Comparative Analysis in 3D Face Recognition

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Abstract - **In this paper, we introduce a new system for 3D face recognition. We are making use of 48 small regions on the face that allow for the highest level of 3D face recognition. We are translating the incoming image to the origin and crop 48 regions, which is defined by cuboids of appropriate radius centered at the nose tip. We are making use of regions that are consistent in the presence of facial expressions. Our algorithm reduces the effects caused by variation in expression . We are comparing and analyzing the performance based on 38 regions and 48 regions.**

Keywords-**Expression variation, 3D face recognition, REFER, FRGC,MFRA.**

I. INTRODUCTION

3D Face Recognition is a research topic . The largest publically available 3D face dataset used for face recognition research FRGC V2.0 Dataset [1] . This dataset is having images showing different variations in expressions . We are considering regions that are consistent in the presence of expression. This approach is called REFER [2]

.In our approach we are making use of a modified algorithm called MFRA(Modified Face Recognition Algorithm). In the literatures only 38 regions on the face are consider red . We are making use of 48 regions .Based on the threshold value we will determine whether a match or not.

FRGC database is not available for common users. So in order to acquire the 3D image, a third party database is used. We report a false acceptance rate of 0.1% and a verification rate of 93%.

In this work we are analyzing by comparing the benefits of choosing 38 regions and 48 regions. Inorder to implement this we are making use of IDL programming.

In Region Ensemble for 3D face recognition[2] they are making use of 38 regions on the face that remain consistent . They report a verification rate of 93.2% and a FAR of 0.1%.

II DATASETS AND METHODS

A recent broad survey of face recognition research is given in [1].FRGC dataset is not available to us, so we are making use of a third party database .We firstly considered images without expressions and then with images having expression.

We modified the algorithm [2].Based on the MFRA we are conducting the tests. The step for MFRA is as follows.

1. Image Acquisition.
2. Smooth the acquired image.
3. Nose tip detection.
4. Generation of probe list.
5. Alignment of the images to gallery.
6. Comparison of probe to gallery.
7. Based on comparison , increase count.
8. If Count is greater than threshold, match otherwise no match

The images are from database much preprocessing is not needed. We are considering the frontal region. A 3X3 median filter is used to smooth the original image. Fig.1

The nose tip is detected manually. After finding the nose tip. Based on the offset values we are splitting the frontal region to 48.

The region splitting are based on the probe list. The probe list available on ref[2] is used and an additional 10 more regions are added . Table II.

The offset x and offset y determines the new cuboids in relation to origin. We are making use of a cuboids because the volume is higher compared to that of a sphere. Based on Euclidian distance we are performing the calculation. By making use of multiple regions which are nearby, error caused by a regions can be compensated. For implementation IDL programming is used.

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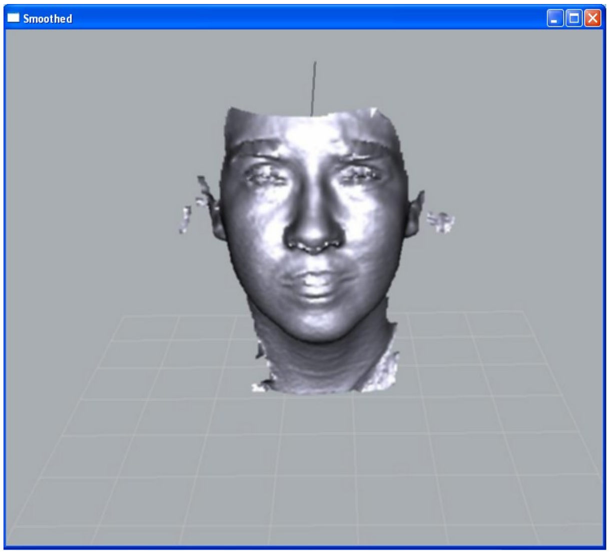

Fig. 1,smoothed image

IDL, interactive data language, is a programming language that is an data analysis language. IDL is vectorized, numerical, and interactive. It is commonly used for interactive processing of large amounts of data . The syntax includes many constructs from FORTRAN and some from C. As most other array programming languages, IDL is very fast doing vector operations. It is quite slow if elements need processing individually.

Region Matching

Once an input image is taken and it is smoothed and the nose tip is found. We are manually detecting the nose tip. Based on the probe list we are dividing it into 48 regions. We are storing this 48 regions on our training database.fig 3.we are having a test database which contain all the images that is to be tested. Consider any one image. Smooth the image. Manually detect the nose. Based on the probe list the image is divided into regions and a gallery to probe comparison occurs.

Region	Offset X	Offset Y	Sphere Radius
39	0	50	35
40	0	50	45
41	0	50	40
42	0	15	25
43	15	0	25
44	-15	0	25
45	-45	0	25
46	-45	0	45
47	45	0	45
48	-35	-20	35

Table II Created probe list

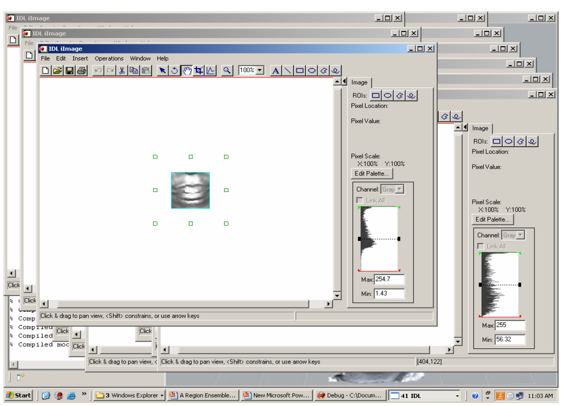

Fig.2,Region splitting

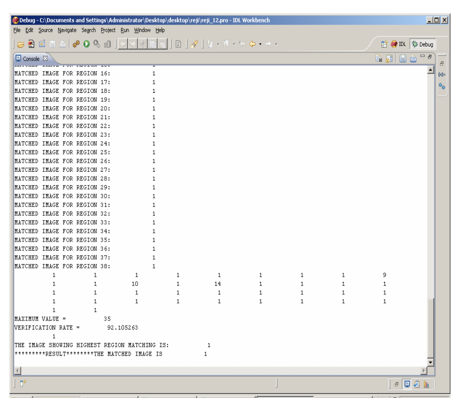

Fig.3, console

The results of comparisons and the recognition of the image is shown in the console, fig 3.
We have set the threshold value and based on it the image is found as a match or not. The verification rate is displayed.

III. ANALYSIS

Comparing the verification rate with 38 regions and 48 regions. Initially we are generating the regions based on the table I[2], the regions are saved on the training database. In this case we are considering 38 regions. Its verification rate and FAR is studied. Similarly we extended the work to 48 regions. In this case also we studied the verification rate and FAR. We are plotting graph by taking count or score along the X axis and VR along the Y axis. Graphically we are analyzing the Score vs VR for 38 regions and also for 48 regions.

We also considered image with expression and generate its regions and we are storing the regions on the training database. Same image without expression is taken and in this case also we find matches.

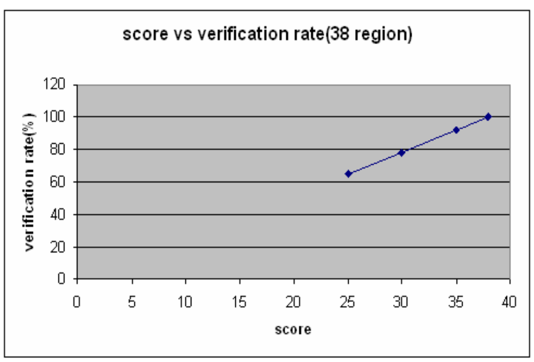

Fig.4, SCORE vs VR

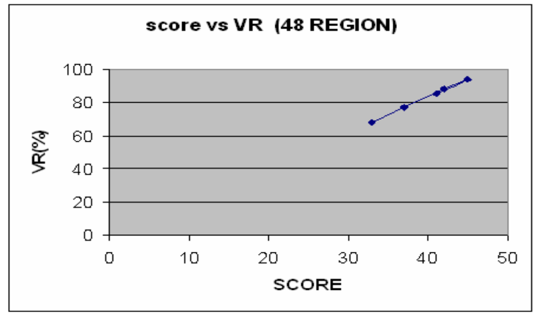

Fig.5,SCORE vs VR

IV. RESULTS

From the analysis we can say that our system is performing well with a FAR of 0.1% and VR of 93%. If the number of regions is increased then the possibility of finding the match is high and hence the VR increases. If we wish to decrease the FAR, we simply decrease the threshold that is required for a match

V. CONCLUSIONS AND FUTURE WORKS

We have presented the results of our approach. The algorithm can be evaluated on FRGC v2 dataset We can append the work by considering large number of images having variety of expressions. Incomplete facial data and artifacts are still major issues in many biometrics experiments.

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