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AUTOMATIC FACIAL IMAGE RECOGNITION USING HOG-SVG

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Abstract: Humans often use their facial identification to get recognized individuals and in recent improvement and capability of computing now allow recognition and detection automatically but with quite a number of disadvantages. Histogram of Oriented Gradients (HOG) has been recently adopted and seen as a standard for efficient face recognition and object detection generally. Our system will help to save instructional lecturer time by eliminating manual calling of name and also help monitor students.

1. Introduction

Face recognition is a computer vision research area that has attracted a remarkable interest recently due to its application in pedestrian detection, crime detection and biometrics also, the access to cheap computers and digital cameras have helped facial recognition research.

We applied HOG to a database of images obtained for extracting distinctive features of their facial images at different moods, looks and face positioning. Based on it, we used a regular grid to extract the HOG descriptors to reduce errors found in the facial feature during recognition that might occur due to illuminations, pose and occlusions.

2. Literature Review

A set of features that allows the face to be discriminated clean, even under bad illumination or clustered backgrounds will be needed .Shireesha and Raghunath proposed a system for managing attendance, this system is based on face detection and recognition algorithms. Once a student enters the lecture hall, the system automatically detects their face and takes the student attendances after recognizing them. Results are shown manually.

Visar and Agni proposed a real-time algorithm for facial image recognition used in automatic attendance taking. Navneet and Bill studied the problem of feature sets for human

detection by using linear support vector machine (SVM) based on human detection as a test case and found out that HOG descriptors gives better output. Alberto et proposed a new algorithm for face recognition using the common EBGM (Elastic Bunch Graph Matching).

Histogram of Oriented Gradients:

The HOG approach is similar to scale-invariant feature transform shape contexts & edge orientation histogram. This count occurrences of gradient orientation in localized portions of an image then converts an input image of height H×widthW×3 (RGB) feature vector of length l. The standard input image size

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is 64×128×3 and the feature vector size of output is 3780. Mathematically, as follows

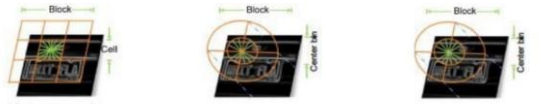
$$G_a = I(a+1,b) - I(a-1,b) \quad (1)$$
$$G_b = I(a,b+1) - I(a,b-1) \quad (2)$$

where $I(a,b)$ is the pixel intensity at position (a,b), and G_a and G_b are the vertical and horizontal properties of the gradients.

$$M(a,b) = \sqrt{G_a^2 + G_b^2} \quad (3)$$
$$\theta_{a,b} = tan^{-1}\frac{G_a}{G_b} \quad (4)$$

$M_{a,b}$ is the gradients magnitude, $\theta_{a,b}$ is the gradient angle at a given position. HOG descriptors fall into two major categories namely: Rectangular HOG (R-HOG), see Figure 1(a) and Circular HOG (C-HOG), see Figure 1(b) and Figure 1(c) [15].

In this paper, we use R-HOG descriptor to divide our input image into blocks made up of grids.



(a) A rectangular HOG (R-HOG) descriptor with 3 × 3 blocks of cells

(b) Circular HOG (C-HOG) descriptor with the central cell divided into angular sectors as in shape contexts

(c) C-HOG descriptor with a single central cell

Figure 1: HOG Descriptors [15]

In this paper, we use R-HOG descriptor to divide our input image into blocks made up of grids. Input facial images first divided into cells or small spatial regions, each cell in the window accumulates a local I-D histogram of edge orientations or gradient directions over the pixel of the cells. These can be circular or rectangular in shape, and the histogram bins are distributed evenly from 0° - 180° making every histogram bin have a spread of 200.

Face Recognition Using HOG Description:

ALGORITHM: Overview of HOG
Input: Facial Image
Output: Feature vector containing extracted features

Methodology

Step 1: Preprocess input images & Calculate the gradient image

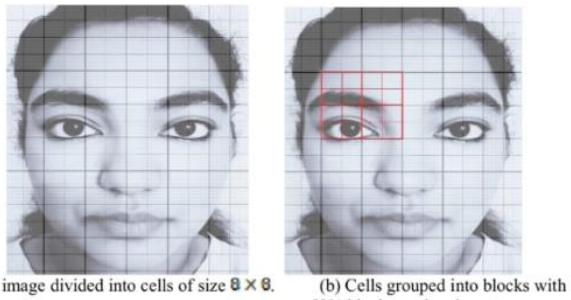
Step 2: Compute HOG in 8 x 8 cells with 16 x 16 block normalisation.

Step 3: Compute the HOG feature vector and Visualise the HOG.

5. Dataset and Methodology:

The HOG descriptors used in this paper is computed on 92 x 112 patch of a facial image, 8-bit gray levels organized in 25 directories - one for a single face in different moods and looks. We analyzed the image patches at multiple scales in numerous image locations. Patches are computed on a fixed aspect ratio.

An aspect ratio of 92: 112 and a patch size of 100 x 200 was used for computing our HOG feature descriptor. For easy computation, images are normalized into a dynamic range of [0,1] and converted to double precision.



(a) An image divided into cells of size 8 × 8.

(b) Cells grouped into blocks with 50% block overlapping rate.

The histogram gradients were computed using the Sobel operator with kernel size 1. The gradient image gets rides of much irrelevant information making the image still visible le cays recognition of the face in the image x s. Images with color the gradients of the RGB are evaluated and the facial image is divided into 8x cells and a HOG is

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computed for each cell. An 8 X image has pixel values. Magnitude & direction per pixel are of two values contained in the gradient of the image. A x path makes the system less prone to noise irrespective of individual gradient noise.

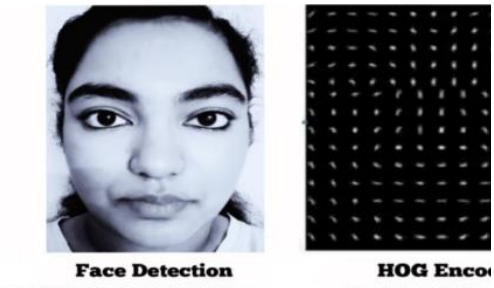
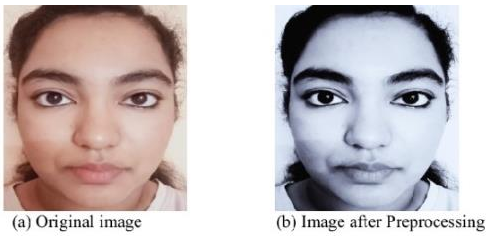


Figure 5. HOG visualisation for Figure 3(b)

Fig. 6. Extracted Histog Gradient Features for

This shows the blocks, catch block shows the histogram. At every block we obtained a vector or length 36 then computed by multiplying the no:of bins in each histogram by the no:of cells in block. Continued with every block, and normalization is carried out on the resulting vector before been transformed into a large HOG feature vector in sequence.

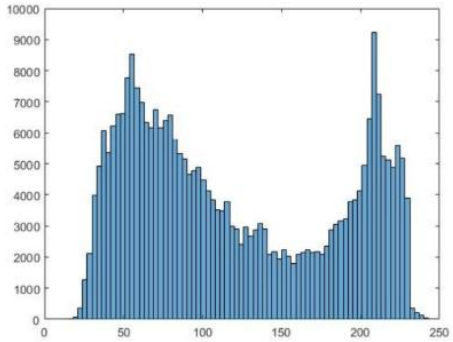
Then, the image gradients are processed by lapping the image with mask [+1: 0; -1] along a and b axes without smoothing, at each direction G, and G are gotten as the gradient matrices as illustrated in Figure3.



(a) Original image (b) Image after Preprocessing

Figure 3. Preprocessing for HOG Feature Extraction

The image window is split into the same dense sampled grid of points. At every point, the square pixel region in the image is centered, this is known as block and it is divided into cells and the block steps in both a and b directions are 8 pixels, this implies that the rate of overlapping is set as 50% to allow cache cell contribute at least once to block histograms.



3. Conclusion

This paper investigates the application of HOG features for facial image recognition. HOG descriptors attributes which are robust to changes in rotation and illuminations Central to the good performance of our technique is that the features are taken from a big set of blocks at multiple positions aspect ratios and sizes For the future, an efficient classifier using Support Vector Machines (SVM) will be developed

Also, is based on snapped images, developing a recognition system that will work for a video camera with real-time recognition will be a thing to look at.

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