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Detecting Face in video file and images

Neelam Mahale[1*], Dr. Manoj S. Nagmode[2]

[1*,2] *MIT COE Pune, India*
neelam_mahale@rediff.com, manoj.nagmode@mitcoe.edu.in

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***Abstract*—** Face detection is very first term face recognition. Find Face and feature of face has very important in many application such as face tracking, surveillance and security system etc. This paper presents a face detection technique which detects the faces in images and video file. It receives the images or video file from camera and detects the locations of face(s). This system uses Opencv library and VC 10.

***Keywords*—** Fact detection, Haar classifier, cascade, opencv.

I. INTRODUCTION

Face and facial feature detection plays an important role in face recognition. It is used in many applications like video surveillance, object tracking, security, smart rooms, intelligent robots, biomedical image analysis. Efficient face detection algorithms are required for these tasks. Recently face detection is attracting much attention in the society of network multimedia information access. The face detection system is providing to be very efficient in the present day market. Now a day the need to maintain the security of information or physical property is becoming both increasingly important and increasingly difficult. It has been noticed about the crimes of credit card fraud, computer hackings, or security breaches in a company or government buildings [9]. Government agencies are investing a considerable amount of resources into improving security systems as result of recent terrorist events that dangerously exposed flaws and weaknesses in today's safety mechanisms. This paper presents face detection method which is based on the Viola-Jones algorithm using Haar feature [6][8]. This algorithm looks specific Haar feature of human face. When one of the features is found it allows the face candidate to pass to the next sections the original image called sud-windows. This sub-window is often scaled in order to obtain a verity of different size faces. The algorithm scans the entire image with this window and denotes each respective section a face candidate [4].

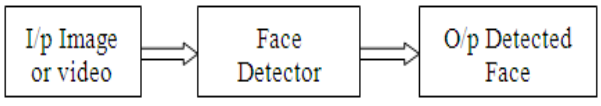

Fig. 1 Block diagram of face detector

Corresponding Author: *Neelam Mahale*

This system presents a technique of face detection. In which the image or a video file captures from camera or takes from database. The next step is to apply algorithm and detect the locations of the faces. The block diagram of the system is shown in Fig. 1

II. RELATED WORK

Face detection techniques have been researched for years and much progress has been proposed in literature. Most of the face detection methods focus on detecting frontal faces with good lighting conditions. According to Yang's survey, these methods can be categorized into four types: knowledge-based, feature invariant, template matching and appearance-based.

- Knowledge-based methods use human-coded rules to model facial features, such as two symmetric eyes, a nose in the middle and a mouth underneath the nose.
- Feature invariant methods try to find facial features which are invariant to pose, lighting condition or rotation. Skin colors, edges and shapes fall into this category.
- Template matching methods calculate the correlation between a test image and pre-selected facial templates.
- Appearance-based, adopts machine learning techniques to extract discriminative features from a pre-labeled training set

Face detection proposed by Paul Viola, Michael J. Jones, is very popular among the face detection approaches based on statistic methods. This algorithm achieves rapid robust face detection. They proposed a face detection framework based on the Ada-Boost learning algorithm using haar features [6]. Junguk Cho et al. [4] presented hardware architecture for face detection using Haar features. The architecture was designed in Verilog HDL and implemented in Vertex-5 FPGA. In this architecture the performance of hardware

implementation was good as compared to equivalent software implementation. J. Cho et al. [5] presented a parallelized architecture for Hardware acceleration of multi-view face detection, this system rotated image window and their integral image window for each classifier which perform parallel classification operations to detected non-upright (rotated) and non-frontal (profile) faces in the image. I. Sajid et al [1] presented a High performance FPGA based Face recognition system, where they used fixed point technique with software hardware co-design methodology which reduces cycle and provides the flexibility in face recognition. Hau T. Ngo et al. [2] described a flexible and efficient multilane architecture for real-time face recognition system based on modular Principal component Analysis method in a environment of FPGA, they showed that modular PCA improves the accuracy of face Recognition when face images have varying expression and illumination. Sathaporn et al. [3] presented new multipipelined architecture for face recognition system on FPGA. This architecture helps to reduce the recognition time through its pipeline process and also encourage the reduction in hardware resources. P.Karthigayani et al. [11] presented Occlusion verification in facedetection and age estimation using local binary pattern and dtod classifier using morph dataset, they focused on occlusion conditions in the face like wearing sunglasses and scarf in the eyes and mouth positions of the facial image and completed their work in three stages. They have finded high accuracy of identification of face using decision tree and local binary pattern method using non occluded part of the facial image as the feature.

III. FACE DETECTION SYSTEM

Object detection is a task to detected specified object class such as faces, number plate's, cars etc in an image or a video sequence. Object detection has many applications in computer based vision such as object tracking, face recognition and video surveillance. This paper presents architecture for face detection based system on Ada-Boost algorithm. Paul Viola and Michael Jones presented a fast and robust method for face detection which is 15 times quicker than any technique [6]. The technique use simple Haar-like features that are evaluated quickly through the use of a new image representation. By the use of an "Integral Image" it generates a large set of features .After that boosting algorithm Ada-Boost use to reduce the over-complete set and the introduction of a degenerative tree of the boosted classifiers provides for robust and fast interferences. The detector scans the image and used on gray-scale images, the scanned window that is applied can also be scaled, as well as the features evaluated.

A. Integral image

The intermediate representation of an image is called Integral image. Rectangle features can be computed by the integral image. At location p,q integral image contains the sum of pixels above and to the left of p,q, inclusive

$$ii(p,q) = \sum_{p' \le p, q' \le q} (p', q')$$

In above equation ii(p,q) is the integral image and i(p,q) is the original image shown in fig. 2. Using the following pair of recurrences:

$$s(p,q) = s(p,q-1) + i(p,q) \qquad (1)$$

$$ii(p,q) = ii(p-i,q) + s(p,q) \qquad (2)$$

Where s(p,q) is the cumulative row sum, s(p,-1) = 0, and ii(-1,q) = 0 the integral image can be computed in one pass over the original image. Using the integral image any rectangle sum can be computed in four arrays.

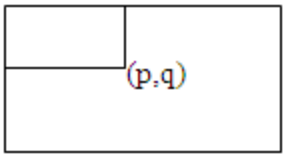

Fig. 2 The value of integral point (p, q) is the sum of all pixels above and to the left.

A. Haar Features

Haar features are combination of either two or three type's rectangles. Face candidates in images are scanned and searched for Haar features. These haar features is of the current stage. By using machine learning algorithm the weight and size of each feature and the features themselves are generated. The weights are constants generated by the learning algorithm. The various forms of features are shown in Figure 3. Every Haar feature has some value which is calculated by taking the area of each rectangle and multiplying each by their respective weights after that summing the results. The area of each rectangle is calculated by using the integral image. We can get the sum of all the pixels above and to the left of that location using coordinate of the any corner of a rectangle of the integral image. By using each corner of a rectangle, the area can be computed as denoted by Figure 4. Since 4 are subtracted off twice it must be added back on to get the correct area of the rectangle. The area of the rectangle D, denoted as the rectangle integral, can be computed as follows using the locations of the integral image: 4-3-2+1

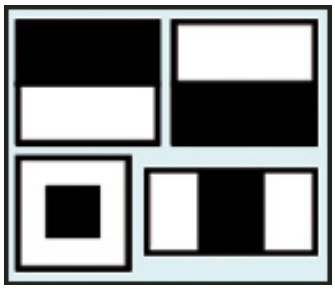

Fig. 3 Example of haar features

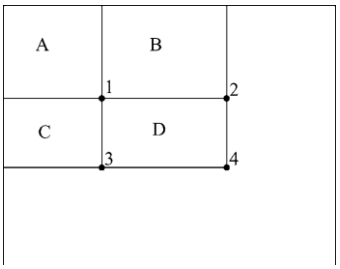

Fig. 4 Calculating the area of rectangle D is done using the corner of the rectangle: D=4-3-2+1

A. Haar feature Classifier

The value of features is calculated by rectangle integral. The Haar feature classifier multiplies the weight of all rectangle by its area and then the added the result together. The Haar feature classifiers compose a stage. A stage comparator sums all the Haar feature classifier results in a stage and compares this summation with a stage threshold. The threshold is obtained from the Ada-Boost algorithm and it is constant. Each stage does not have a set number of Haar features.

B. Cascade

The Viola and Jones face detection algorithm uses cascade of stages to eliminate the face candidate. The candidates exit the cascade if they pass all stages or fail any stage. A face is only detected if the candidate passes all stages. This process is shown in Fig 5.

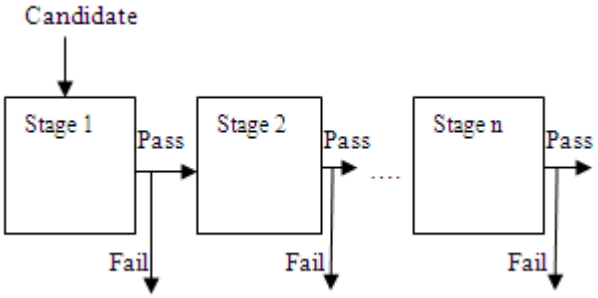

Fig. 5 Cascade of stage. Candidate must pass all stages in the cascade to be concluded as a face.

IV. EXPERIMENT AND RESULTS

The data base used for face detection contains single image and multiple face images. Some samples of images from this data set are shown in Fig. 6. These face images vary in face orientation, variety of facial expression, illumination, and different background. The experiment tris on different types of face images in group and single. The experiment also tries on some images which does not contain any image. Some input and output images are shown in fig. 6 and fig. 7.

Fig. 6 Input images for face detection

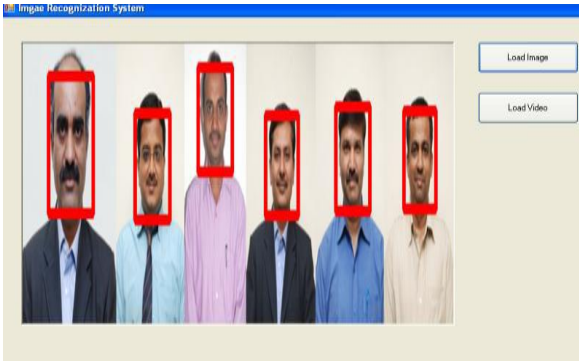

Fig. 7 Output images for face detection

V. CONCLUSION

In this work the system detected face in video file and images. The OpenCV library and C++ is used. We successfully detected face in video file and images. We find that if the image taken from more distance it will not detect the location of faces in group image. In future we can try for that. And also find that the system is not detecting face in side position, so in future we detect faces in multi-view directions.

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Neelam Mahale, Student ME, MITCOE Pune.
Teaching Experience 2 years

Dr. Manoj S. Nagmode,
Working as professor in MITCOE Pune in E & TC Department. He has 18 years of teaching experience. His area of intrest in image and vedio processing.

