTRODUCTION

As increasing popularity of plastic surgery, interest for different look has rising consistency. As observed by report in 2010, there is increase of more than 9 % in plastic surgery operations [1]. Plastic surgery procedure is benefit for patient suffering from several kind of disorders caused due to different accident. These procedures give the facial features and skin texture there by providing a substance over in the appearance of face. Matching of post surgery images with pre surgery images become difficult task for automatic face recognition system. The face recognition under certain conditions results in faces, which are termed the unconstrained faces [2].operations.

Face recognition after plastic surgery can lead to rejection of genuine users or acceptance of impostors. While face recognition is a well studied problem in which several approaches have been proposed to address the challenges of illumination, pose, expression, and disguise, the use of plastic surgery introduces a new challenge to designing future face recognition systems. From past two decades face recognition has been an active research area. The much attention given to face recognition within the research and commercial community can be associated with its real-world application potentials in areas such as forensics, surveillance, and home land security [3]. Among the most challenging tasks for face recognition in these application scenarios is the development of robust face recognition systems.

II. LITERATURE SURVEY

Mayank Vatsa advancement and affordable is top to the popularity of plastic surgery procedures. Facial plastic surgery can be reconstructive to correct facial feature or cosmetic to improve the appearance [2]. Both corrective as well as cosmetic surgeries alter the original facial information to a large extent thereby posing a great challenge for face recognition algorithms. 1) Preparing a face database of 900 individuals for plastic surgery, and 2) providing an analytical and experimental underpinning of the effect of plastic surgery on face recognition algorithms.

Rajesh Kumar Gupta proposed the Principal Component Analysis (PCA) which decomposes a face image into a small set of characteristic feature images called eigenfaces and recognition is performed by projecting a new face onto a low dimensional linear "face space" defined by the eigenfaces, followed by computing the distance between the resultant

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position in the face space and those of known face classes [4]. The objective of the Principal Component Analysis (PCA) is to take the total variation on the training set of faces and to represent this variation with just some little variables. When we are working with great amounts of images, reduction of space dimension is very important. PCA intends to reduce the dimension of a group or space so that the new base describes the typical model of the group. The image space is highly redundant when it describes faces. This happens because each pixel in a face is highly correlated to the others pixels. The objective of PCA is to reduce the dimension of the work space.

Di Huang Local binary pattern (LBP) is a nonparametric descriptor, which efficiently summarizes the local structures of images. In particular for facial image analysis, including tasks as diverse as face detection, face recognition, facial expression analysis, and demographic classification.[5]represents a comprehensive survey of LBP methodology, including several more recent variations.

III. PROPOSED ALGORITHM

Face recognition after plastic surgery can lead to rejection of genuine users or acceptance of impostors. While face recognition is a well studied problem in which several approaches have been proposed to address the challenges of illumination, pose, expression, and disguise, the use of plastic surgery introduces a new challenge to designing future face recognition systems. From past two decades face recognition has been an active research area. The much attention given to face recognition within the research and commercial community can be associated with its real-world application potentials in areas such as forensics, surveillance, and home land security [3]. Among the most challenging tasks for face recognition in these application scenarios is the development of robust face recognition systems.

A. *Source of data collection:*

The Data required for face recognition across plastic surgery is collected from IIT-D plastic surgery database online which contain pre-surgery and post-surgery images of face. As part of research work, they are forming this face database comprising pre and post-surgery images. The face database enables researches in developing, testing and publishing human recognition algorithm. Image Analysis and Biometrics (IAB) lab at Indraprashtha Institute of Information Technology, Delhi (IIT-D) holds the copyrights for the image collected and source of distribution of IIT-D plastic surgery face database.

B. *Preprocessing:*

In pre-processing, first background is remove and obtained particular region from the face images. i.e. strip, overlapping, non-overlapping and lips region of face images [1]. In this first normalization of face images done and then pre-processing is performed on the normalized image.

C. *Local Binary Pattern:*

In the basic local binary pattern operator, introduced by Ojala , was based on the assuming that texture has locally two complementary aspects, a pattern and its strength. In that work, the LBP was proposed as a two-level version of the texture unit to describe the local binary patterns [1]. The original version of the local binary pattern operator works in a 3×3 pixel block of an image.

Local binary pattern (LBP) is a non-arithmetic algorithm, which mostly use for detection of the local structures of images. LBP features are in gray scale and rotation invariant texture operator. These features are more widely used for expression recognition. LBP features are also applied for face recognition task. LBP feature extraction is faster than any other feature extraction method and it provides good performance make this most researched features. The local binary pattern operator is an image operator which converts an image into an array or array for describing small-scale appearance of the image. These labels or their operations, most commonly the histogram, are then used for further image analysis. The most widely used versions of the operator are designed for monochrome still images but it has been extended also for color (multi channel) images as well as videos and volumetric data [1], [3].

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D. *Principal Component Analysis:*

In face recognition PCA has been mostly used. Suppose we have an image and wish to compare this with a set of date base image to find the best match [1]. Each pixel can be considered a variable thus we have a very high dimensional problem which can be solved by PCA. PCA is usually used in dimension, eigenvectors and lots of numbers it reduced the dimension of data using PCA. In face recognition PCA has been extensively used [2]. The objective of the Principal Component Analysis (PCA) is to gives the total variation on the training set of faces and to represent this variation with some variables. When we are working with more amounts of images, reduction of space dimension is very important. PCA intends to reduce the dimension of a group or space so that the new base describes the confident model of the group

The image space is mostly redundant when it describes faces. This happens because each pixel in a face is mostly correlated to the others pixels. The maximum number of principal components is the number of variables in the original space. This concludes that some principal components can be rejecting because they only have a small quantity of data, considering that the larger quantity of information is contained in the other principal components. Practically, the eigenvectors of the matrix of these vectors would important variation amongst the face images. The eigenfaces are the principal components of the original face images, obtained by the variation of PCA, forming the face space from these images. So any new face can be expressed as linear combination of this Eigen face [1].

E. *Periocular Biometrics:*

There is no database available with periocular region images. Only way to fetch this is using available face image. Periocular biometrics is performed in three different ways such as Non-overlapping, overlapping and Strip Using four significant points in eye region all this three different types of periocular regions are obtained. Strip is area below forehead and above nose considered whole region together. This strip region is cropped using outmost corner points of both the eyes. By bisecting strip into left and right region and then Overlapping periocular is obtained.

Non-overlapping regions are cropped from the two corner points of each eye separately. Lips regions are obtained using two corner points. LBP features from periocular and lips region are used in this work PCA is used for LBP feature dimension reduction and in turn helps in increasing the recognition rate

IV. SYSTEM MODEL

In the proposed system, we are introducing advanced smart system technology using raspberry pi. It is a plastic surgical face detection technique in which skin structure are selected among cooperating better reception of smart system

These methods can increase the recognition accuracy to almost sufficient level. However, it is difficult to improve the accuracy more as surgery can alter the facial features (e.g. LBP) which are used for training. In smart system, local binary pattern algorithm use to detect hole region and local eye region to achieve better match and accuracy ratio. However, the working of smart system is different than earlier reorganization techniques. First, the raspberry pi is used to operate all the performing operations working speed of execution is more aster than other like MATLAB. On changing face he/her can change personal identity which is unrecognizable. Conceder in result traditional face detection method is not suitable which decrease accuracy of system. In ratio in accuracy range from 30% to 60% is depend on recognition technique.

In the fig.1, input image is take in consideration on performance of both algorithm PCA and LBP feature get extracted. Pre-processing operations are not meant to increase image information content they are meant to extract the useful information and suppress the undesired distortion or enhances some image features relevant for further processing and analysis task. In face recognition PCA has been extensively used primarily, for reducing the number of variables. Suppose we have an image and wish to compare this with a set of date base image to find the best match. PCA is usually referred to in tandem with Eigen values, eigenvectors and lots of numbers. Dimension is reduced the dimension of data using PCA.

Data sets contain different varieties of plastic surgery such as noise surgery, eyelid surgery, skin peeling. It is difficult to reorganization of undergone plastic surgery and recognizes them. LBP methodology developed recently with more variation for improved more variation in applications. The variations are increment of discriminative capability. Enhancement of robustness, selection of neighborhood, these are latest variation in LBP.

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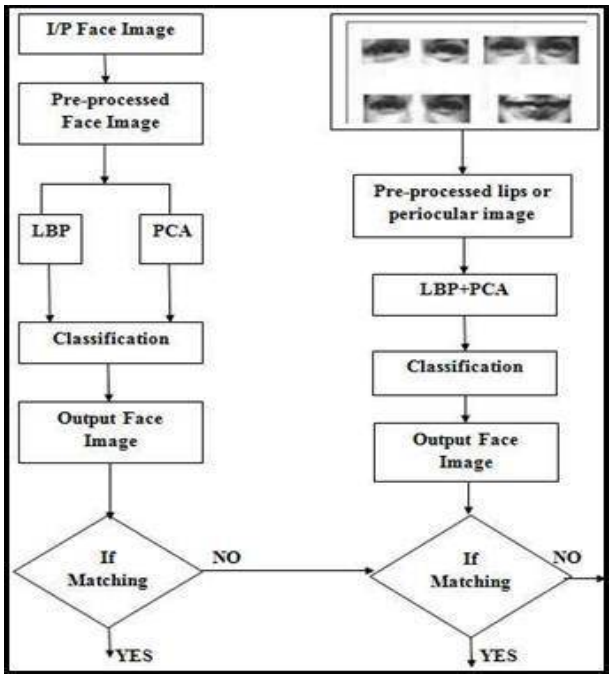

Fig. 1. Working frame algorithm

For evaluating the performance of proposed system, we analyze system based simulations using raspberry pi2 terminal window software. In simulation, assume a scenario in which reorganization rate using raspberry pi is high. Also, we use camera structure in future which focuses multiple faces recognition in the environment. We consider only offline recognition because of availability of plastic surgery persons. In simulation, we show histogram graph which means that variation in faces.

A. *Euclidian Distance:*

Euclidian distance is used to better match of image. Minimum distance is better match of input image. It can be calculated using a distance formula. The position of a point in a Euclidean n-space is a Euclidean vector. So, p and q are Euclidean vectors, starting from the origin of the space, and their tips indicate two points. The Euclidean norm, or Euclidean length, or magnitude of a vector measures the length of the vector.

A vector can be described as a directed line segment from the origin of the Euclidean space (vector tail), to a point in that space (vector tip). If we consider that its length is actually the distance from its tail to its tip, it becomes clear that the Euclidean norm of a vector is just a special case of Euclidean distance: the Euclidean distance between its tail and its tip. In a three-dimensional space (n=3), this is an arrow from p to q, which can be also regarded as the position of q relative to p. It may be also called a displacement vector if p and q represent two positions of the same point at two successive instants of time.

B. *Canberra Distance:*

The Canberra distance is a numerical measure of the distance between pairs of points in a vector space, introduced in 1966[1] and refined in 1967[2] by G. N. Lance and W. T. Williams. It is a weighted version of L_1 (Manhattan) distance.[3] The Canberra distance has been used as a metric for comparing ranked lists[3] and for intrusion detection in computer security.[4]

The Canberra metric is similar to the Manhattan distance (which itself is a special form of the Minkowski distance). The distinction is that the absolute difference between the variables of the two objects is divided by the sum of the absolute variable values prior to summing. The generalised equation is given in the form.

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$$d^{CAD}(i,j) = \sum_{k=0}^{n-1} \frac{|y_{i,k} - y_{j,k}|}{|y_{i,k}| + |y_{j,k}|}$$

This is a slightly modified form compared to the original form given by Lance & Williams (1966) and was suggested by Adkins (reference in Lance & Williams 1967). In the equation dCAD is the Canberra distance between the two objects i and j, k is the index of a variable and n is the total number of variables y.[3]

V. PERFORMANCE EVALUATION

In recognition we use the updated version of raspberry pi2 which has high working speed and enough RAM memory and storage memory. Working algorithm is in python language which helps to reliable changes in smart system. Online detection is one of feature of system which also use in future.

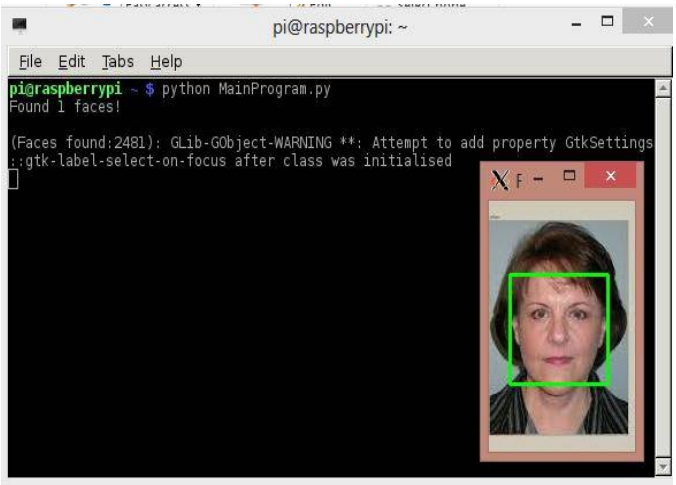

Fig. 2. Recognized face portion

Fig. 3. 1) Surgery face 2) detect face 3) LBP histogram image

In fig.4 rhinoplasty surgical face is used for recognition performanceof proposed system, second image is gray scale image which use for further process. After applying LPB, histogram image is found. Histogram image is use for matching purpose of pre and post surgery faces.

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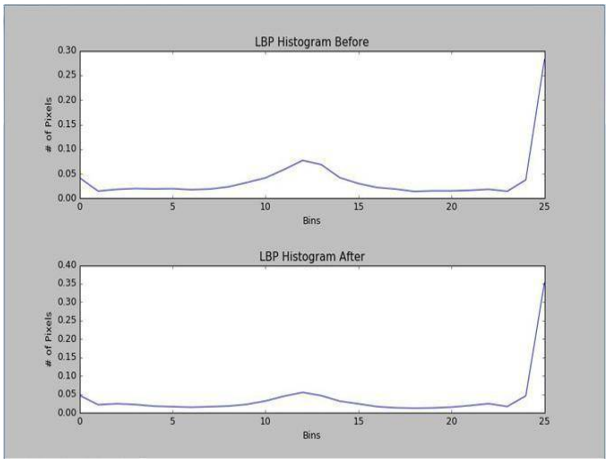

Fig. 4. Rhiniplasty nose surgery LBP histogram

In fig.5 rhinoplasty surgical faces graph is detected, its observed value of graph shows variations of face before and after plastic surgery faces. Pixel values of image are used for detection, variation on faces changes position of pixel which we can observe in LBP histogram graph.

Fig. 5. 1) Scar repair image 2) detect face 3) LBP histogram image

In fig.6 scar surgical faces are used, different surgical images are used for matching purpose. Second image is surgical face detection portion image. And third is its histogram, used for observation of matching.

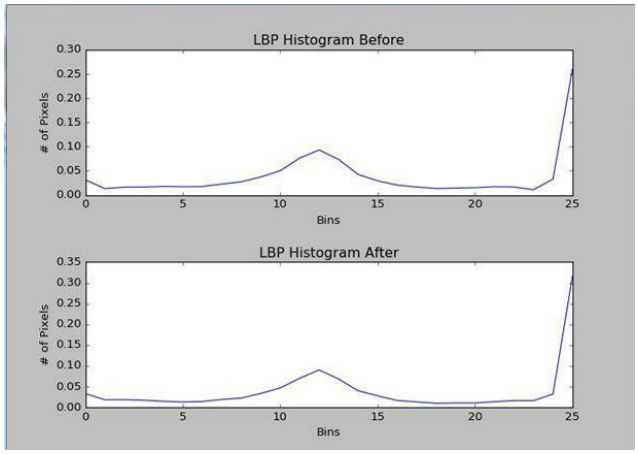

Fig. 6. Scar nose repair LBP histogram

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In fig.7 scar surgical faces graph is detected, its observed value of graph shows variations of face before and after plastic surgery faces. Pixel values of image are used for detection, variation on faces changes position of pixel which we can observe in LBP histogram graph.

Test Image	Euclidian Distance Accuracy	Canberra Distance Accuracy	Total Images
Number of true positive identification	72%	80%	50
Number of false negative identification	28%	20%	50

Fig. 7 Accuracy Table

VI. CONCLUSION AND FUTURE WORK

In this paper, an overview of face recognition using intelligent system is discussed with the help of certain existing technology. This paper also reviewed existing methods and provides some conclusion based on it. By overcoming the time consumption and complex operations in the existing technology, methods proposed appropriate face can be recognize after plastic surgery and before surgical faces, system will also be detect other parameters of faces. Small industries can use this system for the security purpose especially in investigation area by using advanced technology of face detection matching method and algorithm this system will provide better accurate result. Above result gives the matching performance of system, we getting to match 50% to 60% of faces using smart system. Histogram graph of different images are different and it vary according to face parameter. Thus system will be used for the security of human health. System will have advantage that it helps to both investigation team and normal person as well advance security in sensitive areas laboratory. Also this paper shows that raspberry pi2 is better device use to perform algorithm in the image in face recognition by comparing certain strength and weakness of both the system.

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BIOGRAPHY

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