Review Paper on Face Detection Techniques Author

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***Abstract*- In this paper we compare different approaches used for face detection. We provide various advantages and disadvantages for each approach on the basis of detection rates, simplicity and versatility.**

Keywords:* *Face detection, Template Matching, Multilayer Perceptron.

1 . INTRODUCTION

Over the past few decades, face recognition has become a popular area of research in pattern recognition and computer vision due to its wide range of commercial and law enforcement applications, such as passports, credit cards, drivinglicences,biometric authentication, video surveillance, And system security. Although researchers in psychology, neural sciences and engineering, image processing and computer vision have investigated a number of issues related to face recognition by human beings and machines, it is still difficult to design an automatic system for this task.

Until now, a great number of face recognition approaches have been developed. In this paper brief description and comparison of some of this approaches is given. Variations in lighting conditions, pose and expressions makes face recognition an even more challenging and difficult task. A lot of approaches have been applied for different applications. Robustness and reliability becomes more and more important for these applications especially in security systems.

2 . FACE DETECTION

***2.1.1 Face Detection*-**Face detection is a technology to determine human face in an image.

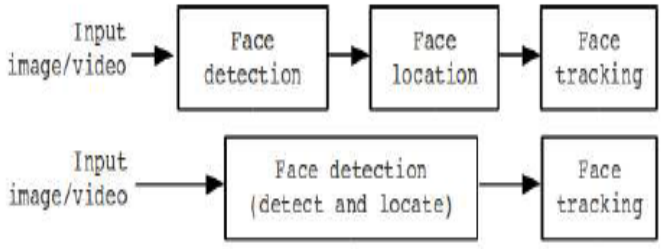

Fig. Face Detection Process

2.1.2 Importance of Face Detection:

The first step for any automatic face recognition system Involves the following things:

a) Expression Recognition.
b) Cognitive State/Emotional State Recognition.
c) Tracking: Face is a highly non rigid object.

Face Detection: Current state of research

a) State-of-the-art: Front-view face detection can be done at >15 frames per second on 320x240 black and white images on a 700MHz PC with ~95% accuracy.
b) Detection of faces is faster than detection of edges.
c) Side view face detection remains to be difficult.

2.1.3 Challenges in Face Detection are as follows:

a) Facial Expressions.
b) Occlusions by long hair, hand.
c) In-Plane Rotation.
d) Image conditions: Size ,Lighting condition ,Distortion ,Noise and Compression.

3. APPROACHES TO FACE DETECTION

3.1 Knowledge-based methods:

Encode what constitutes a typical face, e.g., the relationship between facial features.

Top Top-down approach: Represent a face using a set of human-coded rules

Example: The center part of face has uniform intensity values. The difference between the average intensity values of the center part and the upper part is significant. A face often appears with two eyes that are symmetric to each other, a nose and a mouth.

Use these rules to guide the search process:

Level 1 (lowest resolution): Apply the rule "the center part of the face has 4 cells with a basically uniform intensity" to search for candidates.

Level 2: local histogram equalization followed by edge equalization followed by edge detection .

Level 3: search for eye and mouth features for validation.

Pros:

a) Easy to come up with simple rules.
b) Based on the coded rules, facial features in an input image are extracted first, and face candidates are identified.
c) Work well for face localization in uncluttered background.

Cons:

a) Difficult to translate human knowledge into rules precisely: detailed rules fail to detect faces and general rules may find many false positives.
b) Difficult to extend this approach to detect faces in different poses: implausible to enumerate all the possible cases.

3.2 Feature invariant approaches:

Aim to find structure features of a face that exist even when pose, viewpoint or lighting conditions vary.

1) Bottom-up approach: Detect facial features (eyes, nose, mouth, etc) first.
2) Facial features: edge, intensity, shape, texture, color, etc .
3) Aim to detect invariant features .
4) Group features into candidates and verify them .

Pros: Features are invariant to pose and orientation changes.

Cons:

1) Difficult to locate facial features due to several corruption (illumination, noise, occlusion).
2) Difficult to detect features in complex background.

3.3 Template matching:

Several standard patterns stored to describe the face as a whole or the facial features separately.

1) Store a template.
2) Predefined: based on edges or regions.
3) Deformable: based on facial contours (e.g., Snakes).
4) Predefined: based on edges or regions .
5) Templates are hand-coded (not learned)
6) Use correlation to locate faces.

Pros : Simple

Cons:

1) Templates need to be initialized near the face images.
2) Difficult to enumerate templates for different poses (similar to knowledge-based methods).

3.4 Appearance-based methods:

The models are learned from a set of training images that capture the representative various faces.

It includes the following:

1) Neural network.
2) Multilayer Perceptrons.

Principle Component Analysis (PCA), Factor Analysis, Support vector machine (SVM) ,Mixture of PCA, Mixture of factor analyzers ,Distribution Distribution-based method .

Naïve Bayes classifier, Hidden Markov model ,Sparse network of winnows (SNoW) Kullback relative information ,Inductive learning.

Pros:

1) Use powerful machine learning algorithms.
2) Has demonstrated good empirical results.
3) Fast and fairly robust.
4) Extended to detect faces in different pose and orientation.

Cons:

1) Usually needs to search over space and scale.
2) Need lots of positive and negative examples.
3) Limited view-based approach.

4. Conclusion: In this paper our focus is the different face detection techniques and their advantages and disadvantages .This paper basically signify how the different face detection techniques can be improved after studying their different parameters and can be implemented for the newer methods.

5. REFERENCES:

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