CHALLENGES IN AUTOMATIC EMOTION RECOGNITION PROCESS

Gurpreet Singh
Chandigarh University,
Punjab, India

Amandeep Kaur
Chandigarh University,
Punjab, Punjab

Abstract: The field of image processing and analysis provides solution for many complex problems such as enhancement of degraded images for the purpose of clarity, medical image processing, biometric identification etc. Automatic emotion detection form the facial image is also comes under these categories of complex issues. The main challenges in this area are: different color complexion of persons over different regions of the globe, facial accessories, pose variations etc. This paper shows the overall process of automatic recognition of emotions and highlight key issues or challenges in this fields. At the end a system is proposed to overcome these issues.

Keywords: Emotion Detection, Complexions, facial accessories, Pose variations.

I. INTRODUCTION

The field of automatic recognition of emotions from the facial data has been recognized because of the applications like surveillance of criminals, security, reflection of HCI (Human Computer Interaction) as HHI (Human-Human Interaction) etc. [1] The input to these systems are either the facial data in the form of still images or video streams. On the other hand, the outputs of these systems are the various categories of emotions. The basic categories of emotions are happy, sad, fear, anger, surprise and disgust. These categories are represented by Figure1 [2].
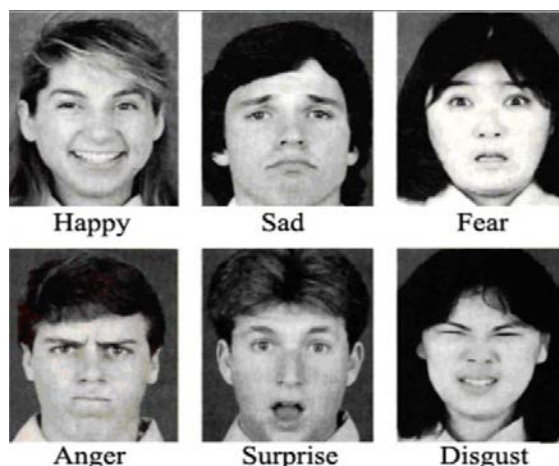

Figure1. Different categories of emotions

To identify these categories, the basic units to process information are considered as the pixels present in the image. The first part of the system must understand that the image supplied to it, must be a facial image or must contain facial data for next processing. This part can be treated as the identification process, which tells that the image supplied to the system is a facial image or not. The next part of the process is to find the area in the image, which contains facial data only. Rest of the pixels can be avoided

for the point of view of processing [1], [3]–[5]. After finding the suitable area in the input image, which contains facial data only, the next process in the identification of various regions of interests (ROI's), which further helps in the identification process of emotion category on the basis of its features [6]. The next part of the paper will highlight the work already done in the field of automatic emotion recognition. After that the section will explain the step by step procedure to implement the system under consideration. Next to that section, various challenges can be highlighted in this field of research. At the end, conclusion section will conclude various finds of the discussion.

II. RELATED WORK

This section will highlight the resent attention given to the research field of automatic recognition of emotions. Song [7] focused on two major issues related to the datasets used for the purpose of experimentation during the testing of automatic emotion recognition systems. He considered the problem of feature matching and feature selection simultaneously during the adaptation of one model working with one dataset on another dataset. He used the concept of subspace learning to deal with this complex issue. Lan et al. [8] discussed the comparative analysis of domain adaptation technique for EEG datasets. They worked on the datasets DEEP and SEED for emotion recognition. They concluded the effecting working of domain adaptation technique on DEEP dataset as compared to SEED dataset. Singh et al. [6] worked on an automatic system for facial expression recognition by considering the optical flow components present in facial images. They focused on the movement of neighbor pixels.

III. METHODOLOGY

The input to the automatic facial expressions recognition system has to be considered as the facial image or video data. Figure2. shows the further processing of this automatic system.

Input Facial Image

↓

Pre-Processing

↓

Image Identification as Facial or Non-Facial

↓

Face Detection

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ROI Extraction
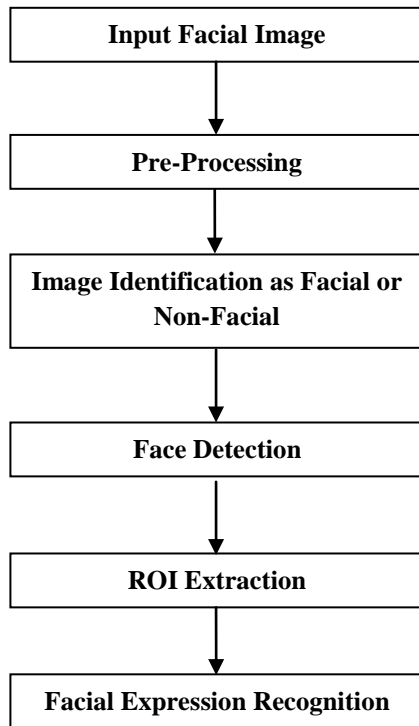
↓

Facial Expression Recognition

Figure2: Steps of automatic emotion recognition system

During the pre-processing step, Resizing of input image has been performed to deal with the large size of input images. This step is required to decrease the number of iterations during the further processing steps like segmentation and ROI extraction. If this step is avoided then it leads to the greater complexity and slowness of the application software. After pre-processing the next part is the proper identification that the image to be processed is a facial image or not. Means the image contains face data or it is without face data. If a non facial image is recognized, then there is no need to perform the further steps. For this identification step the color image processing performs a major role. Skin color identification based on certain skin threshold helps in this basic identification process. After the recognition of facial image, The next part is the identification of that part of input image which contain only facial data. This can be done by identifying the face rectangles, which only shows the facial data. Once these facial rectangles have been identified, then the next part is the application of knowledge based system to identify the Regions of Interests (ROI's). These ROI's can be taken based on the Facial Action Coding System (FACS). Their list may contain eyes, nose, lips, nose wrinkles etc. Then the identification of the structure or shape of these

ROI's will further helps in the identification process of facial emotions or facial expressions.

IV. CHALLENGES

Number of challenges can be considered under the development of automatic facial expressions identification system. Following is the list of some of these challenges.

- The Big size of the image to perform processing on each and every pixel present in the image. More number of pixels results in more number of iterations.
- Image identification as facial or non-facial. If color processing or skin color based processing is performed on the input image for the purpose of identification then, the factor like variations of skin tones on region basis across the globe may affect the overall process. This may leads to the difficulty in the identification of better threshold point for skin pixels. Even sometimes, the background of images may contain some objects carrying color same as skin pixels, this also make the segmentation process more difficult [9]–[11].
- ROI extraction is also a very difficult task to perform. The application of knowledge based system fails for the images containing the faces of some abnormal persons. At that time, it is very much difficult to identify the exact position of face components like eyes, lips, nose, eyebrows etc.
- Facial accessories also affect the process of segmentation and further identification.
- Variations in pose while capturing facial images for input also affect the overall processing of the system.
- Makeup tricks also affect the identification of similar persons in different images or at different point of time.
- Lack of proper dataset of certain category of persons like Sikhs and Muslims mostly having beard and mustaches or even turban.

Figure3 will show all the points discussed above. These all points are considerable for the proper development of an automatic system for facial expressions identification.

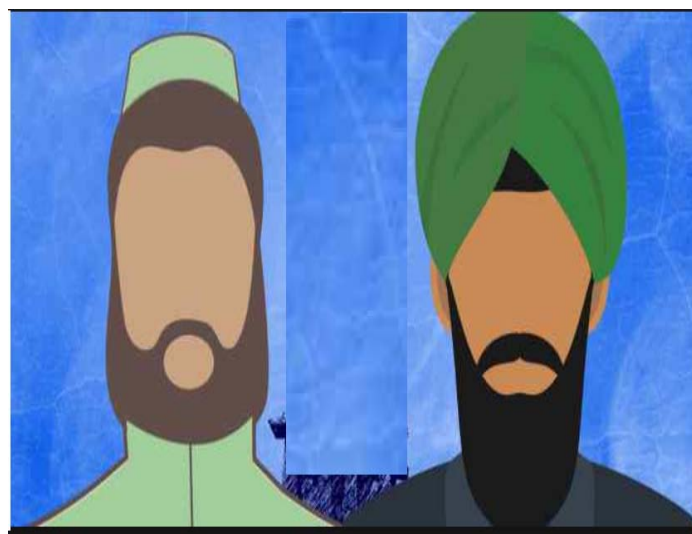| 3(a) Background composed of skin pixels | 3(b) Skin Tone variations |
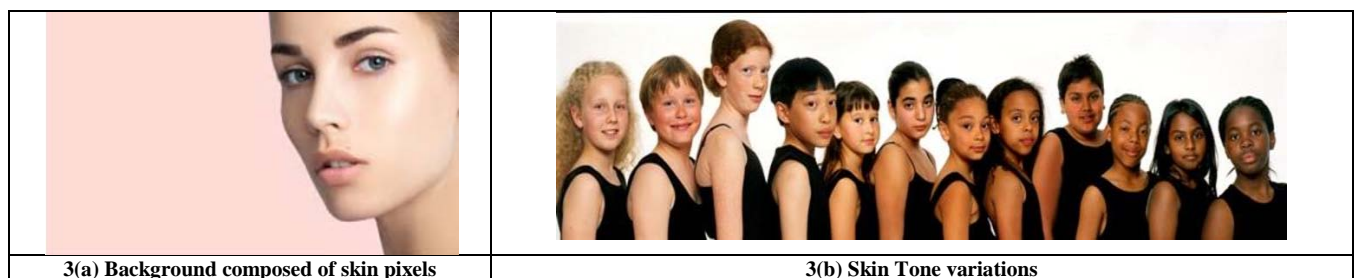
3(C) Faces with abnormal positions of ROI's

3(d) Pose Variations, Facial Accessories and Makeup tricks

3(e) Images with beard and mustaches

Figure3: Images reflecting various challenges

V.   CONCLUSION

In this paper, number of challenges in the field of automatic emotion detection have been discussed. The main finding of this paper involves in the preparation of a unique dataset of Punjab region peoples, who categorized as Sikhs and wear turban and mostly have beard and mustaches. Number of datasets have already been proposed but no one considered this particular aspect. This concept must lead to a special algorithm for dealing with the above said things. In future the hybrid classifiers can be used to deal with this sensitive issue of image data

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