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## Real time face detection using haar-like feature method and local binary pattern method

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# Real time face detection using haar-like feature method and local binary pattern method

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**Abstract.** Face detection is one of the important roles in face identification. There are some difficulty factors in the process. Therefore, some methods are developed. This study aims to compare Haar-Like Feature method and Local Binary Pattern (LBP) method for face detection. Samples are 25 people in the Electric Engineering Department. Based on the result, Haar-Like Feature method is more accurate than LBP method. Haar-Like method can detect 20 faces from 25 faces with success rate of 80% while LBP can detect 14 faces from 25 faces with success rate of 56%. From this research, it is taken that both methods are having in trouble detecting face from someone that use glasses, have dark skin, or having facial hair.

## 1. Introduction

Bio-metric term is used to define the individual's DNA, Hand Geometry, Face or Retinal scans etc or Human behaviour and characteristics like hand gestures, body language, voice tone, signature and handwriting and so on. This kind of characteristics are the most important for a person because it is unique in the entire world or universe [1]. Biometric technique is widely used for identification and verification purpose[2]. Face is one of the most popular biometrics. There are many applications relate to face biometric since face is part of human that differentiate them.

First process for face identification is face detection. It is a process of detecting a face in an image, whether it is video or picture captured by the camera. Face detection is useful in many applications such as surveillance system, human machine interaction, biometrics recognition, gender classification etc[3],[4],[5]. For human being, face detection is an easy task but for a computer it can be quite difficult[6]. Computer needs to know some information about human's face and the located where the face is in the camera. The information which represents the face is called features.

Since face detection is one of the important role in applications, there are some difficulty factors such as illumination, contrast and varying of face tone. Therefore, some methods are developed. And since the applications pay attention to rate so the application can real time to detect face. When the face is captured by the camera, the camera can make detection sign on the screen of camera. The most popular features extraction methods are: Haar-Like Feature[7] and Local Binary Pattern (LBP)[8],[9]. This research objective is to analyze the different between those two methods while detect face of human. Some faces are detected by using laptop camera. The detection is done one by one person. We



can analyze about the contrast and the skin tone that affect those methods. Illumination factor we eliminated because the process of capturing the image is done in the same illumination condition.

## 2. Theory

### 2.1. Face detection

Face detection is a technology to identify human faces which can be useful in many applications. For human, face detection is a process of locating and recognizing faces from what they see[10].

The objective of face detection is to search faces in the image, then return the location of faces and the bounding box along those faces in the image regardless of illuminations, occlusions, facial pose, orientation and expression[11].

Face detection system which is able to identify and locate all faces regardless of their positions, scale, orientation, lightning, expressions and so on is considered the ideal one. Due to the large factor that can affect the process, face detection has been a challenging problem in the field of computer vision[12].

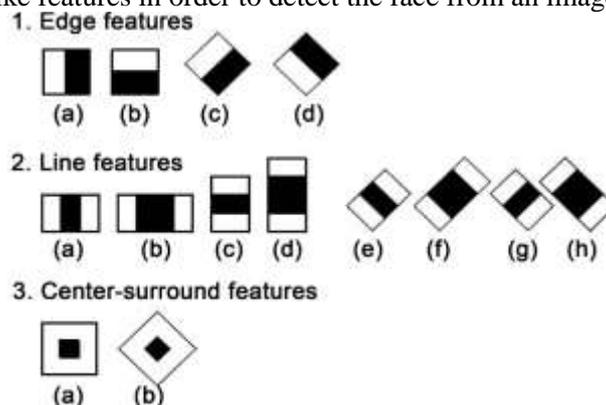
### 2.2. Haar like feature

The Haar-like Feature is a method to extract face features. Each Haar-like feature is composed by neighbouring rectangular regions. The values of the pixels in the black rectangular regions are subtracted from the values of the pixels in the white rectangular regions.

$$P(x) = \text{sum}_{\text{black rectangle}} - \text{sum}_{\text{white rectangle}} \quad (1)$$

The total represents the value of a Haar-like feature. While a Haar-like feature goes through the detection window, the area with the minimum value is the best match for this feature[13].

The Haar feature starts scanning the image for the detection of the face from the top left corner and ends the face detection process at bottom right corner of the image. The image is scanned several times through the Haar-like features in order to detect the face from an image[6].

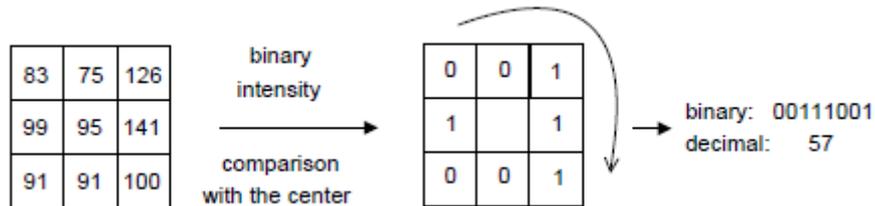


**Figure 1.** Haar-Like Feature

### 2.3. Local binary pattern (LBP)

The Local Binary Pattern (LBP) operator is a non-parametric  $3 \times 3$  kernel which summarizes the local spatial structure of an image[14]. Each pixel is compared with its eight neighbors in a  $3 \times 3$  neighborhood by subtracting the center pixel value. In the result, negative values are encoded with 0, and the others with 1. For each given pixel, a binary number is obtained by merging all these binary values in a clockwise direction, which starts from the one of its top-left

neighbor. The corresponding decimal value of the generated binary number is then used for labeling the given pixel[15].



**Figure 2.** Calculating LBP

The decimal form of the resulting 8-bit word (LBP code) can be expressed as follows:

$$LBP(x_c, y_c) = \sum_{n=0}^7 s(i_n - i_c)2^n \tag{2}$$

**3. Results and discussion**

This research was done at telecommunication lab of Electrical Engineering Department. There were 25 people with different characteristic on the face such as glasses, dark and bright skin tone. The data was taken real time using laptop camera.

**Table 1.** Result of Haar-Like Feature and LBP Face Detection

No	Method		No	Method	
	Haar	LBP		Haar	LBP
1			7		
2			8		
3			9		
4			10		
5			11		
6			12		

No	Method		No	Method	
	Haar	LBP		Haar	LBP
13			20		
14			21		
15			22		
16			23		
17			24		
18			25		
19			Result	20 from 25: 80% Success Rate	14 from 25: 56% Success Rate

Table 1 shows the result of faces that was detected and undetected by each method. Haar-Like Feature method can detect 20 faces from 25 faces thus resulting 80% of success rate. LBP method can detect 14 faces from 25 faces thus resulting 56% of success rate. From the table, Haar-like Feature method is more accurate than LBP for face detection. While taking data, it was found that both face detection method have trouble dealing with glasses, dark skin[16], and facial hair. For glasses, it is assumed that the light that reflected on the glasses cause a misreading. For dark skin and facial hair, it is assumed that those property affect the value so the method declared that it is not a face.

#### 4. Conclusion

From the result of this research, Haar-Like Feature can detect 20 faces from 25 faces with 80% success rate. LBP can detect 14 faces from 25 faces with 56% success rate. It is concluded that Haar-Like Feature is more accurate than LBP in detecting face.

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