CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class. Examples include upper torsos, pedestrians, and cars.

Face-detection algorithms focus on the detection of frontal human faces. It is analogous to image detection in which the image of a person is matched bit by bit. Image matches with the image stores in database. Any facial feature changes in the database will invalidate the matching process. Firstly, the possible human eye regions are detected by testing all the valley regions in the gray-level image. Then the genetic algorithm is used to generate all the possible face regions which include the eyebrows, the iris, the nostril and the mouth corners.

Each possible face candidate is normalized to reduce both the lightning effect, which is caused by uneven illumination; and the shirring effect, which is due to head movement. The fitness value of each candidate is measured based on its projection on the Eigen-faces. After a number of iterations, all the face candidates with a high fitness value are selected for further verification. At this stage, the face symmetry is measured and the existence of the different facial features is verified for each face candidate.

2.2 History of face detection

In the early stage, face detection algorithms mainly focused to detect the frontal human face. However, newer algorithms try to consider the different view of face as a core of face detection. During 1964 and 1965, Bledsoe, along with Helen Chan and Charles Bisson, worked on using the computer to detect and recognize human faces [5]. He was proud of this work, but because the funding was provided by an unnamed intelligence agency that did not allow much publicity, little of the work was published.

At the beginning of 1990, techniques are proposed focused on the face recognition on and increase the need of face detection. Many system were constructed to deal with video streaming. In 2001, Paul Viola and Michael Jones proposed a real-time face detector framework, named 'Viola–Jones object detection framework'. It is the first object detection framework to provide competitive object detection rates in real-time [3].

2.3 Face detection method

2.3.1 Viola jones method

The Viola Jones object detection method is the first object detection framework to provide competitive object detection rates in real-time proposed in 2001 by Paul Viola and Michael Jones. Although it can be trained to detect a variety of object classes, it was motivated primarily by the problem of face detection.

Paul Viola and Michael Jones presented an approach for object detection which minimizes computation time while achieving high detection accuracy. Paul Viola and Michael Jones proposed a fast and robust method for face detection which is 15 times quicker than any technique at the time of release with 95% accuracy at around 17 fps. The technique relies on the use of simple Haar-like features that are evaluated quickly through the use of a new image representation. Based on the concept of an Integral Image [4].

Cons: This method is faster and more accurate than any other method. Although it also need high level and high resolution image for face detection.

2.3.2 Gabor feature method

Sharif et al proposed an Elastic Bunch Graph Map (EBGM) algorithm that successfully implements face detection using Gabor filters. The proposed system applies 40 different Gabor filters on an image. As a result of which 40 images with different angles and orientation are received. Next, maximum intensity points in each filtered image are calculated and mark them as fiducial points. The system reduces these points in accordance to distance between them. The next step is calculating the distances between the reduced points using distance formula. At last, the distances are compared with database. If match occurs, it means that the faces in the image are detected.

Gabor feature method basically analyses whether there are any specific frequency content in the image in specific directions in a localized region around the point or region of analysis. Frequency and orientation representations of Gabor filters are claimed by many contemporary vision scientists to be similar to those of the human visual system, though there is no empirical evidence and no functional rationale to support the idea [6].

Cons: This method used 40 different image with different angles, sometimes it is difficult to find accurate angle and orientation.

2.3.3 Constellation method

The constellation model is a probabilistic, generative model for category-level object recognition in computer vision. Like other part-based models, the constellation model attempts to represent an object class by a set of N parts under mutual geometric constraints. Because it considers the geometric relationship between different parts, the constellation model differs significantly from appearance-only, or "bag-of-words" representation models, which explicitly disregard the location of image features.

 All methods discussed so far are able to track faces but still some issue like locating faces of various poses in complex background is truly difficult. To reduce this difficulty investigator form a group of facial features in face-like constellations using more robust modelling approaches such as statistical analysis. Various types of face constellations have been proposed by Burl et al. They establish use of statistical shape theory on the features detected from a multiscale Gaussian derivative filter [7].

Cons: This method is work on statistical analysis, sometimes it may be very time consuming.

2.4 Chapter summary

In this chapter we discuss about history of face detection. There are many scientist work on face detection. They use face in different sector in different cause. They try to get the maximized result. We discuss about top and more popular three face detection method. Viola Jones is the most accurate method. Gabor feature use about 40 image with different pose and orientation. Third method, constellation method is a statistical method. Sometimes this method is time consuming.