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NC-FACE DATABASE FOR FACE AND FACIAL EXPRESSION RECOGNITION

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Abstract: Human faces are non-rigid objects with a high degree of variability in size, shape, color, and texture. Face recognition continues to be one of the most popular research areas of computer vision and machine learning. Along with the development of face recognition algorithms, a large number of face databases available publically or commercially. However, many of these databases are tailored to the specific needs of the algorithm under development. Here I collect the face images of Indian domain with number of Subject (Male, Female, Age) with Pose, illumination and different facial expression images such as happiness, sadness, anger, disgust, fear and surprise. Using the high resolution Sony camera Also Collection done with indoor (infrared) and outdoor using CCTV camera. In this paper we describe a NC-Face (Narasamma College) database of static images of human faces. Database contains 11040 static images of using digital Camera of 160 subjects. And 7200 images of using CCTV Camera of 144 subjects. Images from different quality cameras should mimic real-world conditions and enable robust face recognition algorithms testing, In addition to database description, this paper also elaborates on possible uses of the database and proposes a testing protocol. A baseline Principal Component Analysis (PCA) face recognition algorithm was tested only on facial Expression and Illumination images Other researchers can use these Database for different algorithms with different testing protocol. Database is freely available for research purpose on demanding through mail.

Keywords: Face Database, Face recognition, CCTV

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INTRODUCTION

The Face recognition as a combination of Image Processing and Pattern Recognition is still growing. Many papers are written and many real-world systems are being developed and Distributed. Face recognition is a Biometric Recognition domain is attractive for national security purposes as well as for smaller scale surveillance systems. Biometric recognition refers to the automatic recognition of individuals based on their physical and/or behavioral characteristics [1] [2].

The AR database was collected at the Computer Vision Center in Barcelona, Spain in 1998. It contains images of 116 individuals (63 men and 53 women). The BANCA multi-modal database was collected as part of the European BANCA project. Data were collected in four languages (English, French, Italian, Spanish) for 52 subjects each (26 men and 26 women). The CAS-PEAL Chinese face database was collected at the Chinese Academy of Sciences (CAS). It contains images of 66 to 1040 subjects (595 men, 445 women) in seven categories: pose, expression, accessory, lighting, background, distance, and time. The CMU PIE database was collected between October and December 2000. The PIE database contains 41,368 images obtained from 68 individuals. The Facial Recognition Technology (FERET) database was collected at George Mason University and the US Army Research Laboratory facilities as part of the FERET program, The Yale Face Database B was collected to allow systematic testing of face recognition methods under large variations in illumination and pose. Indian face Database contains a set of face images taken in February, 2002 in the IIT Kanpur campus. There are eleven different images of each of 40 distinct subjects. The JAFFE database contains 213 images of 10 Japanese female models obtained in front of a semi reflective mirror. The aim of developing this database is to collect images with controlled and uncontrolled condition, different illumination condition different pose, angle, different facial expression of a same subject such as happiness, sadness, anger, disgust, fear and surprise.

Using Digital camera, CCTV camera, for capturing the images for better study of face and facial expression recognition. Study and verify the recognition result of available face and facial expression with collected face database.

DATABASE DISCRIPTION

In different situation. In such a setup, one can easily imagine a scenario where an individual should be recognized comparing image of Pose , This database was designed mainly as a means of testing face recognition algorithms Expression , Illumination as well as low quality video surveillance still image.

A. Using Digital Camera

We have use Sony Digital camera (DXC-Hx 300v) of 20 Mega pixel for Different Pose, Illumination variation and different Facial Expression.

1. Pose

In controlled condition subject seating in the chair with complete light condition (studio atmosphere) as shown in fig.1. Then taking the photograph for frontal position, then subject chair rotates on different angles. 90 , 75, 60, 45, 30, 15, 0 degree from Front and then same procedure from right position Total 13 Frontal face images for single subject, 13 up directional face images for single subject and 13 down directional face images for single subject. So $13 + 13 + 13 = 39$ face images for pose of single person/subject. Fig.2 shows the images of frontal direction. Fig.3. shows the images of up direction and Fig.4. Shows the images of down direction

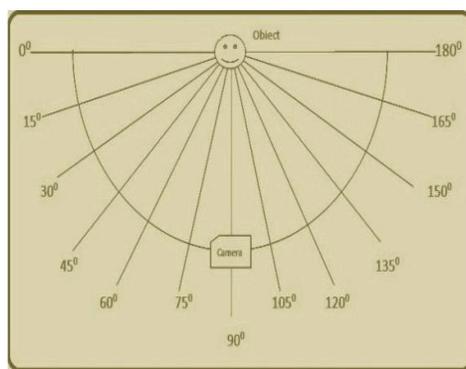


Fig.1. Digital Camera image Acquisition Methodology

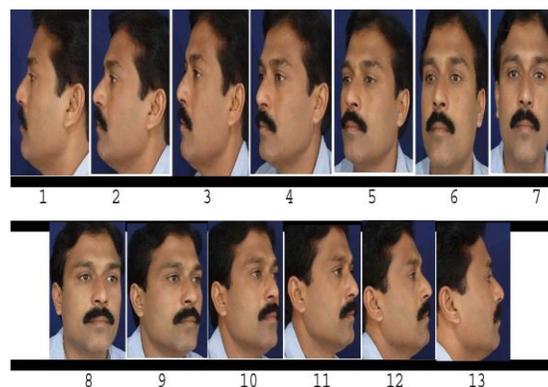


Fig. 2. Pose Front



Fig. 3. Pose Up

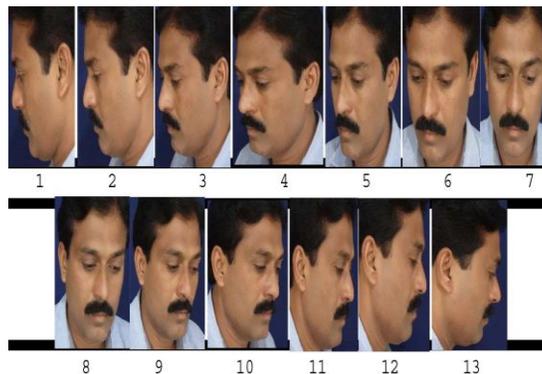


Fig. 4. Pose Down

3. Illumination

In illumination condition setup is similar use in pose Subject seating in the chair with complete dark condition, except the one CFL bulb (35 Watt). Taking the photograph for frontal position, only the bulb rotates on different angles. The subject left of angle 90, 75, 60, 45, 30, 15, 0 degree from Front and then same procedure from right position And 2 images from up and down light source. Fig.5. shows the images of illumination.

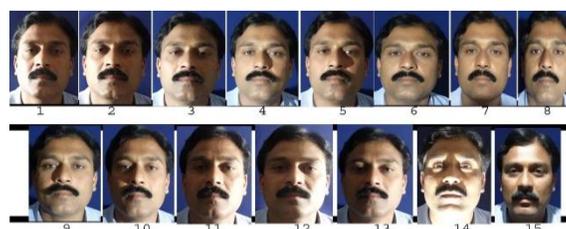


Fig. 5. Illumination

2. Expression

In controlled condition subject to inform for giving various facial expression such as neutral , happiness, sadness, anger, contempt , fear and surprise. We have collect the 1 neutral expression and 2 images for each expression. Total 15 face images of single subject for facial expressions. Fig.6. shows the images of expression.

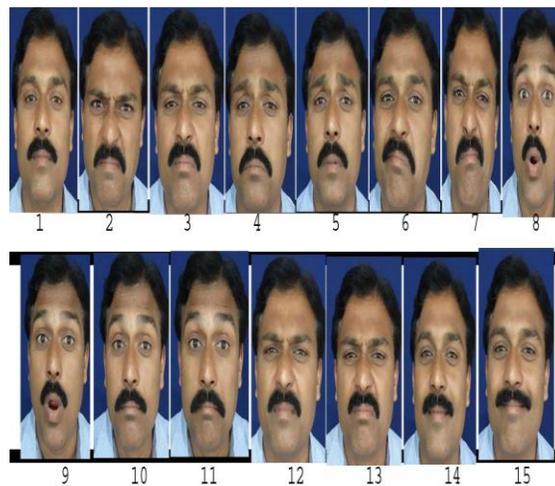


Fig. 6. Expression

B. Using CCTV Camera

CCTV Camera are used for surveillance purposes on different situation and or different places. In face recognition scenario one can match image of surveillance camera to available database with image. Image acquisition surveillance cameras were installed in Corridor at the height of 2 meter and positioned as illustrated in Fig. 7.

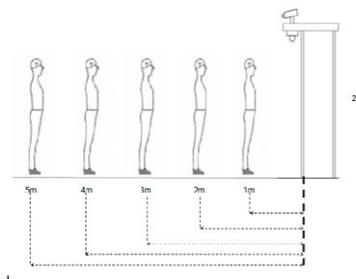


Fig. 7. CCTV image Acquisition Methodology

1. Outdoor Condition

For surveillance camera image acquisition in outdoor condition, 700 TVL surveillance cameras was installed in Corridor at the height of 2 meter and positioned as illustrated in Fig. 7. The only source of illumination was the outdoor sun light. The person walk through the camera and standing each distances like 1, 2, 3, 4, 5 meter. The person move his neck from left to right and from upward direction to the downward direction. Recording of the camera video streams on internal hard disk. For storage of images and for controlling surveillance camera we used 4 channel Digital recorder with adequate software provided from manufacturer for connecting and controlling over personal computer. We have collect 5 face images from each distances from camera with frontal, left, right, up and down directions of pose randomly. So each distance has 5 face images of single subject. Total face images of five distances is 25. The captured images is converted into RGB to Gray scale and then manually cropped and resize with 100 x 125 pixels. Images shown in fig.8.



Fig.8. CCTV Outdoor

2. Indoor Infrared Condition

We adopt the image acquisition procedure same as the outdoor condition, only difference is using the separate dark room for the same setup. So total 25 face images of single subject as shown in fig.9.



Fig. 9. CCTV Indoor

DATABASE DEMOGRAPHICS

The participants in this project were students, professors and employees at the Arts, Commerce and Science College, Kirannagar, Amravati, Maharashtra. From total of 180 volunteers, 114 were males and 16 females. All participants were Indian, between the ages of 18 and 45.

EXPERIMENTAL SETUP

The Baseline PCA Algorithm for recognition the database of Expression and Illumination are used for 50% training and 50% testing the recognition rate for Expression is 91% and For illumination 86%. The PCA algorithm details as well as the experimental Protocol are beyond the scope of this paper.

RESULTS AND DISCUSSION

The Result shown in Experiment are good with the baseline Algorithm PCA. For user may use this database with different Algorithms and protocols. User may choose the training and testing combination for digital camera images to the CCTV camera images with Different Pose and Lighting condition. And compare the results with different available databases.

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