

A Survey on Face Detection and Classification for Partially Occluded images

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ABSTRACT

In today's world of digitization, the major issues is authentication and identification. Face recognition on occluded images has many potential applications which have attracted the attention of researchers in the last decade. In real time application, face recognition is the vast research area to deal with problems like not proper illumination, partial occlusion, low-intensity images, and external occlusion by another face, etc. Occlusion means hiding the object by another object, e.g. face covered with a scarf, wearing glasses, beard, cap, mask, etc. is one of the greatest challenges in face recognition system. In this paper, there are four types of generally using system: face detection, extraction, classification, and recognition. In the Existing system, it is not so much identify the exact face of a person. In this proposed taking the different methods for face detection and recognition for occluded images. The main purpose of this paper is to comparative study analysis of the different methods for face detection and recognition on partially occluded images.

Keywords: -Face detection, partial occlusion, Face recognition, Impainted.

1. INTRODUCTION:

In image processing, face detection and recognition is a most important research topic. In today's world of digitization face detection, classification and recognition have a huge application but still, we face problems like partial occlusion, low-intensity images, side view images, etc. Hence, thieves, local criminals, and terrorists take advantage of it. Government is doing a lot of work to identify thieves and criminals, which needs manual interference. Our objective to implement an automated system which can detect and recognize human face with occlusion.



Fig.: Examples of Occluded Images

The automated system will mainly perform following three steps.

- Face Detection
- Features Extraction
- Face Recognition

Face Detection is used to identify whether the object is a human face or not and Feature Extraction involves reducing the amount of resources required to describe a large set of data. Face Recognition is used to identify the person by comparing its face with its previous database and Occlusion is used to hiding of an object by another object. Our main focus on partial occlusion in which face is covered with different obstacles like a scarf, wearing glasses, beard, cap, mask, etc. Different types of face occlusion are mentioned in the figure below.

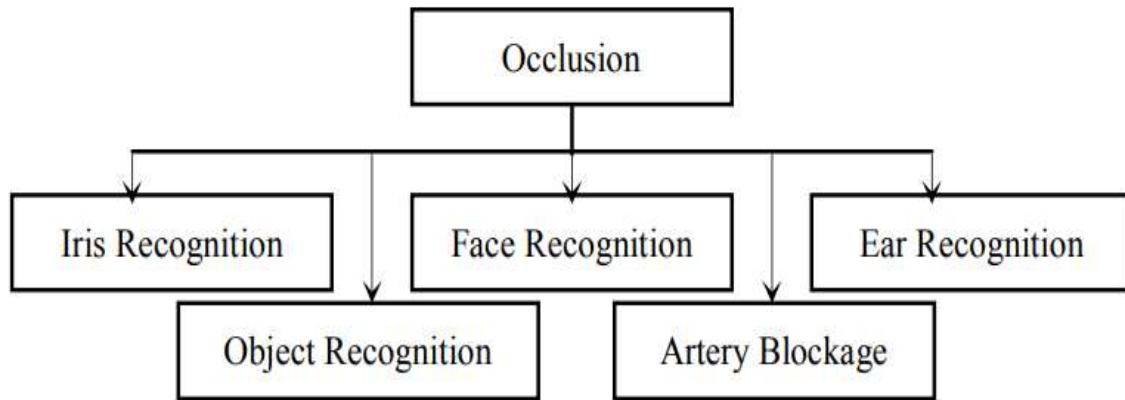


Fig.: Partial Occlusion in different areas [1]

2. LITERATURE REVIEW:

2.1 Occlusion Detection and Recognizing Human Face using Neural Network

- In this paper, the authors in [2] aim to improve the face recognition accuracy using Neural Network. In this paper Viola Jones algorithm is used for face detection and also used Fast Weighted Principal Component Analysis (FWPCA) for occlusion detection and reconstruction of occluded face. For recognizing the face feature extraction through Local Binary Pattern method to compare features like skin color, color of eye, etc. Here Neural Network is used to recognize face and give the resultant image by comparing faces from database. The simulation results show that their algorithm can produce 95% accuracy for recognizing occluded face. The proposed method also works on different parameters like structural similarity index and feature similarity index to prove the system better. The future work is on low intensity images and side view images.

2.2 Occlusion Detection Prior To Face Recognition Using Structural Feature Extraction

- In this paper, the authors in [3] propose a method to improve the performance of the CRC (Census Regression Classification) method, which is a modified version of LRC (Linear Regression Classification). In CRC, each pixel takes twice the amount of time than the execution time of LRC. In this paper, the Viola-Jones algorithm is used for face detection. As the LRC method is not suitable for the partially occluded face, if the occlusion is detected in the input, then face recognition is done using the CRC method, and if not detected, face recognition is done using the LRC method. The results revealed that the proposed approach has taken below 2 seconds for non-occluded faces and used a minimum number of structure features with good accuracy. The experiment shows that the accuracy for the upper part of face occlusion and lower part of the face occlusion is 85.93% and 76.81% respectively.

2.3 Occlusion-aware face inpainting via generative adversarial networks

- In this paper, the authors in [4] restore the corrupted regions of face images due to extreme lighting variations, occlusion, or even disguise. For face inpainting, Generative Adversarial Networks (GAN) based algorithms and morphological operations are used. According to the result, the advantage of this system is

it does not requiring the prior knowledge of locations and types of image corruption. Hence, it works when face images are taken in an unconstrained environment (pose, illumination and expression variation). According to this method when we deal with occlusion then the reflection of any occluded object is also consider as part of the same occlusion, thus the proposed method would not correctly detect the occlusion. So, result in partially inpainted outputs.

2.4 Real-Time Face Detection Using a Moving Camera

- In order to Real-Time Face Detection Using a Moving Camera, the authors in [5] propose a real-time face detection system to overcome the challenge multi-scale face detection. Detection of the face candidate is done using skin color, edges and face area. Then verification of face candidate is done using the Histogram of Oriented Gradient (HOG) and the two-class classifier C-SVM. SVM performs well on big datasets that have many attributes. The proposed algorithm avoid the huge amount of computation time and successfully detect most faces of the crowds in open space. The experiments show that the average detection rate of about 64.0% can be achieved with a false detection rate of 13.6%.

2.5 Occlusion Invariant Face Recognition System

- The purpose of this paper [6] is improves the face recognition accuracy. In this paper near set theory algorithm is used for face detection, Principal Analysis component (PCA) and SVM is used for occlusion detection and Linear Binary Pattern is used for face recognition. The main aim of the paper is to improve the performance of a face recognition under a varying condition such as partial occlusion. The system works on grayscale images. The proposed approach is to work on different parameters like structural similarity index and feature similarity index for prove system better. Future works of the proposed approach give a solution for a pose, illumination, aging and expression problem.

2.6 Occluded Face Detection Based on Ad boost Technology

- The Purpose of this paper [7] is to secure the ATM normal Transactions. In this paper, the AdaBoost Algorithm with cascade classifier is used for occluded face detection. This will help to detect the upper part of the human face then detect the lower part of the human face. If the upper half part of the human face was not detected then run to the lower part and conclude that face occluding the upper part of the face in the target region. As a result, the proposed method takes less computation time and 99% detection rate for the full covered face. The Proposed method also gets less detection rate at low covered faces as well as normal faces.

2.7 Face detection and Recognition in color images

- In this paper [8], the proposed method is use to detect and recognize the face with high accuracy on color image. They propose Template Matching algorithm for face detection, Skin color model for feature extraction and Principal Analysis Component for face recognition. The whole proposed system is divided into two parts. First separate skin region to non-skin region. Second generate the Chroma chart shows skin colors. Then using Chroma chart we create a grayscale image from the color image then recognize the face. The proposed algorithm can achieve up to 78% accuracy for face recognition. The proposed system deal with some problems like color image effect by many factors like ambient light object moments and different camera produce a different color value which depends on features of the camera.

2.8 Review of Face Detection based on Color Image and Binary Image

- In order to Review of Face Detection based on Color Image and Binary Image, the authors in [9] compare the different color model and method on color image and binary image to detect the face with high accuracy. In this survey, for different color model like RGB, YCbCr, HIS and different face detection methods are used on color models. In binary image method of face detection included LBP, PCA. The proposed paper have some problem in segmentation of skin color such as skin color and background color of image are same. As a result, the LBP method provide better results on binary images.

The Comparison table for face detection and recognition on binary and color images is given below.

3. COMPARATIVE TABLE:

Table -1:Comparison table for face detection and recognition on binary and color images [9]

| Method Type | Method Name | Advantage | Disadvantage |
|--------------|---|---|--|
| Binary Image | LBP | After taking the threshold value it is easy to detect the face. | In this to detect the face it is compulsory to take the threshold value. |
| | PCA | Image is not match that time to process will be continues try to match the image until match is found. | Image match time is more consume. Test image is reduce the length of feature vectors |
| Color Image | Skin color model based on RGB, YCbCr and HSI. | All three method can match to original skin color and detect the human face. | Only match to skin color based. When wear some objects related to skin color so difficult to detect face. |
| | Skin region based | Skin regions threshold value match to the original skin regions value and easily detect the human face. | Only match to skin color regions. When wear some objects related to skin color so difficult to detect face. |
| | Skin Segmentation | Easily detect the human faces with the algorithm of skin based segmentation. | There is a chances of getting the false result with this algorithm |

4. CONCLUSION:

In this work, many researchers have done a lot of research in face detection and recognition with different algorithms and methods for face recognition and detection for achieving high accuracy without obstacles. Some of the existing systems work on the front view of the face image, low-intensity image, structure similarity, feature extraction, and small database etc.

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