ADVANCE APPROACH FOR FACIAL EXPRESSION RECOGNITION

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Abstract : Facial emotion recognition is one of the most important cognitive functions that our brain performs quite efficiently. State of the art facial emotion recognition techniques are mostly performance driven and do not consider the cognitive relevance of the model. This research work is an attempt to look at the task of emotion recognition using deep belief networks which is cognitively very appealing and at the same has been shown to perform very well for digit recognition. In this research work we apply segmentation with machine learning methods to identify the key seven human emotions: anger, disgust, fear, happiness, sadness, surprise and neutrality.

IndexTerms - Image Processing, Facial expression, Machine Learning, Human emotion, Segmentation

I. INTRODUCTION

Facial expression presents key mechanism to describe human emotion. From starting to end of the day human tend to changes plenty of emotion; it may be because of their mental or physical circumstances [1]. Facial expression plays important role in our communication with other people in our daily life. For the continuous progress and development of intelligent robot, emotional interactions between these robots and people also are the foundational function of these intelligent robots [2]. Facial expression play important role in recognition of emotion and are used in the process of non-verbal communication, as well as to identify people [3]. The important of facial expression in communication is significant as it allows from the first contact to reveal the emotions. Emotions are body movement and they are much more complex to be understood and ready by a machine [4]. Face emotion is similar to face recognition. However, face recognition systems recognize human face using facial features, while face emotion recognition system identifies the type of human emotion expressed using facial features. The two systems are different but can be complementary in that face recognition system identifies the owner of the face while face emotion recognition system identifies the emotion expressed by the owner of the face [6]. Image expresses thousands of times faster and effective than any other way of communication. Emotional images are direct/indirectly associated with other human behavior for example kindness, decision-making, awareness, memory, and learning and this emotion can be read mainly through facial emotion in an efficient way. Emotions are more often related to changes in a few discrete facial structures, for example, lips show anger and lip corners shows sorrow, therefore continuous face monitoring gives higher accuracy in emotion estimation. Intensity variation in smiling using optical flow is a common method to find the person is happy or sad. We have used spontaneous expression recognition rather than deliberate which performs a series of expressions [7].

II. RELATED WORK

TECHNIQUES USED FACIAL EXPRESSION RECOGNITION

A. LBP (Local Binary Pattern) features

Texture information is an important descriptor for the pattern analysis of image; LBP was presented to get the texture information from the images. The Fig.1 shows the calculation progress of the LBP value [2].

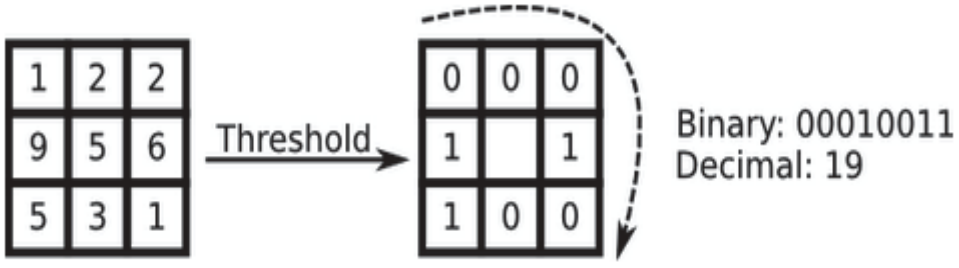

Figure 1 Calculation of LBP value [2]

The uniform pattern LBP to achieve options from the patches, the patches are all separated to little patches. Mistreatment uniform patterns, the length of the feature vector for one cell reduces from 256 to fifty nine. for instance, the dimensions of the mouth patch is 40*60 and therefore the little patches' size is 10*15, therefore the mouth patch is split to sixteen patches. The uniform

LBP options are extracted from every little patch and mapped to a 59-dimensional bar chart. In the Fig. 2.we have a tendency to separate the mouth to sixteen little patches

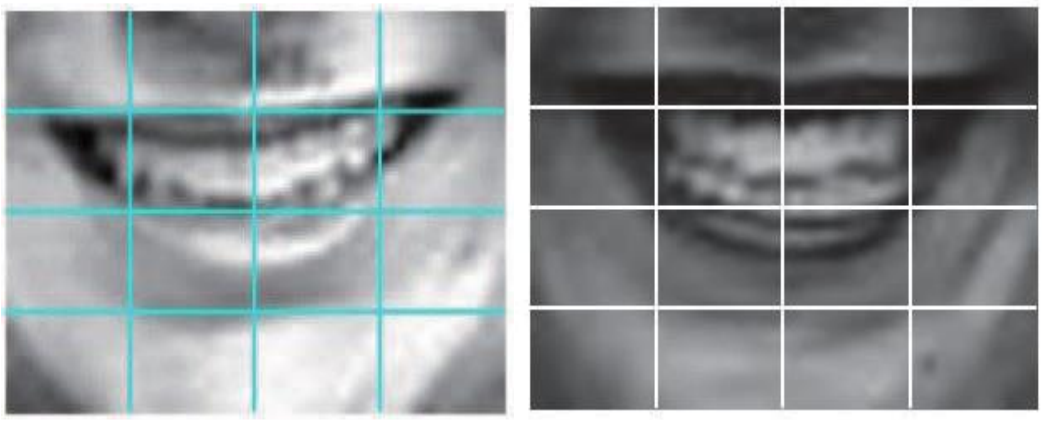

Figure 2: LBP Example [2]

For the active patches of faces the LBP feature gained from the little grey worth patch has variety with massive variance whereas the grey worth has smaller variance than the LBP feature. If we have a tendency to use the concatenation information for classification, the {little} variety within the LBP feature can have little impact. To use a lot of complete data of the vectors, we have a tendency to propose a way to scale back the massive variance within the vectors and retain the various of the info within the vectors. so as to realize this goal, we have a tendency to use root to alter the vectors of LBP features[2]

B. (PCA) Principle Component Analysis

Use PCA to scale back the size. PCA has done a crucial job during this method[2] . PCA is done by Eigen price decomposition of a knowledge variance (or correlation) matrix or singular price decomposition of a knowledge matrix, typically once a standardisation step of the initial information. PCA will provide the user with a lower-dimensional image, a projection of this object once viewed from its most informative viewpoint. this is often done by victimization solely the primary few principal parts in order that the spatiality of the reworked information is reduced [8].

The main plan of principal element analysis (PCA) is to scale back the spatiality of a knowledge set consisting of the many variables correlative with one another, either heavily or gently, whereas holding the variation gift within the dataset, up to the utmost extent. a similar is finished by remodeling the variables to a replacement set of variables, that are called the principal parts. principal element retains most variation that was gift within the original parts. The principal parts are the eigenvectors of a variance matrix, and therefore they're orthogonal[9].

Machines browse pictures or do some calculations victimization simply pictures and no numbers. we are going to try and answer a vicinity of that currently. For simplicity, we are going to be limiting our discussion to stand pictures solely. Any sq. image of size NxN pixels is painted as a NxN matrix wherever every component is that the intensity price of the image. Given a picture to acknowledge that isn't a vicinity of the previous set. The machine checks the variations between the to-be-recognized image and every of the principal parts. It seems that the method performs well if PCA is applied and therefore the variations are taken from the 'transformed' matrix. Also, applying PCA offers North American country the freedom to go away out a number of the parts while not losing out abundant data and therefore reducing the quality of the matter. For compression, on casting off diminished eigenvectors, we are able to really decrease the dimensions of the image for storage. However to say, on reproducing the first image from this can lose out some data for obvious reasons. [9]

C. Softmax Regression

Softmax regression classifier perpetually is that the last layer that is when a fully-connected layer within the deep learning network. Softmax regression model generalizes supplying regression to classification issues wherever the category label will withstand quite 2 potential values. Softmax regression may be a supervised learning algorithmic program. Softmax may classify quite 2 categories right away. [2]

D. SVM (Support Vector Machine)

Support vector machine (SVM) is used as our classifier for training and testing of the extracted face emotion features. SVM typically constructs a hyper plane or a set of hyper planes in higher or infinite dimensional space which is used for classification. Four SVM kernel functions were used separately for our classification task of face emotion recognition. These are the Radial basis, Polynomial, Linear and the Quadratic (Sigmoid) functions with their equations listed in (1), (2), (3) and (4) respectively.

$$K(x, x') = \exp(-y\,\|x-x'\|^{2++}) \quad (1)$$

$$K(x, x') = (y(x, x''))^{d} \quad (2)$$

$$K(x, x') = (x, x'') \quad (3)$$

$$K(x, x') = (\tanh(y(x, x'' + r) \quad (4)$$

Where y= width of Radial basis function coefficient; in polynomial (y =1); degree of polynomial (d=3), the higher the soft margin from the hyper plane, the higher the degree of accuracy and r = coefficient for sigmoid. [6]

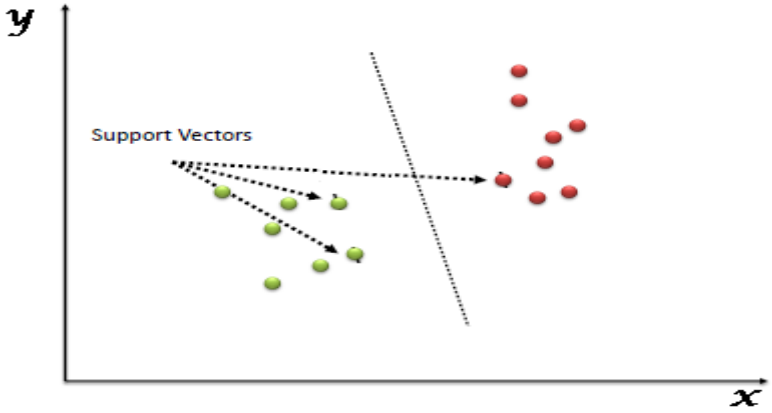

Fig3: SVM classifier [5]

Support Vector Machine (SVM) could be a supervised machine learning rule which may be used for either classification or regression challenges. However, it's principally employed in classification issues. during this rule, we tend to plot every knowledge item as a degree in n-dimensional house with the worth of every feature being the worth of a selected coordinate. Then, we tend to perform classification by finding the hyper-plane that differentiate a pair of} categories o.k. as shown within the figure 2.4 Support Vectors ar merely the co-ordinates of individual observation. Support Vector Machine could be a frontier that best segregates the 2 categories.[5]

E. Viola Jones algorithm

The Viola Jones algorithmic program is enforced for the face feature detection because it doesn't consumes abundant time, therefore giving bigger accuracy [1].
The algorithm has four stages: [10]

Haar Feature Selection

Creating an Integral Image

Adaboost Training

Cascading Classifiers

F. Gabor wavelet

To extract expression feature we have a tendency to enforced physicist rippling filter. A second physicist kernel with multiple scales and multiple orientations is developed. Physicist filter is applied to the entire image or simply to the actual points on the face victimization convolution rule. Convolution rule square measure expressed within the following equation.

$$a_{k,\partial}(x_0, y_0) = \iint I(x,y) P_{k,\partial}\,(x_0 - x, y_0 - y) \ldots\ldots\ldots\ldots\ldots (1)$$

After enforced physicist moving ridge filter the image with the reduced purpose of expression feature sounds like figure 5.

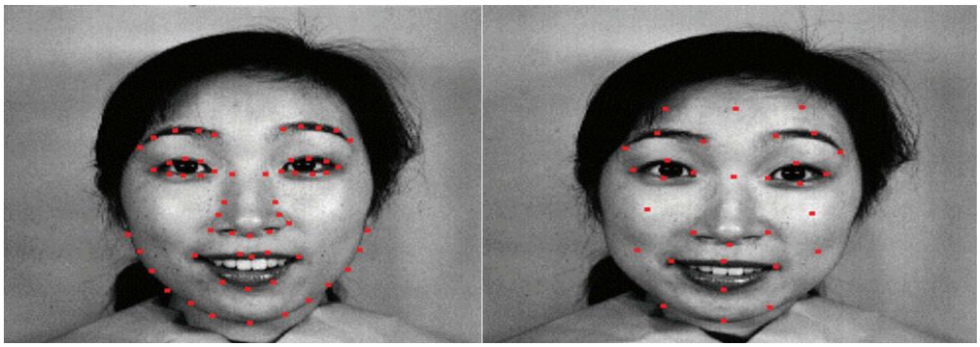

Figure.4: Detected fudicial points on face[5].

Figure 5: Reduced points using Gabor Wavelet Filter [5].

III. LITERATURE SURVEY

Renuka S. Deshmukh et al.[1], The flows of system embrace the fundamental method in face expression Recognition system. They embrace image acquisition, preprocessing of image, face detection, feature extraction, classification and so once the feelings are classified the system assigns the user specific music in keeping with his emotion. system focuses on live pictures taken from the digital camera The aim of this paper is to develop automatic facial feeling recognition system for stressed people therefore assignment them music medical care therefore on relief stress. The emotions thought-about for the experiments embrace happiness, Sadness, Surprise, Fear, Disgust, and Anger that ar universally accepted.

Yanpeng Liua et al.[2], This paper proposes formula supported the mix of grey element worth and native Binary Patterns (LBP) options. Principal element analysis (PCA) is employed to scale back dimensions of the options that square measure combined by the grey element worth and native Binary Patterns (LBP) options. All the options square measure extracted from the active facial patches. The active facial patches square measure these face regions that bear a serious modification throughout completely different expressions. Softmax regression classifier is employed to classify the six basic facial expressions, the experimental results on extended Cohn-Kanade (CK+) info gain a mean recognition rate of ninety six.3% underneath leave-one-out cross validation technique that validates each subject within the info

Paweł Tarnowski et al.[3], This paper bestowed the results of recognition of seven emotional states (neutral, joy, sadness, surprise, anger, fear, disgust) supported facial expressions. Coefficients describing parts of facial expressions, registered for 6 subjects, were used as options. The options are calculated for three-dimensional face model. The classification of options was performed exploitation k-NN classifier and MLP neural network. [3]

Safae Elhoufi et al.[4],. In this paper work relies on Kinect detector with a man-made neural network approach. They propose a system for automatic feeling recognition from facial expressions. Used the Microsoft Kinect for Windows detector in our system to discover facial feeling expressions, this device adds simplicity to the facial feature extraction. Victimization image, audio and depth sensors, it detects movements, identifies faces, and acknowledges speech of players, permitting them to play games victimization solely their own bodies as controls. Microsoft Kinect provides a cheap and moveable watching platform that along side providing depth data additionally provides sensible quality color image knowledge. The Microsoft Face trailing package Development Kit for Kinect for Windows (Face trailing SDK), at the side of the Kinect for Windows package Development Kit (Kinect for Windows SDK), permits North American country to make applications which will track human faces in real time

Sagor Chandro Bakchy et al. [5], during this projected methodology, initial extract the form options from positions on a face. Then multi-orientation physicist wave constant feature ar extracted from expression pictures. we've used Support Vector Machines (SVM) as classifier. As face has some fastened special points, linear classifier works glorious on facial purpose knowledge. so SVM performs with satisfactory outcomes in our FER system. Our experimental result shows that victimization facial form options and physicist wave constant supported SVM is a lot of correct and quicker most different antecedently projected methodologies

V. PROPOSED WORK

Take image and Read the image. Apply median filter on pre-processing stage. Face detection using Viola Jones algorithm. Extract feature using WPCA for Eigen values. Generic moment after derived feature matrix apply Machine learning algorithm and classify types of expression and analysis result. The purpose of proposed algorithm is to improve the performance and accuracy using median filter and WPCA.

Flow Chart of proposed work

Step 1: First Read images

Step 2: Apply Median filter for pre-processing.

Step 3: face detection using Viola- jones algorithm

Step 4: Extract feature using WPCA for Eigen values

Step 5: Apply Generic moment

Step 6: Derived Feature matrix

Step 7: Apply machine learning Algorithm

Step 8: Derived types of expression

Step 9: Analysis result

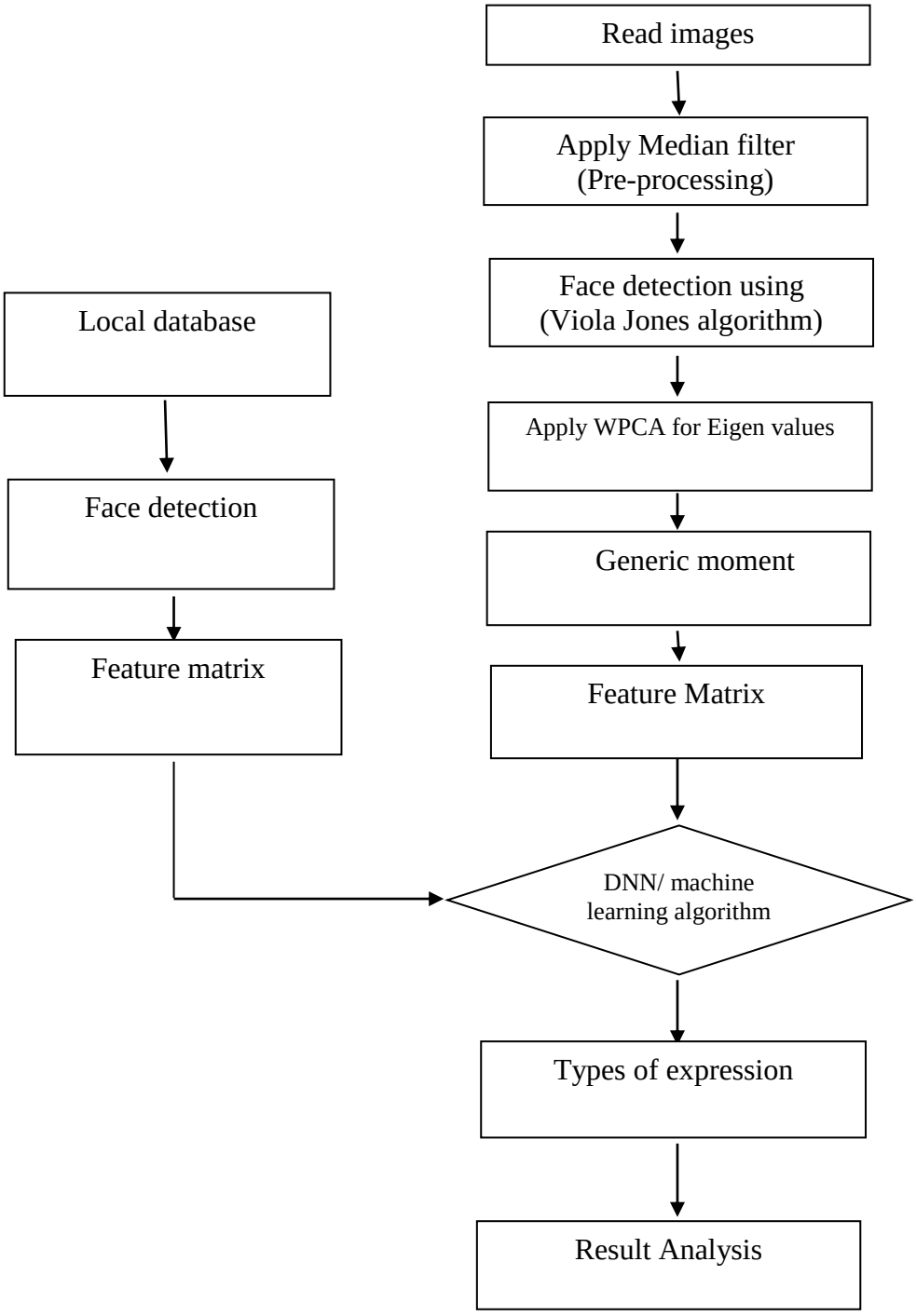

Fig 6 Proposed works

VI.CONCLUSION

Security play a main role for current generation and according to survey data can be stolen by thumb or eye retina also but still data become secure using facial expression so according to comparative analysis certain methods and algorithm's available for facial expression recognition still found research- gap so using proposed model improve security ratio of existing system.

REFERENCES

[1] Renuka S. Deshmukh, Vandana Jagtap, Shilpa Paygude "Facial Emotion Recognition System through Machine Learning approach" International Conference on Intelligent Computing and Control Systems ICICCS 2017

[2] Yanpeng Liua, Yuwen Caoa, Yibin Lia, Ming Liu, Rui Songa Yafang Wang, Zhigang Xu , Xin Maa† "Facial Expression Recognition with PCA and LBP Features Extracting from Active Facial Patches" Proceedings of The 2016 IEEE International Conference on Real-time Computing and Robotics June 6-9, 2016, Angkor Wat, Cambodia

[3] Paweł Tarnowski, Marcin Kołodziej, Andrzej Majkowski, Remigiusz J. Rak "Emotion recognition using facial expressions" International Conference on Computational Science, ICCS 2017, 12-14 June 2017, Zurich, Switzerland

[4] Safae Elhoufi , Maha Jazouli, Aicha majda, Arsalane Zarghili , Rachid Aalouane "Automatic Recognition of facial expressions using Microsoft Kinect with artificial neural network" 978-1-5090-5579-1/16/$31.00©2016 IEEE

[5] Sagor Chandro Bakchy, Mst. Jannatul Ferdous, Ananna Hoque Sathi, Krishna Chandro Ray, Faisal Imran, Md. Meraj Ali "Facial Expression Recognition based on Support Vector Machine using Gabor wavelet Filter" 2nd International Conference on Electrical & Electronic Engineering (ICEEE), 27-29 December 2017, RUET, Rajshahi, Bangladesh.

[6] Ibrahim A. Adeyanju, Elijah O. Omidiora, Omobolaji F. Oyedokun "Performance Evaluation of Different Support Vector Machine Kernels for Face Emotion Recognition" SAI Intelligent Systems Conference 2015 November 10-11, 2015 | London, UK IEEE2016

[7] Subarna Shakya, Suman Sharma, Abinash Basnet " Human Behavior Prediction using Facial Expression Analysis" International Conference on Computing, Communication and Automation (ICCCA2016) IEEE2016

[8] https://en.wikipedia.org/wiki/Principal_component_analysis

[9]https://www.dezyre.com/data-science-in-python-tutorial/principal-component-analysis-tutorial

[10] Mehul K Dabhi, Bhavna K Pancholi "Face Detection System Based on Viola - Jones Algorithm" International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14 | Impact Factor (2015): 6.391

[11] https://www.cs.auckland.ac.nz/courses/compsci373s1c/PatricesLectures/Image%20Filtering_2up.pdf