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A Face Identification Technique for Human Facial Image

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Abstract- Face is a primary focus of attention in social intercourse, playing a major role in conveying identity and emotion. Human face recognition plays an important role in many user authentication applications in the modern world. Facial expression recognition can be utilized for automated analysis of human emotion. The system is commenced on convolving a face image after preprocessing the image at different scales and orientations. A given images of a face, identify or verify the emotion of person in the scene using a stored database of facial image properties. Available collateral information such as race, age, gender, facial expression, or speech may be used in narrowing the search (enhancing recognition). The solution to the problem involves detection of emotion from a given image, feature extraction from the face regions and recognition of emotion.

Keywords: ***facial expression recognition system, expression recognition, facial expression recognition.***

1. INTRODUCTION

Interrogations are a critical practice in the information gathering process, but the information collected can be severely compromised if the interviewee attempts to mislead the interviewer through the use of deception. Being able to quantitatively assess an interview subject's emotional state and changes in emotional state would be a tremendous advantage in being able to guide an interview and assess the truthfulness of the interviewee. Recent advances in facial image processing technology have facilitated the introduction of advanced applications that extend beyond facial recognition techniques. The recognition of facial expressions has attracted a lot of attention due to its potential commercial value in fields like Lie detection, Surveillance, Criminal Investigation, Security and Forensic applications. Facial expression recognition can be utilized for automated analysis of human emotion. This paper introduces an detection of emotion from a given image, feature extraction from the face regions and recognition of emotion. In identification problems, the input to the system is an unknown face, and the system reports back the determined emotion from a database having various extracted properties of emotion in facial images.

Approaches for Facial Expression detection are:

1.1 Template Based Method : This approach used the average face for each category of emotion and classifies the individual facial expression according to the best match of each template.

1.2 Feature Based Approach : It uses a training set of images for different emotion expressions. Features are extracted from each emotion subset for all facial expressions then are subsequently tested unseen facial image. The selection of Facial region is based on Facial Action Coding System (FACS).

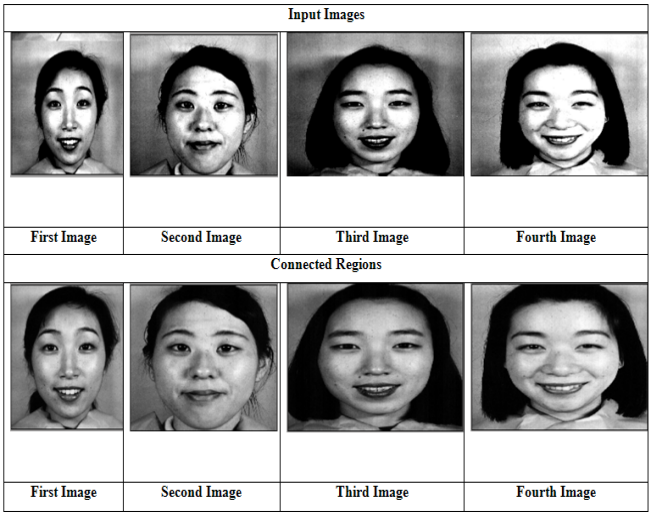
1.3Facial Action Coding system (FACS): It is a human observation based system designed to detect changes in facial regions. It consists 44 anatomically based action units, which individually or in combination can represent all visible discriminate expressions. Action units are: Upper lip raiser, Cheek Puffer, Nose Winkler, Lip corner puller etc.

2. PRESENT WORK

The various steps used in the present face recognition system are discussed below. Face recognition is one of the most relevant applications of image analysis. It's a true challenge to build an automated system which equals human ability to recognize faces. Although humans are quite good identifying known faces, we are not very skilled when we must deal with a large amount of unknown faces. The computers, with an almost limitless memory and computational speed, should overcome human's limitations. Face recognition remains as an unsolved problem and a demanded technology.

2.1 Database

The most common database used for facial expression system is JAFFE. The Japanese Female Facial Expression (JAFFE) Database contains 213 images of 7 facial expressions including neutral posed by 10 Japanese female models. Each image has been rated on 6 emotions adjectives by 60 Japanese subjects. For the implementation of face recognition a JAFFE database captured face data is used. Face database contains 24 colored face images of individual. There are 4 images per subject, and these 4 images are, respectively, under the following different facial expressions or configuration. In this implementation, all images are resized to a uniform dimension of 256 x 256. To date, the Cohn-Kanade AU Coded Facial Expression Database is the most commonly used database in research on automated facial expression analysis.



2.2 Face Recognition System Structure

The input of a face recognition system is always an image or video stream. The output is an identification or verification of the subject or subjects that appear in the image or video. Some approaches define a face recognition system as a three step process. From this point of view, the Face Detection and Feature Extraction phases could run simultaneously.

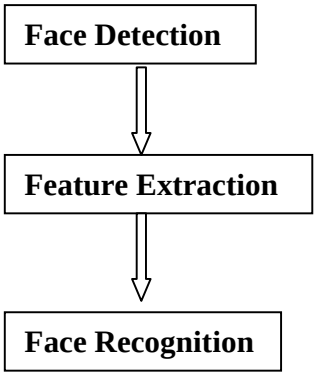


Figure 2.2: A generic face recognition system

2.3 Face Detection

Nowadays some applications of Face Recognition don't require face detection. In some cases, face images stored in the data bases are already normalized. There is a standard image input format, so there is no need for a detection step. An example of this could be a criminal data base. There, the law enforcement agency stores faces of people with a criminal report. If there is new subject and the police has his or her passport photograph, face detection is not necessary. However, the conventional input images of computer vision systems are not that suitable. They can contain many items or faces. In these cases face detection is mandatory. It's also unavoidable if we want to develop an automated face tracking system. For example, video surveillance systems try to include face detection, tracking and recognizing. So, it's reasonable to assume face detection as part of the more ample face recognition problem. Face detection must deal with several well known challenges. They are usually present in images captured in uncontrolled environments, such as surveillance video systems. These challenges can be attributed to some factors:

- Pose variation. The ideal scenario for face detection would be one in which only frontal images were involved. But, as stated, this is very unlikely in general uncontrolled conditions. Moreover, the performance of face detection algorithms drops severely when there are large pose variations. It's a major research issue. Pose variation can happen due to subject's movements or camera's angle.
- Feature occlusion. The presence of elements like beards, glasses or hats introduces high variability. Faces can also be partially covered by objects or other faces.
- Facial expression. Facial features also vary greatly because of different facial gestures.
- .Imaging conditions. Different cameras and ambiental conditions can affect the quality of an image, affecting the appearance of a face.

2.4 Approaches to face detection

It's not easy to give taxonomy of face detection methods. There isn't a globally accepted grouping criterion. They usually mix and overlap. In this section, two classification criteria will be presented. One of them differentiates between distinct scenarios. Depending on these scenarios different approaches may be needed. The other criterion divides the detection algorithms into four categories.

2.4.1 Detection depending on the scenario:

- Controlled environment: It's the most straightforward case. Photographs are taken under controlled light, background etc.
- Color Images: The skin colors can be used to find faces.
- Images in motion: Real time video gives the chance to use motion detection to localize faces. Another approach based on motion is eye blink detection, which has many uses aside from face detection.

2.4.2 Detection methods divided into Categories:

- Knowledge Based Methods: Ruled-based methods that encode out knowledge of human faces.
- Feature-invariant methods: Algorithms that try to find invariant features of face despite its angle or position.
- Template matching methods: These algorithms compare input images with stored patterns of faces or features.
- Appearance-based methods: A template matching method whose pattern database is learnt from a set of training images.

Categories	Input Images	Hit count	Miss Count	Accuracy percentage (%)
Smile	99	93	6	93.93
Sad	91	84	7	92.30
Surprise	79	70	9	88.60
Normal	85	83	2	97.64

Face Recognition				
Images	**Total Input Images**	**Correct Detection**	**False Detection**	**Accuracy (%)**
Non Facial Images	**160**	**158**	**02**	**98.75%**
Facial Images	**238**	**234**	**04**	**98.31%**

Region of Interest (ROI)				
ROI	Total Input Images	Correct Detection	False Detection	Accuracy (%)
Left Eye	249	245	04	98.39 %
Right Eye		243	06	97.59 %
Lip		231	18	92.77 %

3. Result and Discussion

The face recognition system introduces an detection of emotion from a given image, feature extraction from the face regions and recognition of emotion. The input to the system is an unknown face, and the system reports back the determined emotion from a database having various extracted properties of emotion in facial images in which results are shown in Categories ,input images, hit count, miss count and accuracy percentage. Face Recognition & ROI should be contained at type of image, total input images, correct detection ,false detection and accuracy percentage of image.

4. Conclusion

In the present work emotion recognition from facial images, Template based approach deals with the average faces from facial images, which consider number of pixel values using the Face recognition algorithm. In the field of emotion recognition from facial images, Template based approach deals with the average faces from facial images, which consider number of pixel values. But by considering specific feature points, we will improve the speed of processing and storage problem, as the number of pixels under consideration are less than Template based approach. Feature based approach is the best way to detect human emotions from the facial images as per the findings of the proposed work in terms of accuracy achieved in the detection of emotion states present in the facial images. Face recognition rates of the proposed algorithm show that Skin Color Segmentation is one of the best methods of face recognition. The detection rates of different emotion categories show the accuracy of proposed algorithm against existing Multi-Modal systems. The range of values of different feature points observed from the proposed work increases the detection rate by providing standard minimum and maximum values for each feature point.

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