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Face Identification using Histogram

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ABSTRACT

Various experiments or methods can be used for face recognition and detection however two of the main contain an experiment that evaluates the impact of facial landmark localization in the face recognition performance and the second experiment evaluates the impact of extracting the HOG from a regular grid and at multiple scales. We observe the question of feature sets for robust visual object recognition. The Histogram of Oriented Gradients outperform other existing methods like edge and gradient based descriptors. We observe the influence of each stage of the computation on performance, concluding that fine-scale gradients, relatively coarse spatial binning, fine orientation binning and high- quality local contrast normalization in overlapping descriptor patches are all important for good results. Comparative experiments show that though HOG is simple feature descriptor, the proposed HOG feature achieves good results with much lower computational time.
Keywords : Histogram of Oriented Gradients, Face Recognition, Histogram

I. INTRODUCTION

Various selection feature and methods extraction methods are largly being used. Other holistic methods such as PCA, LDA and Fisher Face the local descriptors have been studied recently.[7] The descriptors having large inter-class variance and small intra-class changes are considered to be ideal descriptors for local facial regions. Among the various descriptors that have been developed for appearance of the image blocks, local binary pattern feature yields some of the best results when used for images. The idea behind using local binary pattern is that the faces can be seen as a composite of patterns, which are well defined by this operator.[8] In practice the system has to less the number of possible scales or the more number of local regions to form a reasonable length feature vector as there are many micro-patterns.

One of the effective successful applications of image analysis and understanding, face recognition has recently received significant attention, especially during the previous several years.

Histogram of Oriented Gradients (HOG) is descriptors among many others. There are a some advantages of HOG over the other descriptors. As HOG operates on local cells, it is invariant to photometric transformations and geometric transformations, except for object orientation. These changes will only appear in widely spatial regions. The discovery by Dalal and Trigg's clearly states that the fine orientation sampling, coarse spatial sampling and strong photometric normalization permits the movement of pedestrians to be ignored as long as they maintain an upright position.[2] The local features and shapes in HOG can be characterized by the distribution of local intensity gradients or edge orientation even having the exact knowledge of the specific gradient or edge position. As the histogram gives translational variance it is robust to lighting changes. The HOG feature summarizes the distribution of measurements within the image regions and is particularly very useful for recognition of textured objects with deformable shapes.

II. HISTOGRAM OF ORIENTED GRADIENTS

In computer vision and image processing, histogram of oriented gradients is feature descriptor used for the purpose of object detection. The appearance of gradient orientation in localized portions of image are counted. This method is identical to that of scale invariant feature transform descriptors, edge orientation histograms and shape contexts, but it uses overlapping local contrast normalization and is computed on a dense grid of uniformly spaced cells to improve the accuracy

A. Basic Theory

Like the SIFT and EBGM method, the HOG feature is generated for each key-point of an image. The neighboring area around each key-point in the image is divided into uniformly spaced cells. For each cell a local 1-D histogram of edge orientations or gradient directions is accumulated over all the pixels of the cell. The feature of a key-point is formed by the histogram entries off all cells around that key-point. The image is represented by combining the histogram features of all key- points.

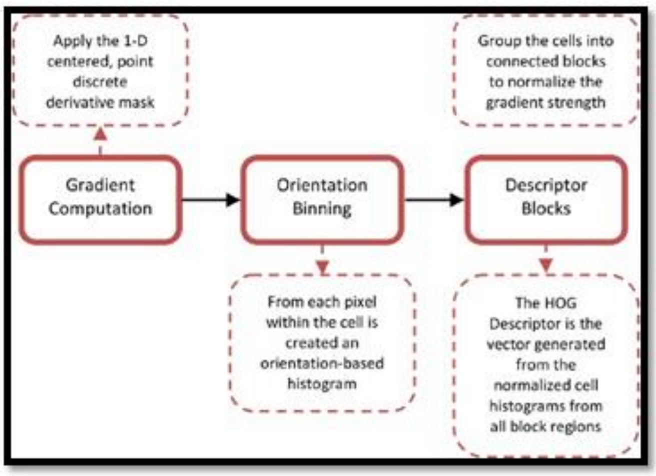

Fig.1. Block diagram of the overall flow

The histogram of oriented gradients is a dense feature extraction method for image. Dense means extracting features for all locations in the images as opposed to only the local neighborhood like Scale Invarient Feature Transformation Intuitively. It tries to capture the shape of structures in the region by capturing data about gradients. Each cell have fixed number of gradient orientation bins. It does so dividing the image into small usually 8x8 pixels cells and blocks of 4 x4 cells. Each pixel in a cell votes for the bin for orientation of gradient with a vote commensurate to the gradient magnitude at that pixel. To reduce aliasing, the pixels vote is bi-linearly interpolated. This interpolation happens in both the position and orientation. This statement is very important, it means that a pixel will not vote for its orientation bin, also to neighboring orientation bins (e.g. the gradient orientation at a pixel is 40 degrees, it will vote with a weight of 0.5 for the 35 to 40 degree bin and a weight of 0.5 for the 40 to 55 degree bin). Likewise it will also vote for the other two or three orientation bins not only in its cell, but also in the neighboring four cells of its cell. The distance of the pixel from the cell center is used to identify the weight. As the block has a step size of one cell, a cell will be a part of three blocks. Histograms are also normalized based on their energy regularized L2 norm across blocks. The four differently normalized versions of cell's histogram are thus identified. These 4 histograms are focus to get the descriptor for the cell.

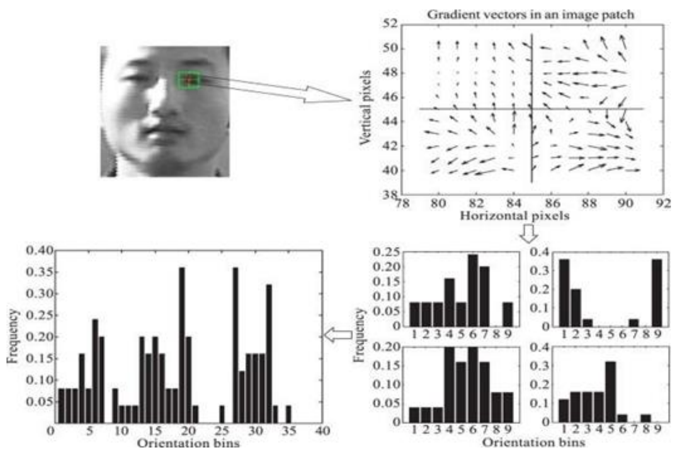

Fig.2. Image divided into small regions called cells.

Local 1-D histogram of edge orientation or gradient direction are accumulated and concatenated to form the final histogram feature.[1]

B. Orientation

A single angle treats a given edge as having opposite orientation whereas the Single angle maps it into the different orientation. Orientation can either be described as a single angle orientation or a more angle orientation. More patterns may be distinguished by using single angle representation. We are using images from an already existing Database We need two variables in order to describe the gradient vector. In this experiment we have used single angle orientation to allow more differentiation between patterns. Euler can be used to describe the orientation of a three dimensional body structure.

C. Normalization

Normalization is a flow that alters pixel intensity values. It is referred to as Histogram Stretching Contrast Stretching. It helps us bring the signal or image into a range that is more familiar to the senses, it better contrast. The purpose of normalization is usually to bring the image the type of double under study, range that is more relevant to us, the aim being achieving uniformity for good interpretation. The flow of normalization is usually carried out after calculating the vectors. Normalization has some approaches: first is Normalization to standard interval - (0,b) or (0,255). Second approach is Normalization to zero mean and unit variance where mean when changed to zero- wipes all the information in the image. so, it is advisable that we keep the mean value the midpoint value of intensity. finally, Histogram Equalization spreads the values to full range, 0-255; set the mean to midpoint and standard deviation or variance to 0.23 of the range. We have used L norm in our result. This scheme was used owing to its good comparative result.

D. Overlapping in HOG

For matching of the facial images accuracy is very important. The histogram provides some equilibrium to it, but it is not enough .Though accuracy is not possible the accuracy further decreases due to motion blurring or bad light conditions.. Thus to overcome this, HOG is introduced. This was inspired by Trigg's conclusion that the redundant information introduced by HOG significantly improves the performance.[2]

The pixel of every cell provides weighted histogram gradients to its respective angular bin. Overlapping in HOG gradietnt improves the performance of detection and identification which would have been otherwise difficult in presence of lighting conditions and motion and the information available, though redundant is highly effective in reducing the rate of false-positives. These small regions are called cells. Then for each individual cell compute a histogram of edge orientation direction for the pixels within the cell. The method we used here is to divide the image into connected regions. Separate each cell according to its orientation into angular bins. The neighboring cells group and are as spatial regions called blocks. This grouping of cells into blocks forms the basis for grouping and normalization of histograms gradient. The Set of histograms represents the block histogram and the set of block histograms represent the descriptor. The descriptor is a add of histogram of gradient which was obtained for every pixel within every cell of the image.

These grids may have cells of different sizes, but for simplicity we have used cells of the same size in our experiments. To generate an overlapped HOG , several HOG descriptors are first generated independently based on unique HOG grid .Thus the cells in different HOG grid may overlap with another. Due to overlapping the HOG feature is more robust to small variations. Some of other parameters, overlapping increases the performance for the HOG feature.

III. EXPEREMENTAL RESULTS

Various tests were used to evaluate the HOG on the face database. In the face identification database there are some grayscale images in GIF format of 15 individuals. For every individual, there are twelve images, one per different face configuration. As shown below the face an configuration are as follows:, normal, right light, sad, sleepy, surprised and wink, center light, with glasses, happy, left light, without glasses.

Fig.3. Images in yale face database.

All images of each subject were randomly selected for training. The HOG was compared with other existing methods like LDA, etc. The compare results of each method are summarized in the table below.

Method	2 train	3 train	4 train
S-LDA	58.6	73.3	78.8
Fisherface	46.7	63.3	74.0
2DLDA	45.4	58.3	65.5
PCA	47.0	51.0	56.7
HOG	78.44	84.00	86.00

There are different factors that have different effects on the performance of the HOG for face recognition. All factors do not affect the HOG performance the same way as in pedestrian detection.[4] Several experiments were carried out to evaluate the factors. These considered variations of, orientation bins, overlapping, angle representation, scales, cell size etc.

Face recognition and also its accuracy is shown in the Fig.4.

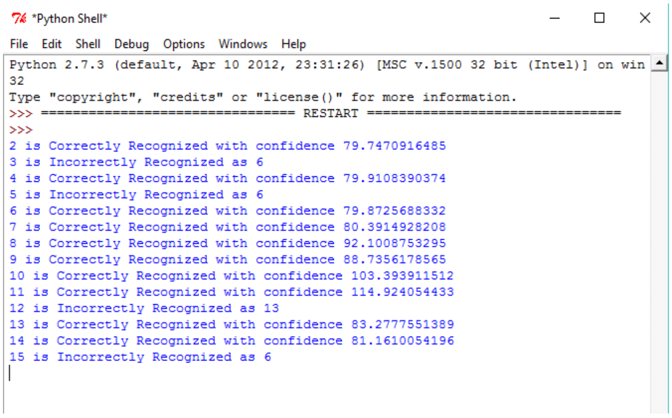

Fig.4. Final output of Face Recognition.

IV. CONCLUSION

The HOG feature is widely used for pedestrian detection but has been rarely used for face recognition. A fast computational method was developed and different factors were evaluated. We explore the use of HOG features for face recognition. The contributions are threefold:
To provide robustness to facial feature detection, we propose uniform sampling of the HOG features.

To remove redundancy in the data, improve computational efficiency and avoid over fitting. We propose to use, dimensionality reduction in the HOG representation.

We show that a decision-level combination of results using HOG features extracted from different image patch sizes significantly improves in choosing a single best patch size.

V. FUTURE SCOPE

The face recognition system are quite useful and work very well for frontal mug-shot images and constant light conditions, but the current face recognition algorithm are fails when there are varying light situation under which the humidity need to and are able to identify other public. The upcoming generation system will need to identify people in much less situations.

The idea of developing a system which can perform efficient under different light conditions and in present of noise cannot only rely on single modality. For good systems there needs to be a joint with other modalities. The technology used has to be allow the users to act freely. Considering all the requirements that need to be done, the face identification systems looks to have the most potential for wide applications.

VI. REFERENCES

[1]. Shu Chang, Ding Xiaoquing, Fang Chi, Histogram of the Oriented Gradients for Face Recognition, 2011. [2] ei Jia, Rong-Xiang Hu, Ying-Ke Lei, Yang Zhao, Jie Gui, Histogram of Oriented Lines for Palm Print Recognition, 2014.

[2]. Dalal N, Triggs B. Histograms of oriented gradients for human detection. In: IEEE Conference on Computer Vision and Pattern Recognition (CVPR). San Diego, CA, USA, 2005, 1: 886-893.

[3]. Gabor D. Theory of communication. Journal of Institute for Electrical Engineering, 1946, 93(Ⅲ): 429-457.

[4]. Zhao W, Chellappa R, Rosenfeld A, et al. Face recognition: A literature survey. ACM Comput. Surv., 2003, 35: 399-458.

[5]. Wiskott L, Fellous J M, Kruger N, et al. Face recognition by elastic bunch graph matching. IEEE Trans. Pattern Analysis and Machine Intelligence, 1997, 19(7): 775-779.

[6]. Freeman W T, Roth M. Orientation histograms for hand gesture recognition. In: Intl. Workshop on Automatic Face and Gesture Recognition. IEEE Computer Society, Zurich, Switzerland, 1995: 296-301.

[7]. Aba M. Patil, Satish R. Kolhe, Pradeep M. Patil and Milind E Rane, "Modified Fisher Face Approach for Robust Biometric Recognition System", ICGST International Journal on Graphics, Vision and Image Processing, GVIP, Vol. 10, Issue IV. 2010, pp. 9-15. Satyajit Kautkar, Rahulkumar Koche, Tushar Keskar, Aniket Pande, Milind Rane, Gary A. Atkinson,

[8]. "Face Recognition Based on Ridgelet Transforms," ICEBT 2010, Procedia Computer Science 2, pp.35–43, 2010.

[9]. Shrinivas Kadam, Ashwini Barbadekar and Milind Rane, "Face Detection Methods: A Survey," IJRIT International Journal of Research in Information Technology, Volume 1, Issue 11, Pg. 282-289, November, 2013

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