Image Pre-Processing, Face Detection and Feature Extraction

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Abstract

Various image processing techniques can be used to enhance the captured image and there increase in the recognition rate. Image normalization, denoising, filtering ,histogram equalization, image resizing and cropping and accurate face detection are certain techniques to enhance image quality and improve recognition rate Image pre-processing is done prior to extraction of features from the image

1. Image Pre-Processing Techniques

1.1 Image Normalization:

Illumination variation is one of the important challenges in face recognition, Image with uncontrolled lighting conditions i.e the distribution of intensity/gray levels is not alike. To make these levels equal or almost equal we use histogram equalization technique.Given an M x N image,Cumulative Distribution Function (CDF) at each Pixel Value (V) is used to find pixels equalization value(h) over L gray levels.

Mathematically it is given as: $h = \left[\frac{CDF(V) - CDFmin}{MXN - CDFmin} \right]$

1.2 Image De-Noising and Filtering:

Images are often by default have Gaussian noise due to illumination variations.To de-noise it we work on pixel based filtering technique. In our project we used Low Pass Filter (LPF) to eliminate high frequency information and retain only with low frequency information.

1.3 Face Detection and Cropping:

Face detection involves detecting a face from an image using complete image (image based approach) or by detecting one or more features from the image (Feature based approach) such as nose, eyes, lips etc.Face detection can also be done based on active shape models such as locating head boundary.The project haar cascade classifier is used, It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.Face cropping is also an important task to achieve high recognition rate.

2. Feature Extraction:

Input image after preprocessing fed to a feature extraction scheme to extract features from it.LBPH is used,For each pixel in the grayscale image, we select a neighborhood of size *r* surrounding the center pixel. A LBP value is then calculated for this center pixel and stored in the output 2D array with the same width and height as the input image.The last step is to construct a 256-bin histogram of LBP 2D array and normalize it to get a final feature vector.

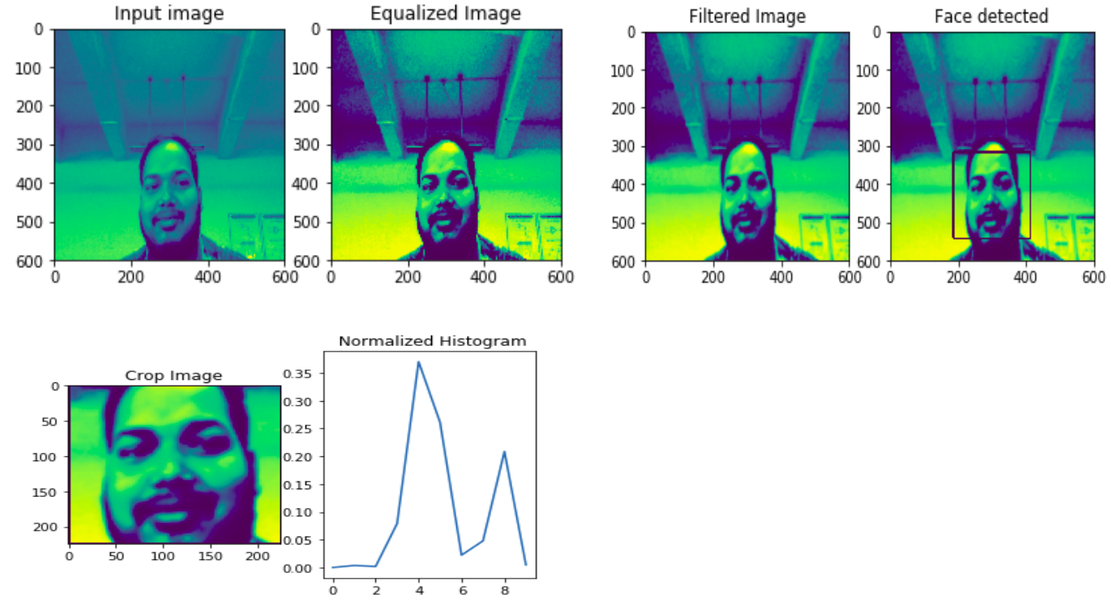

Fig 1.(a) Input image, (b) Equalized Image, (c) Filtered Image (d) Face detected Image, (f) Histogram plot.