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A Research - Face Recognition by Using Near Set Theory

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Abstract— Many applications including face verification use face image retrieval method. It's a challenging technique since all the faces and the faces will be similar due to its similar geometrical configuration of face structure. Face recognition system is a computer application for automatically identifying or verifying a person.Establishing identity is becoming critical in our vastly interconnected society. The need for reliable user authentication techniques has increased in the wake of heightened concerns about security and rapid advancements in networking, communication, and mobility. This paper does a research and comparative study of face recognition by using near set theory.

Keywords— Input Images, Damage face images, Face recognition system, etc....

I. INTRODUCTION

A wide variety of biometric systems have been developed for automatic recognition of individuals based on their physiological/behavioural characteristics. These systems make use of a single or a combination of traits like face, gait, iris, etc., for recognizing a person. Some biometrics may have a severe degradation of performance due to variability factors caused by the acquisition at a distance but they can still be perceived semantically using human vision. In the area of face recognition, several approaches have been proposed to address the challenges of for physically challenged person recognition. However plastic surgery based face recognition is still a lesser explored area. Thus the use of face recognition for surgical faces or burned introduces the new challenge for designing future face recognition system [1]. Plastic surgery is a sophisticated operational technique that is used across the world for improving the facial appearance. For instance remove acne, scars become while remove dark circles and many more. To recognize a face after plastic surgery might lead to rejection of genuine users or acceptance of impostors. To this challenge yet much literature is not available. Very few researchers till now have contributed in this field. In paper [2] we have discussed the overview of the face recognition. We propose an approach based on near set theory for comparing surgical and burn facial Images .Near set has been already used for frontal face recognition [6]. We have taken some sample from databases of iris for future comparison of input data. Our work concerns only geometrically obtained feature values, their Approximation using near sets and the performance. Once the features will be extracted a feature database will be formed. Using this feature values near set theory provides a method to establish resemblance between objects contained in a disjoint set, that is it provides a formal basis for observational comparison and classification of the objects. This approach will improve the performance in terms as comparison will be made between the objects in near sets only [2].For face detection we used viola Jones algorithm and then we used near set theory for matching and recognising purpose. When we done this process then we first have original face images of iris dataset .This datasets having all information of each person means their age, ethinicity, gender,etc. For this detection we use Viola Gones algorithm. When we authenticate a person then we give input image, iris of face detection process done. After using the near set theory for match input images with original datasets. Then result will shown.

The paper is organized in following sections. Section1: gives a brief introduction; Section 2: overview near sets; Section 3: will focus on proposed approach followed by experimentation and simulation result, Conclusion and future scope.

II. RELATED WORK

Verification Based on Soft Biometrics, Verification Based on Face Biometrics this method used in that system. In first method range and distance of the person should be measure. They use the at least minimum distance of person .in second face verify using FACE-SDK and VJ-SRC method. In that system verify face of the person. But in that depending on the scenario, some labels may not be visually present and others may be occluded. P. Tome et al. [1] proposed an experimental study of the benefits of soft biometric labels as ancillary information based on the description of human physical features to improve challenging person recognition scenarios at a distance. They also analyze the available soft biometric information in scenarios of varying distance between camera and subject. A.K. Jain et al.[2] explored Facial marks (e.g., freckles, moles and scars) are salient localized regions appearing on the face that have been shown to be useful in face recognition. An automatic facial mark extraction method has been developed that shows promising performance in terms of recall and precision. N. Kumar et al [3] used two method first is – "attribute" classifiers – uses binary classifier strained to recognize the presence or absence of describable aspects of visual appearance (e.g., gender, race, and age) and second method – "simile" classifiers – removes the manual labelling required for attribute

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classification and instead learns the similarity of faces, or regions of faces, to specific reference people. Other works like [4] are focused on the automatic extraction of soft biometrics from video datasets. On the other hand, D. Adjeroh et al. [5] studied the correlation and imputation in human appearance analysis of using automatic continuous data focusing on measurements of the human body.

Other works like [6] are focused on the automatic extraction of soft biometrics from video datasets. On the other hand John Wright et al. [7] exploit the discriminative nature of sparse representation to perform classification. Instead of using the generic dictionaries, they represent the test sample in an over complete dictionary whose base elements are the training samples themselves. PAUL VIOLA et al.[8] describes a face detection framework that is capable of processing images extremely rapidly while achieving high detection rates. S. Samangooei et al [9], introduced the use of semantic human descriptions as a soft biometric. They carefully selected a set of physical traits and successfully used them to annotate a set of subjects. Koichiro Yamauchi et al [10] explored challenging to recognize walking human sat arbitrary poses from a single or small number of video cameras. P.Petchimuthu et al. [11], this paper retrieves similar faces using content based method. It's a challenging technique since all the faces will be similar due to its similar geometrical configuration of face structure. K. Bhandwalkar et al.[12] explored about E-learning. E-learning institutions are currently facing two key challenges related to identity management. The latest works such as Fuqing Duan et al. [13] introduce the use of craniofacial superimposition and craniofacial reconstruction method for skull detection.

III. BASIC TERMINOLOGY

A. FACE DETECTION

The basic principle of the Viola-Jones algorithm is to scan a sub-window capable of detecting faces across a given input image. The standard image processing approach would be to rescale the input image to different sizes and then run the fixed size detector through these images. This approach turns out to be rather time consuming due to the calculation of the different size images. Contrary to the standard approach Viola-Jones rescale the detector instead of the input image and run the detector many times through the image – each time with a different size. At first one might suspect both approaches to be equally time consuming, but Viola-Jones have devised a scale invariant detector that requires the same number of calculations whatever the size. This detector is constructed using a so-called integral image and some simple rectangular features reminiscent of Haar wavelets. The next section elaborates on this detector.

a. The scale invariant detector --

1	1	1
1	1	1
1	1	1

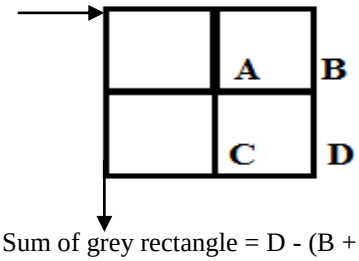
Input image

1	2	3
2	4	6
3	6	9

Integral image

Figure 1 – The integral image

The first step of the Viola-Jones face detection algorithm is to turn the input image into an integral image. This is done by making each pixel equal to the entire sum of all pixels above and to the left of the concerned pixel. This allows for the calculation of the sum of all pixels inside any given rectangle using only four values. These values are the pixels in the integral image that coincide with the corners of the rectangle in the input image. This is demonstrated in Figure 2.



Sum of grey rectangle = D - (B + C) + A

Figure 2---Sum calculation

Since both rectangle B and C include rectangle A the sum of A has to be added to the calculation. It has now been demonstrated how the sum of pixels within rectangles of arbitrary size can be calculated in constant time. The Viola-Jones face detector analyzes a given sub-window using features consisting of two or more rectangles. The different types of features are shown in figure 3

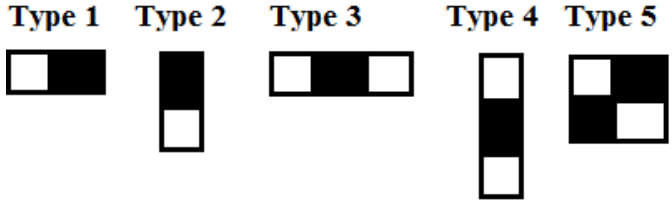


Figure 3 -- The different types of features

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Each feature results in a single value which is calculated by subtracting the sum of the white rectangle(s) from the sum of the black rectangle(s). Viola-Jones have empirically found that a detector with a base resolution of 24*24 pixels gives satisfactory results. When allowing for all possible sizes and positions of the features in Figure 3 a total of approximately 160.000 different features can then be constructed. Thus, the amount of possible features vastly outnumbers the 576 pixels contained in the detector at base resolution. These features may seem overly simple to perform such an advanced task as face detection, but what the features lack in complexity they most certainly have in computational efficiency. One could understand the features as the computer's way of perceiving an input image. The hope being that some features will yield large values when on top of a face. Of course operations could also be carried out directly on the raw pixels, but the variation due to different pose and individual characteristics would be expected to hamper this approach.

B. NEAR SETS: AN OVERVIEW

The idea of near set was first presented by James Peter in the year of 2006. In near set theory, each object is described by a list of feature values. The word feature corresponds to an observable property of physical objects in our environment. For instance, for a feature such as nose on a human face, nose length or nose width will be the feature values. Comparing this list of feature values, similarity between the objects can be determined and can be grouped together in a set, called as near set. Thus near set theory provides a formal
basic for the observation, comparison and recognition or classification of objects. The nearness of objects can be approximated using near sets. Approximation can be considered in the context of information granules
(Neighbourhoods).

Near set theory provides a formal basis for the observation, comparison, and classification of elements in sets based on their closeness, either spatially or descriptively. In Near Sets theory, each object is described by a list of feature values. The word feature corresponds to an observable property of physical objects in our environment. For instance, for a feature like the nose of a human face, the feature values would be nose length or nose width as shown below.

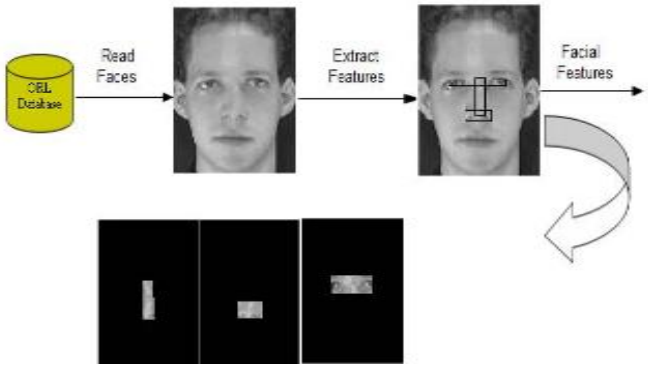

Fig: Near Set Theory

Comparing this list of feature values, similarity between the objects can be determined and can be grouped together in a set called as Near Sets. Thus Near Set theory provides a formal basis for the observation, comparison and recognition/classification of objects. The nearness of objects can be approximated using Near Sets. Near Set for facial feature Selection is used to find partition selection and then to select the best features which can be matched.

IV. DETAIL WORK

For recognizing face it must have a database for matching recognizing face with database. So first have original face database of irises, this database given from the face detection method. For this we apply Violo Gones algorithm for face detection. Database having information of each person like their age, ethnicity, gender, height etc.....

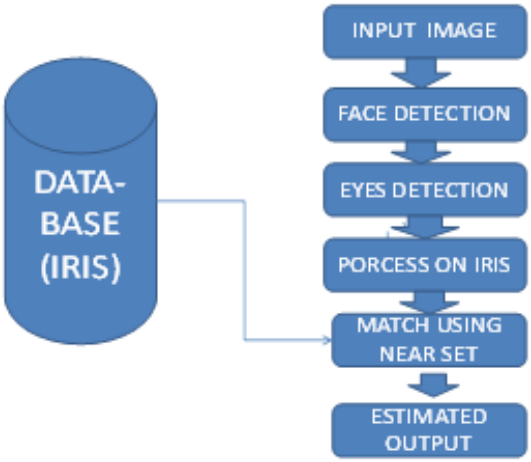

Fig: Flow of Implementation

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When we authenticate any plastic surgery image or burn face image then give this image to the face detection. By using this face detector ,it detect face, eyes (iris).We use eyes for detecting face because if any person done plastic surgery, its eyes can't change even they change all body part. Because of in plastic surgery and in burn face eyes can't change its measurement. Each irises having its threshold value by using hat we match or recognise face.

When we get irises from face detection then it go its next part that is near set theory for match iris with database. Then it give estimated output. Snapshot of face and iris given below by using matlab software.

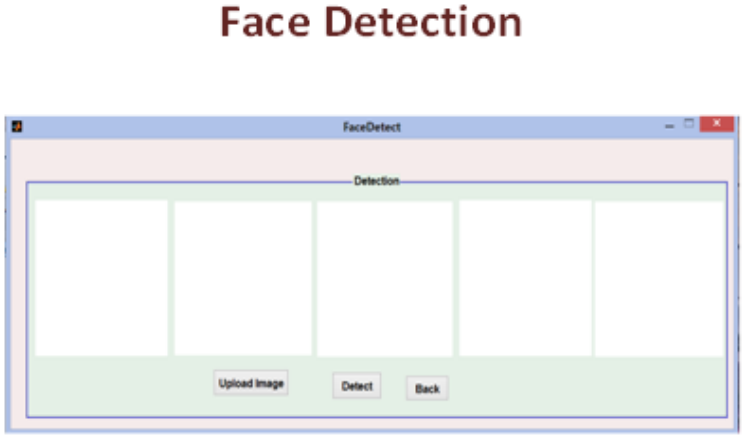

Fig 4.1 - Face detector

Fig 4.2- Eye Detect

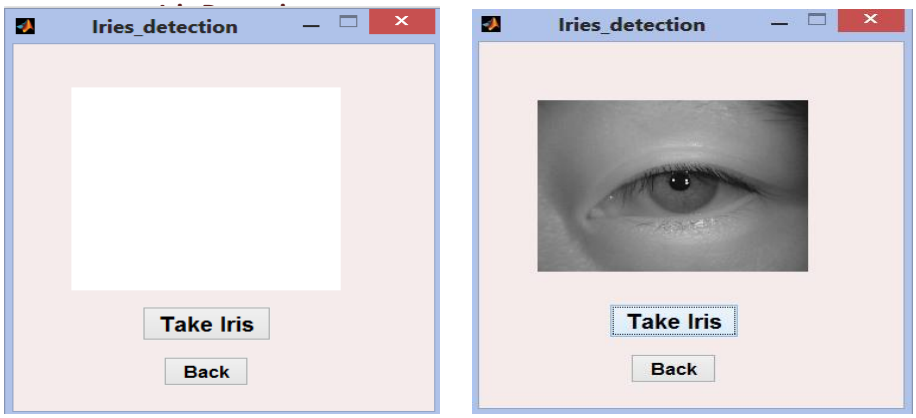

Fig 4.3-Iris Detection

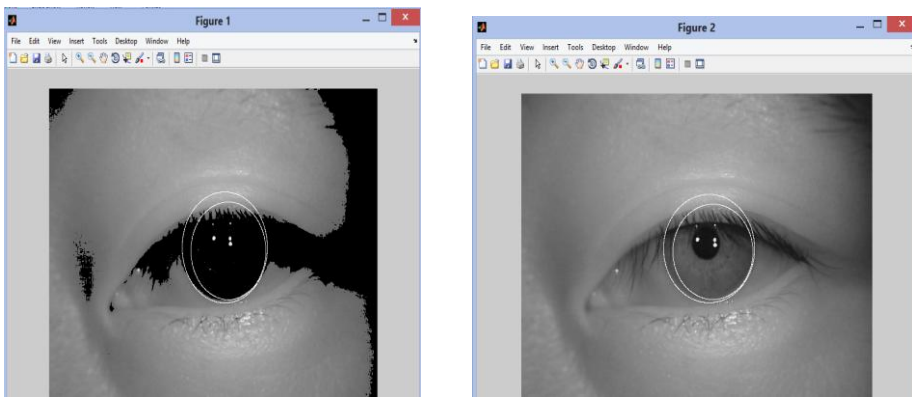

Fig 4.4- Grey images of iris

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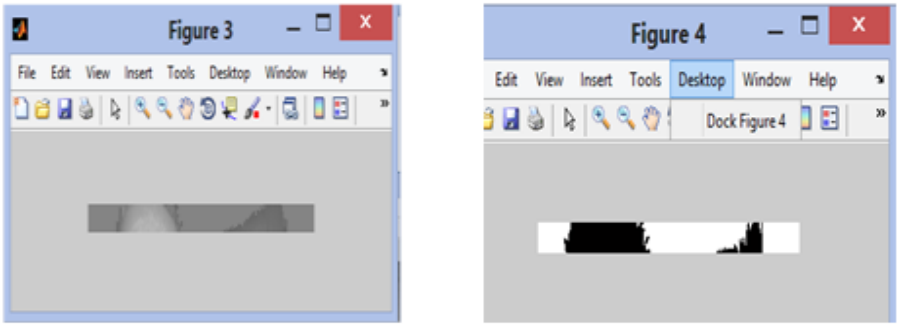

Fig 4.5- Iris measurement graph

V. OBJECTIVE OF THE PRESENT WORK

The objectives of the proposed study are best described as below:

a. It is improved person-recognition scenarios at a distance.
b. It is recognizes the plastic surgery image and burn face image.
c. It is also improved security level.
d. It is also improved the face recognition system.
e. It mainly important to forensic laboratory and it also used for the security purpose.

VI. CONCLUSION

Face identification is one of the most important tasks in Forensic anthropology. It has been practiced over one hundred years. We present an approach for face recognition using near set theory. System is capable of detecting face even after plastic surgery .Thus system provides an efficient approach for face recognition. In this paper, we propose a novel technique for identifying an unknown face based on the correlation measure between the plastic surgical face and original database in terms of the morphology. Using the recognize image data as the probe and original images geometric data as the gallery, this approach matches the unknown image with enrolled images by the correlation measure between the probe and the gallery. To boost the matching accuracy, we used near set theory, and make a decision by model fusion. Through this work, we prove that there is indeed a close relation between the recognize face and original face.
The proposed technique will come into a wide applications.

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