RESEARCH HUB – International Multidisciplinary Research Journal (RHIMRJ)

Comparison of various Techniques for Automatic Facial Expression Recognition: A Survey

Dhvani. H. Trivedi[1st]
Student of M.Tech.
C. U. Shah College of Engineering and Technology,
Surendranagar, Gujarat (India)

Viral. A. Parekh[2nd]
Assistant Professor, Computer Engineering
C. U. Shah College of Engineering and Technology,
Surendranagar, Gujarat (India)

Abstract: In recent years, Emotion recognition using Automatic Recognition of Facial Expression is very important, active and popular area in Computer Vision. Facial Expression is used to expose the passion or sensation of any person as well as used to understand any person's mental views and psychosomatic aspects. To detect the expression of any human face, it is required to detect the different features of faces like movements of nose, eye, chick, eyebrow etc. and then classify these different features by using trained dataset with the help of suitable classifier which are available for the expression recognition.

Keywords: Facial Expression, Image Processing, Human Behavior.

I. INTRODUCTION

Human behavior can be judged by the Human Facial Expression. Human Face is very useful and powerful resource for the commutative information of any Human Behavior. Facial Expression is a kind o non-verbal communication.

Facial Expression is a kind o non-verbal communication. Sentiment of any person can depicts with the help of his/her facial expressions. Facial expression is used for Robotics Communication, Human Computer Interaction (HCI) and in other domains like Telecommunication, Behavioral Science, Video Games, Animations, Psychiatry, Automobile Safety, Education Software etc. In the area of Computer Vision, the term 'Facial Expression Recognition' is referred as to classify the Facial Features into the six basic emotions: Happy, Sad, Fear, Disgust, Surprise and Anger.

The basic task of Facial Expression Recognition system is: First is to obtain the input images by using input sensing devices such as webcam. Second, after detecting the facial area, the features of face will be extracted and apply that features to the pre processed classifier and that classifier will classify that input faces into one of the emotion classes like Happy, Sad, Fear, Disgust, Surprise, Anger etc. Several Detection methods and Classifier algorithms can be used for Detection and Classification purpose.

II. BACKGROUND STUDY

Facial Expression detection processes will now-a-days very popular research area to find out the mental status of any person by using different expression recognition techniques. The processes of expression detection of human faces have the two main phases. First is feature Extraction and second is classification. In the process of Feature Extraction the different required features of human faces will be extracted and then they will be applied for the classification purpose in that the expression will b classified as Happy, Fear, Disgust, Surprise and Anger. Both the phases should be work properly if the features are selected effectively but the chosen classifier is not working properly then the result which will be produced not accurate. And if the best classifier is chosen but the features are selected poorly then also there will be some difficulties to produce the accurate results.

III. RELATED WORK

The Human Facial Expression Detection process is very useful and has the importance for the recent year's research area but the process is very difficult for the actual implementation. First of all we need to find out the images and videos for the input then that will be applied for the feature extraction process in that the inputted face will be divided into the upper region and lower region. Now the features of faces like cheek, chin, wrinkles and the movements of eye brows, lips, eyes etc. will be calculated by calculating the height and width of all the features and then that data will be produced to the classifier and the classifier will test this dataset with the already trained dataset and will produced the results of which face contains which kind of expressions.

IV. COMPARISION BETWEEN DIFFERENT ALGORITHMS OF EMOTION RECOGNITION

A. *Automated Facial Expression Recognition System:*
   Algorithm:
     Step-1: Video Processing
     Step-2: Shape and Appearance Modeling

Step-3: Expression Classification

Step-4: After the Expression Classification the algorithm offers operators with many real time outputs like reporting, trend analysis, snapshots and indicators.

Advantages:

This algorithm will work on the Facial Action Coding System which able to recognize the various universal facial expression effectively. It is also detect the presence of deception during any interview process and the mental status of any person.

Disadvantages:

It cannot detect the presence of deception directly which is actually used for further research.

B. *Fuzzy rule based facial expression recognition:*

Algorithm:
Step-1: Input Video
Step-2: Frame Extraction
Step-3: Feature Point Extraction
Step-4: FAP Extraction
Step-5: Fuzzification
Step-6: Expression Detection

Advantages:

The robustness of Fuzzy system will be the advantageous feature of this algorithm. This system is robust for the various fluctuations of the image processing results.

C. *Recognition of Facial Expression using Principal Component Analysis and Singular Value Decomposition:*

Algorithm:
Step-1: Images which are inputted, given for the pre-processing
Step-2: Features are extracted and inputted to the classifier
Step-3: Then two images are compared and the required expression is detected or recognized.

Advantages:

Excellent results are found by using this method. Singular Value Decomposition technique is used for image enhancement, localization and feature extraction. This algorithm works effectively on the different emotions. It is useful when the lager dataset is available and computation time will be less.

Disadvantages:

The main disadvantage of this algorithm is if there will be any object on the face like, if a person wearing glasses of if a men has a beard so this algorithm cannot eliminate this kind of objects and have a problem to detect the correct expression.

D. *Facial expression recognition using neural network:*

Algorithm:
Step-1: input image is obtained through webcam
Step-2: optical flow method based face detection process
Step-3: image pre-processing
Step-4: Principle Component Analysis is performed
Step-5: classification processing using feed forward artificial neural network

Advantages:

This algorithm will give the practical solution in constraint environment.

Disadvantages:

It will not work properly in the unconstraint environment.

E. *Facial expression recognition using 3-D facial feature distances:*
Algorithm:
Step-1: Extraction of the characteristics distance vector as defined in table containing six characteristic distances is done.
Step-2: The distance vector classified based on neural network that is trained using back propagation algorithm.
Step-3: A sixth distance is used to normalize the first five distances.

Advantages:

This algorithm will provide reliable and valuable information. This algorithm has a higher recognition rate compare to 2D. This algorithm will work better by using of Neural Network as a classifier.

Disadvantages:

In this algorithm there will be some confusion with the anger class and neutral class so recognition rate will be less of anger class in this algorithm.

V. CONCLUSION

Facial Expression Detection is now very interesting and useful area for the further research process. The importance of this area of computer vision will be increasing day by day. The objective of this paper is to show a clean survey about the various available methods for human expression detection with their algorithms and advantages and disadvantages for the purpose of further research

VI. FUTURE WORK

In the future work researcher can combine two algorithms for the human facial recognition purpose and can produce the best result, high accuracy with the best computational time.

REFERENCES

1. Ashim Saha, Anurag De, Dr. M .C. Pal and Nirmalya Kar," Different techniques of Automatic Facial Expression Recognition: A Survey", Second Intl. Conf. on Advances In Computing, Communication and Information Technology- CCIT 2014.
2. Urvashi Bakshi, Rohit Singhal," A NEW APPROACH OF FACE RECOGNITION USING DCT, PCA, AND NEURAL NETWORK IN MATLAB", International Journal of Emerging Trends & Technology in Computer Science (IJETTCS), Volume 3, Issue 3, May-June 2014.
3. Nidhi N. Khatri, Zankhana H. Shah, Samip A. Patel,"Facial Expression Recognition: A Survey", (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 5 (1), 2014.
4. S.P.Khandait, Dr.R.C.Thool, P.D.Khandait,"Automatic Facial Feature Extraction and Expression Recognition based on Neural Network", (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 2, No.1, January 2011.
5. C.P. Sumathi, T. Santhanam, M.Mahadevi," AUTOMATIC FACIAL EXPRESSION ANALYSIS: A SURVEY", International Journal of Computer Science & Engineering Survey (IJCSES) Vol.3, No.6, December 2012.
6. Marryam Murtaza, Muhammad Sharif, Mudassar Raza, and Jamal Hussain Shah," Analysis of Face Recognition under Varying Facial Expression: A Survey", The International Arab Journal of Information Technology, Vol. 10, No. 4, July 2013.
7. Hayet Boughrara ·Mohamed Chtourou · Chokri Ben Amar · Liming Chen," Facial expression recognition based on a mlp neural Network using constructive training algorithm",Received: 5 February 2014 / Revised: 22 August 2014 / Accepted: 13 October 2014 © Springer Science+Business Media New York 2014