# Rectification and analysis of facial images from video sequences using Image Processing

Nidhi Chandrakar
DIMAT,Raipur,(C.G.)
M.Tech (CSE(Info. Security)

Sanjivani Shantaiya
DIMAT,Raipur,(C.G.)
Reader Dept. of CSE

## ABSTRACT
This paper presents a novel method for facial feature extraction from video. Face recognition from video has been extensively studied in recent years. Intuitively, video provides more information than a single image. When a face is partially occluded, handling the occluded part of the face is an especially challenging task. The present research work proposes the method to recognize a face from video based on face patches. First, face patches are cropped from the video frame by frame [4]. Then, face patches are to be matched to an overall face model and stitched together. By accumulating the patches, a reconstructed face is to be built which is used in recognition. Then testing has to be done in two parts. In the first part, a still face database is to be used by randomly occluding parts of the face and using the remaining face patches in recognition. In the second part, the image is to be tested on video sequences.

**Related Work**
Automated face recognition is a relatively new concept. Developed in the 1960's[1], the first semi-automated system for face recognition required the administrator to locate features(such as eyes, ears, nose, and mouth) on the photographs before it calculated distances and ratios to a common reference point, which were then compared to a reference data[2].

## 1. INTRODUCTION
In this project work propose a method to recognize a face from video based on face patches [4]. First, face patches are cropped from the video frame by frame. Then face patches are matched against overall face model and stitched together. By accumulating the patches a reconstructed face is built which is used in recognition. The present research work proposes a novel method to recognize a face from video based on face patches. The work has been carried out in three phase. The first phase is image preprocessing which contains image acquisition, image filtration and image enhancement and image segmentation. The second phase comprises of extracting various features from faces and creating a knowledge base. The third phase includes pattern matching of unknown test images. The testing process has to be carried out in two types. In the first type a still face database is used by randomly occluding parts of the face and using the remaining face patches in recognition. In the second type, the face image is tested on video sequences. Successful video-based face recognition must be able to classify faces with a range of image plane and 3-D orientations [3].

The work has been carried out in the phases as: image rectification, feature extraction, training and testing phase.
In the rectification phase, first input facial image is acquired, then it has been cropped, after that it has been scaled, then enhanced and compressed for the removal of distortion with loss-less information, then it has been segmented for edge detection.
In **training phase** features have to be extracted. Various morphological, length and width of nose, eyes and mouth area features of face image has to be extracted. Then the extracted features have to be trained using feed forward back propagation neural network.
In the **testing** phase, the extracted facial features which uses Artificial Neural Network has to be applied. This process has to be carried out by implementing an algorithm developed in present thesis work. Finally unknown face image has to be studied .The features from the unknown facial images have to be extracted. They have to be matched for pattern matching with existing face image.

## 2. PROPOSED METHODOLOGY
The proposed methodology or procedure for extraction of features from human face image is given in below steps:

Step1: Acquire the video sequence.
Step2: Acquire the image from video sequence.
Step3: Crop individual rice face and scale it.
Step4: Enhance image to remove noise and blurring.
Step5: Do the image segmentation.
Step6: Extract features of faces like length and width of nose, eyes, mouth area.
Step7: Use these features to train the system using Feed-Forward back propagation neural network.
Step 8: Employ unknown face image to extract its features.
Step 7: perform the pattern matching with data set.
Step 8: Do the classification
Step 9: Take decision as face is matched or not.

## 2.1 Preprocessing
### 2.1.1 Image acquisition
The images are acquired with a color Digital Camera/ web camera was used to capture images of human faces keeping fixed distance of approximately 1 meter. To collect data a camera has been placed at a location situated with a plane normal to the object's path. The environment was controlled to improve the data collection with simple plain background. First the video ware captured and then we convert that video in images then stored in JPG format. Through data cable these images has been transferred and then stored in disk managing proper sequence.

## 2.2 Image Enhancement

Image processing modifies pictures to improve them (enhancement, restoration), extract information by analysis, recognition, and change their structure i.e. Composition, image editing. Image enhancement improves the quality and clarity of images for human viewing. Removing blurring and noise, increasing contrast, and revealing details are examples of enhancement operations. Noise reduction merely estimates the state of the scene without the noise and is not a substitute for obtaining a "cleaner" image. Excessive noise reduction leads to a loss of detail, and its application is hence subject to a trade-off between the undesirability of the noise itself and that of the reduction artifacts. Noise tends to invade images when pictures are taken in low light settings. A new picture can be given an 'antiquated' effect by adding uniform monochrome noise. Due to scaling the image has been distorted, hence it is been enhanced by applying special median filtering to the image to remove noise. Image is been compressed using DCT compression. Complement of the image has been done and the image has been properly adjusted for plotting histograms. Smoothing of the image is been done to reduce the number of connected components that is done by applying standard mask and then doing convolution with the image. Finally equalization of image has been done.

### 2.2.1 DCT Compression

The first problem in the present work is detection of noises and loss-less information in the image. Due to the presence of noise the performance of the system may degrade. Hence it must be removed and hence compressed, for obtaining better results during classification process. Discrete Cosine Transform (DCT) is been used to solve the aforementioned problem. The Discrete Cosine Transform (DCT) represents an image as a sum of sinusoids of varying magnitudes and frequencies. The DCT has the property that, for a typical image, most of the visually significant information about the image is concentrated in just a few coefficients of the DCT. For this reason, the DCT is often used in image compression applications [5].

Mathematical representation of DCT is:-

$$DCT \quad \frac{\cdot}{\sqrt{2N}} CuCv \sum_{x}^{N} \sum_{x} Pxy \cos\left[\frac{(2x \quad 1)u\pi}{2N}\right] \cos\left[\frac{(2y \quad 1)v\pi}{2N}\right] \ldots 2.1$$

Cu Cv=$\frac{1}{\sqrt{2}}$ for u,v=0

Cu Cv=1 otherwise

**2.3 Image Segmentation**

After image enhancement, the image has been segmented. Image segmentation i.e. subdividing an image into different parts or objects is the first step in image analysis. The image is usually subdivided until the objects of interest are isolated from their background. There are generally two approaches for segmentation algorithms. One is based on the discontinuity of gray-level values; the other is based on the similarity of gray-level values. The first approach is to partition an image based on abrupt changes in gray levels. The second approach uses thresholding, region growing, region splitting and merging. Segmentation of nontrivial images is one of the most difficult tasks in image processing. Segmentation accuracy determines the eventual success or failure of computerized analysis procedures. Segmentation basically includes edge detection. Thresholding is also one of the fundamental approaches of segmentation. Another approach is for region oriented segmentation as Watershed segmentation for an example. In the present research work after enhancement of image the edges of the object in binary image has been detected using Canny and Sobel detector(mask).Using canny/sobel method edged has been detected. Edge detection using Sobel detector results more accuracy than using canny edge detector. Edges are also been detected by applying Laplacian of Gaussian filter. Thresholding has been done according to properties of neighborhood. Thresholding can be done in terms of global or local thresholding. Generally local thresholding is been preferred if the background illumination is uneven. Also watershed segmentation & connected component segmentation can be used. Watershed segmentation is been used for region based segmentation. Thus Image Segmentation is an essential preliminary step in most automatic pictorial pattern recognition and scene analysis problem.

## EXPERIMENTAL RESULTS

The preprocessing of real image is done in present; the experimental result of the work is given in below figures:

figure 3.1 original colored image

figure 3.2 gray scale image

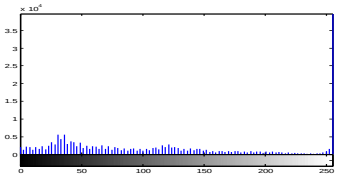

Figure 3.3 Histogram plot of gray scale image

figure 3.4 Edge detected by Sobel

figure 3.5 Edge detected by canny

Figure 3.6 Histogram of Sobel image

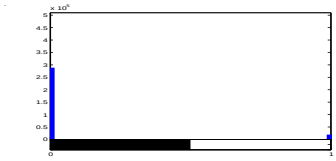

Figure 3.7 Histogram of Canny image

1. **Conclusion and Further work**

The present work that has been done is preprocessing of image, is listed below:

- Image Acquisition
- Image filtering
- Image enhancement
- Image segmentation

Next the work has been carried out with video sequences are:

- Facial feature extraction: length and width of eye, nose, mouth, orientation of face and color features.
- Applying ANN for training the system.
- Pattern matching trained and test image.
- Recognition.

# 4. REFERENCES

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