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Intelligent System For Recognizing Surgically Modified Faces

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Abstract
This 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 (Canberra & Euclidian distance algorithm) is proposed to match face images before and after plastic surgery. 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

This 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].

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 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.

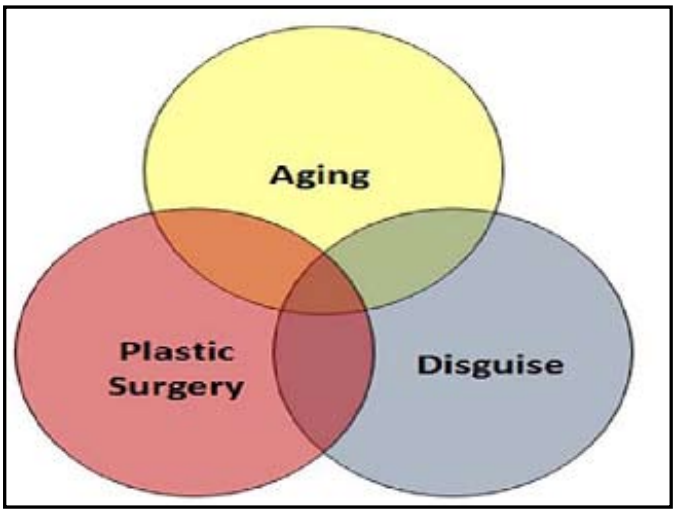

Fig. 1 : Relation Among Plastic Surgery

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 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.

III. Proposed Methodology

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.

(i). 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.

(ii). Pre-processing

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 input image.

(iii). 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]

(vi). 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.[5]

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.

$$d = (x_1 - y_1)_2 + (x_2 - y_2)_2$$

(v). Canberra Distance

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.[4]

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

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]

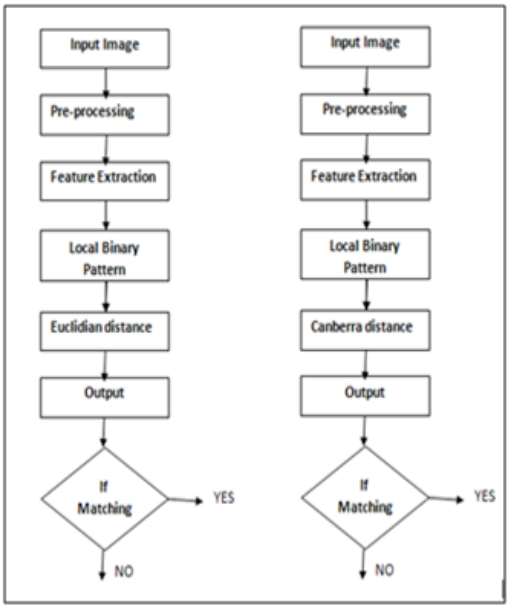

Fig. 2 : Working frame algorithm of Euclidian & Canberra distance

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.

IV. Result and Discussions

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

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Fig. 3 : Recognized face output window

The single person have single image are used as input to the detection algorithm. LBP algorithm makes use of feature based method which extracts characteristics features of face like skin texture and shape to find the matches. Feature detection is the process where we examine an image to extract features which are unique to the face in the image, in such a way that we are able to detect a face based on its features.

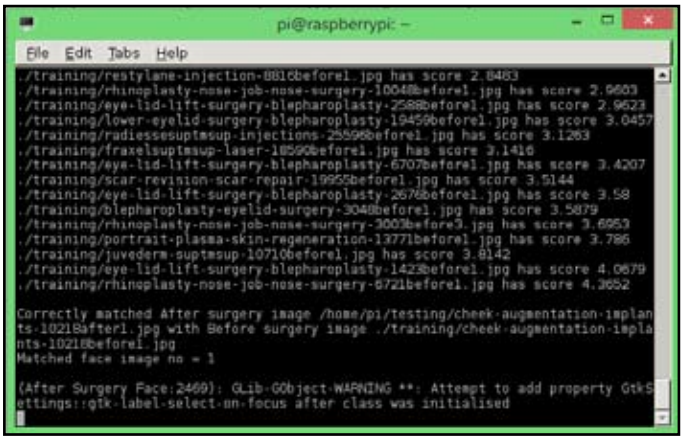

Fig. 4 : Recognized face output window

For face detection different images are used as testing images. These images are taken in various lightening conditions. And test image is compared to get best matches. At every time input image is compared with other remaining images in datasets, and on output window it shows matching face image with its six best matches. Six best matches are shown on the basis of Euclidian distance and Canberra distance features. Among six which number face is perfect matched of input image is also show in output window. In fig. shows matched face image no = 1 is perfect matched of input image

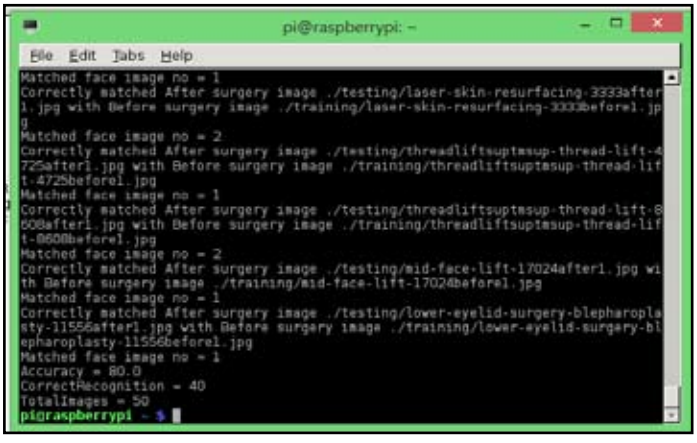

Fig. 5 : Rhinoplasty nose surgery histogram

The accuracy of Canberra distance is better than Euclidian distance. The overall accuracy of Canberra distance algorithm is 80% and Euclidian distance accuracy is 72% shown like bellow in output.

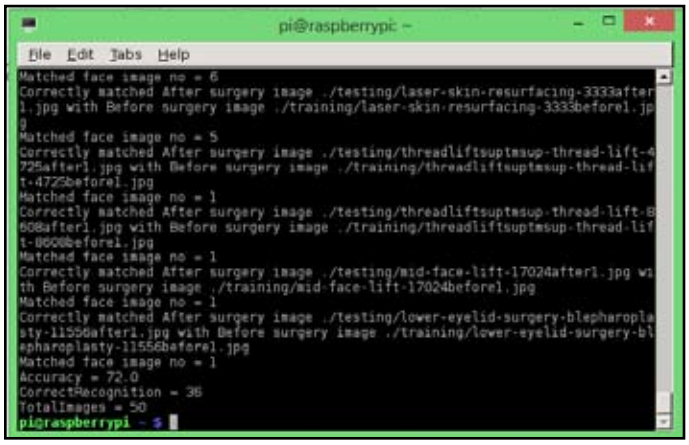

Fig. 6 : Output Window

As show in table we create 50 images datasets and operations are performed on this datasets. By using Euclidian distance 72 % of accuracy is obtained, 28% images is not recognize because of some light illumination problem in image or some time data not available at time of capture image.

Result Table 1:

Test image	Euclidian Distance Accuracy	Canberra Distance Accuracy	Total Images
Number of true identification	72%	80%	50

V. Conclusions

In this study the recognition algorithm is developed to recognize plastic surgical face from input and also to determine their exact match. This algorithm has high accuracy to identify person. About 80% faces of the surgical person are extracted so this algorithm can be reliable for modified face recognition. A simple feature cannot entirely represent the character of the face region. Therefore, multiple features analysis should be used such as integration of face portion, color, shape, texture etc. In order to improve and enhance the functionality and flexibility of the recognition system for more wide usage, the system should be improved by extending its functions to process and recognize more on real time basis. All titles and author's details must be in single-column format

VI. AcknowledgEment

Pratik N. Mohod is a Post Graduate student in the Electronics Telecommunication Department, Smt. Kashibai Navale College of Engineering Pune. He received Bachelor of Engineering degree in 2013 from SGBAU University, Amravati, MS, India. His research interests are Image Processing.

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