

Average Half Face Feature Detection – An Implementation of Viola Jones

Sourabh Arora ^{#1}, Shikha Chawla ^{*2}

^{#1}*Department of Computer Science and Engineering,
I.K Gujral Punjab Technical University
Jalandhar, India*

^{*2}*Asst. Professor, Department of Computer Science and Engineering,
I.K Gujral Punjab Technical University
Jalandhar, India*

Abstract— Face recognition refers to identify any individual in a digital image by just analyzing and comparing the patterns. We all must understand the importance of human face in conveying information about people's identity as it is a part of the human body by which we can identify a person without touching his/her body. Face recognition is better than biometrics because of its non-contact process. The use of average half face is done because Average half face not only gives better accuracy but saves storage and computation time also [1]. Both 2D and 3D images can be recognized using average half face. The average half face can be easily constructed from the full frontal face image in two steps; first step includes to center the face with nose tip as center point and divide it into two halves and then in second step the two halves are averaged together reversing column of one half. Once the average half face creation is completed then the features in the image are detected through Viola Jones method through concatenation process. After the detection process we can use various recognition algorithms such as Elastic Bunch Graph Matching (EBGM), Linear discriminant analysis (LDA), Principal component analysis (PCA) or some intelligent recognition algorithm for the face recognition.

Keywords— Face recognition, Biometrics, Average half face, EBGM, LDA, PCA

I. INTRODUCTION

Image processing is simply a form of signal processing in which input is an image i.e. photograph or video frame and output is either an image or a set of characteristics (parameters) related to an image. Today we deal with mainly two types of image processing, one is Analog image processing and other is Digital image processing. Analog image processing is an image processing in which analog means are used to conduct an image processing task on two-dimensional analog signals. The most common example of analog image processing is Television images [8]. The Digital Image Processing refers to processing of digital images by means of digital computers. Digital images are composed of a finite number of elements and each of which has a particular location and particular value. These finite numbers of elements are called picture elements, image elements, or pixels. The principle advantage of Digital Image Processing method is its preservation of original data precision, versatility and precision. We will be dealing with digital image processing mainly.

II. AVERAGE HALF FACE

To create average half face we first have to create a simple half face. To create a simple half face, the full face image is centered about the nose to represent the data as symmetry as possible. The symmetry means two spatial halves of the face images data are equal One half is called left half and other is called right half. For the creation of average half face these two halves are averaged together [3]. It should be clear that the columns of the one half-face must be reversed so that the two half-faces are aligned before averaging. After creation of average half face two main things that must be done are feature extraction and the face recognition using various parameters. The features of the face such as mouth, nose, eye can be detected. Also we can detect chin, head ear etc

III. VIOLA JONES METHOD

The Viola-Jones algorithm follows a principle to scan a sub-window that is capable of detecting faces easily across an input image [14]. The standard approach that we mostly use while detection of images includes rescaling of the input image to different sizes and then the fixed size detector is run through these images. This approach is rather time consuming because different size images have to be calculated. Viola jones is different from this standard approach because Viola-Jones method works by rescaling the detector. The detector is rescaled instead of the input image and detector is run each time with a different size through the image. We might think that both approaches take equal time, but Viola-Jones have developed a scale invariant detector that requires the same number of calculations whatever the size. This detector is constructed using an integral image and some simple rectangular features reminiscent of Haar wavelets [15]. The viola jones algorithm is designed for quick image detection. The algorithm has mainly four stages i.e Haar Features Selection, Creating Integral Image, Adaboost Training algorithm and Cascaded Classifiers. Haar features are simple and Inexpensive image features which are based on intensity differences between various rectangle-based regions that mostly have similar shapes to the Haar wavelets. AdaBoost is a Super-Efficient Feature Selector. In viola jones we don't have to convert image to gray scale to detect edges we directly detect features in coloured

images .Using Viola Jones we can detect faces or features with a great accuracy and quickly.

IV. ADVANTAGES OF VIOLA JONES

There are various advantages of using Viola Jones. It is one of most efficient methods having following advantages

- Extremely fast feature computation
- Efficient feature selection
- Scale and location invariant detector
- we can scale the features. rather than scaling the image itself
- Another such type of detection scheme can be trained for detection of other types of Viola jones saves time where as other methods take more time
- We can also apply viola jones to open mouth images

V. METHODOLOGY

To process an image, Read the image first. After reading, convert its full frontal face to two half faces, namely left half face and right half face. Then create the mirror image of one half face, either of left or right. Using the mirror image and other half face image as it is, develop the average half face. Concatenate the average half face with the half face image whose mirror image has been developed. Then apply viola jones feature detection technique to detect face and other facial features like eye, nose and mouth. Now draw diagonals between the detected boxes and mark the points of diagonals on average half face

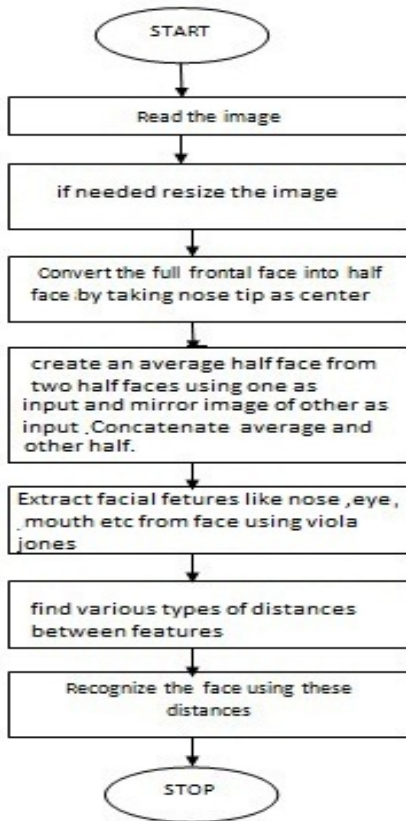


Fig. 1 Proposed Flowchart

VI. EXPERIMENTAL RESULTS



Fig. 1 Full Frontal Face Image



Fig. 3 Left Half Face



Fig. 4 Right Half Face



Fig. 5 Average Half Face

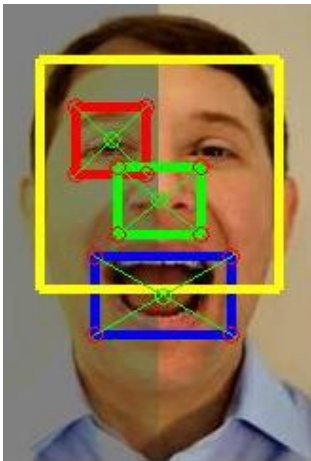


Fig. 6 Concatenated Average image with face and feature detection including eye ,nose and mouth



Fig. 7 Average Half Face with detected feature points of eye, nose and mouth

VII. CONCLUSION

Even though a lot of work has been done in the field of face recognition but the average half face has not received much attention so it can be used in face recognition in a very good manner. Since using average half face approach increases accuracy [1] and reduces time and space consumption [2]. we can explore this field more. Various edge detection algorithms have been used till now for feature detection in average half face but no one has used viola jones. This paper shows Using Viola jones we don't really have to convert the image to gray scale; we can detect features and face from coloured image directly. The results show that the viola jones is accurate and easily detect features and face from the average half face quickly and efficiently. We can further increase the research by applying face recognition methods or algorithm and use this average half face with detected features to recognize the face .Also we can check the recognition accuracy using different databases.

REFERENCES

- [1] Vashisht, "Average half face recognition by elastic Bunch graph matching based on distance Measurement" ,International Journal for Science and Emerging Technologies with Latest Trends2012,pp24-35
- [2] Josh Harguess and J.K. Aggarwal, "A Case for the Average-Half-Face in 2D and 3D for Face Recognition", International Conference on Pattern Recognition ICPR.2009, pp7-12
- [3] Harguess, "3D Face Recognition with the Average-Half-Face", International Conference on Pattern Recognition ICPR.2008, pp 2175-79
- [4] Zhang, "Comparison of Three Face Recognition Algorithms" International Conference on Systems and Informatics, 2012, pp1896-1900
- [5] Anuar, "Nose Tip Region Detection in 3D Facial Model across Large Pose Variation and Facial Expression", IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 4,2010, pp. 1-9.
- [6] Chua, "3D Human Face Recognition using Point Signature" In International Conference on Face and gesture Recognition,pp233-238
- [7] White, "Redesigning Photo-ID to Improve Unfamiliar Face Matching Performance", Journal of Experimental Psychology: Applied, American Psychological Association.2014, pp166-173
- [8] Dong, "A half Face recognition Scheme", Eighth ACIS International Conference, 2007, pp. 355-358.
- [9] F. Prokoski, "History, Current Status, and Future of Infrared Identification", In Proceedings of IEEE Workshop on Computer Vision beyond the Visible Spectrum: Methods and Applications, 2000, pp.5-14.
- [10] K.V. Joshi and N.C. Chauhan, "Edge detection and template matching approaches for human Ear Detection", International Conference on Intelligent Systems and Data Processing, 2011, pp.50-55.
- [11] Nadernejad, "Edge Detection Techniques: Evaluations and Comparisons", Applied Mathematical Sciences, Vol. 2, issue 31, 2008pp. 1507 – 1520.
- [12] http://en.wikipedia.org/wiki/Face_detection
- [13] Viola, P. and M. J. Jones "Robust Real-Time Face Detection." International Journal of Computer Vision 57(2): pp137-154.
- [14] Manisha V. Borkar and Bhakti Kurhade, "A Research Face Recognition by Using Near Set Theory" (2015), Volume 5, Issue 4, 2015 ISSN: 2277 128X