Modified PSO Based Facial Emotion Recognition System

Sarath Lal T S[1], Anoop K Johnson[2]

[1, 2]Department of ECE, Mar Baselios College of Engineering and Technology, Trivandrum, India

Abstract: ***Facial emotion recognition (FER) is an important topic in the fields of computer vision and artificial intelligence owing to its significant academic and commercial potential. In this paper, the system employs a facial emotion recognition system which accurately identifies the nine facial emotions such as happy, sad, akward, depressed, surprise, disgust, anger, terror and courage. The facial emotion recognition system mainly consist of three steps namely, feature extraction, feature optimization and emotion recognition. In feature extraction, a horizontal and vertical neighbourhood pixel comparison LBP is used for generating the LBP operation. A micro genetic algorithm embedded with the particle swarm optimization is implemented to generate the discriminative facial contents in the feature optimization process. Sparse classifier is used for the classification of the facial expressions in the emotion recognition process, which is a highly accurate one. The modified PSO is highly efficient in generating the facial expressions as compared to the conventional PSO.***

Keywords: Feature selection, Sparse classifier, Particle swarm optimization

1. Introduction

Facial emotion recognition system plays a vital role in human computer interaction and provides a wide range of computer applications. It enables the identification of discriminative facial features which represents the characteristic features of each emotion. This paper provides effective and optimized facial expressions which further leads to real- time and accurate facial expression recognition. By comparing other methods, evolutionary computational (EC) algorithms provides powerful global search abilities. The particle swarm optimization (PSO) algorithms has been used for feature optimization, which is motivated by the birds flocking, animal herding and fish schooling. The particle swarm optimization algorithms enables fast convergence speed and low computational cost. Facial expression recognition mainly enables the efficient way of human machine interface communication. Facial expressions are mainly obtained from the position of muscles surrounded on the face. According to deep studies, it prevailed that the human emotions are obtained from the movement of muscles present on the face. The eyes also play a key role in the facial emotion recognition process.

The facial expression is always vital to the human to human communication process. The movements of the muscles are mainly connected to the skin and fascia present on the face. The expressions are mainly obtained by the movement of skin, formation of lines on the skin, eye, eyebrows etc. The neuronal pathways enable the voluntary and emotional expression. The facial expression analysis may differ based on the gender and aging of the humans. The facial features present on the child is not similar to the features present in the senior citizen. The proposed system consist of following steps:

1) Feature extraction
2) Feature optimization
3) Emotion recognition

To improve robustness and power a number of LBP variants are used. The loss of information in the information recognition is mainly due to the uniform patterns in the local binary pattern. Completed LBP mainly consist of mainly three components, CLBP, centre, CLBP sign, CLBP magnitude. Here in the completed LBP the sign, magnitude and gray level of the images are derived and the final histogram is also formed by these three components. CLBP generates the texture classification accuracy as compared with the state-of-art LBP algorithms. CLBP center provides solution for the histogram issues generated on the LBP. Modern techniques are adopted for generating the local binary patterns which includes the hvn LBP comparison to obtain the missing contract information obtained during the recognition process.

Numerous PSO variants are adopted to overcome the local optimum problems of the conventional particle swarm optimization. Here the velocity and position of the particle is changed in the particle swarm optimization process. The particles optimizes the facial contents from the different facial regions and the best solution is obtained in terms of the fitness points. The conventional PSO is integrated with the genetic algorithm and generates the modified PSO which classifies the facial regions separately.

Support Vector Machines (SVM) classifies the training vectors into two classes with the help of a hyper plane. The hyper plane separates vectors linearly as well as non linearly. The support vector machines are mainly used for classification as well as regression process. Regression analysis is a set of statistical process for estimating the relationship among the variables. It includes modeling and analyzing the variable. In linear classification, the classifier separates the set of objects with a line where in non linear classification the set of objects are separated by a curve. The classification process is performed by constructing a hyper plane which separates the different training classes. The novelty generated on the paper is, for improving the classification efficiency support vector machines are accompanied by the sparse classifiers. Sparse classifiers are implemented to analyze nine emotions such as 1) Surprise 2) Sad 3) Depressed 4) Awkward 5) Disgust 6) Happy 7) Anger 8) Terror 9) Courage.

An emotion is a mental and psychological state which involves lots of behavior, action, thoughts and feelings. Emotions facilitate and mediate interactions accompanied among the human beings. The computer vision application mainly involves event detection, personalized learning, robotics, healthcare and surveillance. Normally the emotions are recognized through body language and voice intonation. Here, we are extracting the facial features and classify each emotions with the help of sparse classifier.

2. Related Works

In this section we discuss, the mode of work based on feature extraction, particle swarm optimization process and emotion recognition and classification process.

Ira Cohen, Ashutosh Garg and Thomas S. Huang [2] proposed a method of emotion recognition using the multi level hidden markov models. Here the work focuses on the live video clips. The emotions are recognized from the live videos using temporal cues. It is commonly used in speech recognition applications. In this paper the segmentation process and the emotion recognition of the facial expressions are performed by the multi level hidden markov model architecture. Here the automatic segmentation and the emotion recognition is performed for the continuous signals. The main drawback of this project is, the emotions generate a greater confuse among the emotion classification process. The work also faces the lack of benchmark database availability to test the different algorithms generated during the classification process.

Anchal Garg and Dr. Rohit Bajaj [3] proposed a emotion recognition and emotion classification technique using the hybridization method. Here the genetic algorithm and the independent component analysis is enabled for the hybridization process. Only five emotions are classified in this project such as sad, happy, surprise, angry and neutral, where the emotions are classified using the neural network classifier. Here the independent component analysis and genetic algorithm is applied for the feature extraction process. The training set of images are compared with the eigen faces provided and images having the biggest eigen values. At the final stage the neural network classifiers are used for the classification of the images.

Zhentao Liu, Min Wu and Weihua Cao [4] proposed a facial expression emotion recognition system based on the human robot interaction system. The proposed system is a four layer framework. In this work the robot not only analyzes the human emotions, it also responds to the emotions generated by the humans. The robot exhibits the simple cartoon symbols to the humans and it is displayed on the LED screen which is attached to the robot itself, and is easily understandable by the humans. The emotion classification is mainly done by the extreme learning machine classifier.

Shruti Bansal and Pravin Nagar [5] proposed a emotion recognition system for the facial expression which is based on the Bezier curve. The expressions such as smile, sad, surprise and normal are tested in this face recognition process. The input images are compared with the training images which is provided as the database set. The classification is mainly performed by analyzing the Bezier points and the Bezier curves. The distance between the each curve segments in the image is calculated. By comparing the images the similarity of the faces is taken into the account. The main drawback of this project is, the detection of the grayscale images from the database is difficult where it cannot be filtered.

Anuradha Savadi and Chandrakala V Patil [6] proposed a face based automatic human emotion recognition system. The face detection is also applicable in the real time systems also. The human gestures are identified from the different movements of eyes, nose, mouth and eye brows. If a driver is feeling sleepy, by identifying the human gesture the system can give alert to the driver, which is quite applicable in the safe driving. Here the system mainly works on the basic principle of token finding and token matching. At the initial stage the system captures the image from the webcam and then the face of the human is detected, and finally the gestures from the face image is clearly recognized.

Aitor Azcarate, Felix Hageloh and Koen van de Sande [7] proposed a technique of automatic facial emotion recognition system. In this paper , the facial emotions are recognized from the live video clips and video streams. This system architecture is mainly based on the real time facial analysis. The face image is detected with the help of a haar cascade face detector. The TAN classifier lacks the training data set and generates complexity in implementation. The other drawback of the project is the face detector only works in the good lighting condition. It is commonly used in virtual avatars, games and chat programs.

Ritupama Halder and Sushmit Sengupta [8] proposed a real time facial emotion recognition system which is based on the image processing and the machine learning. The human emotions are mainly conveyed through speech, expressions and behaviours. In this paper, the image processing is combined with a neural network solution. The system classifies six emotions mainly, happiness, sadness, anger, disgust, surprise and fear. At first the coloured image is given as the input to the system and the facial image is detected. From the facial image the facial features are extracted and the extracted features are given to the neural network classifier for further classification.

Semna K and Najla PR [9] proposed an embedded PSO approach to the facial emotion recognition system. The system consist of three steps mainly, feature extraction, feature optimization and emotion recognition. In the feature extraction technique the facial features are extracted by the preprocessing technique and the LBP operation. The extracted facial contents are optimized using the particle swarm optimization which is embedded with the micro genetic algorithm. The velocity updating strategy enables the optimization process to find out the best fitness values. The support vector machine classifier classifies the input images with the training data sets provided and finally the facial emotions are accurately generated.

Priya Metri, Jayshree Ghorpade and Ayesha Butalia [10] proposed a facial emotion recognition system using the context based on the multimodal approach. Nowadays emotions play a vital role in the human to human interaction. For the human to computer interaction the paper generates a finest way of emotion recognition for facial expression, hand and body. In this paper three classifiers are used for the emotion classification process. The multimodal system provides better and fine result as compared to the bimodal approach.

Ismail oztel and Cemil Oz [11] proposed a system of facial emotion recognition with facial analysis. The main applications of the computer vision techniques includes defence technologies, road traffic, health care field and marketing. The main sub areas of computer vision technology is emotion recognition. Here only four facial expressions are detected in this technique namely, confused, happy, sad and normal. At first the faces are detected from the given image, then the mouth and eyes are detected from the extracted facial areas. With the help of computer graphics technology , the Bezier curves are generated on the human face from the Input image and each curves compared the predefined curves in the database for the emotion recognition process.

Albert C. Cruz and Bir Bhanu [12] proposed a system for the vision and attention theory based sampling for continuous facial emotion recognition. Here the emotions are detected from the live video streams or live video sequences. The database are taken from the MMI facial expression database and cohn kanade database set. Here the attention theory is adopted to downsample the video frames generated from the video sequence.

Neelum Mehta and Sangeeta Jadhav [13] proposed a system for facial emotion recognition using log gabor filter and principle component analysis. The humans can generate facial emotions without delay, where the machine generated emotion is still a huge challenge. In this project the filter banks consist of five scales and eight orientations. The principle component analysis is applied to the images to reduce the dimensionality of the images. Japanese female facial expression[JAFFE] database set is used in this system. In this paper, the system employs feature extraction using gabor filter, dimensionality reduction of the filtered images by the principle component analysis and finally seven emotions are detected by calculating Euclidean distance metric.

Zhan Zhang and Liqing Cui [14] proposed an emotion detection system using kinect 3D facial points. In this paper only three kind of emotions are correctly detected such as sad, happy and neutral. For reducing the dimensionality of the filtered image principle component analysis is implemented. Here 3D facial points are also used for the classification of the images. The external environment condition such as temperature, noise and humidity should affect the emotion recognition process.

Debishree Dagar, Abir Hudait and H. K. Tripathy [15] proposed an automatic emotion detection model for the facial expression. The facial emotion recognition is mainly applicable in the defence purposes, health care and traffic surveillance. Here thew face expression are obtained from the live video streams or video clips. Here the real time technique is accurately implemented in the facial expression recognition system which is commonly applicable to the traffic surveillance.

Hadjer Boubenna and Dohoon Lee [16] proposed a feature selection for facial emotion recognition based on the genetic algorithm. The genetic algorithm extracts the appropriate facial features from the face images. The final classification of emotions are performed by linear discriminant analysis [LDA] classifier. The overall accuracy of the feature selection in the input image is 99.33%.

3. Particle Swarm Optimization

The concept of the particle swarm optimization is inspired by the basic social behavior of birds flocking and fish schooling and it was developed by the James Kennedy and Russel C Eberhart in 1995. Particle swarm optimization is similar to the artificial intelligence technique[AI] that can be use to find the best and the appropriate solution. Particle swarm optimization is composed of group of particle which is refer to as solutions. The particles are moved within the solution space to find the best solution by solving the regulated problem. After every iteration each solution is updated by two fitness values, which is reffered to as PBEST and GBEST values. The PBEST is defined as personal best and the GBEST is defined as the global best values.

3.1 PSO Algorithm

The basic algorithm for the particle swarm optimization mainly consists of five steps. It includes initialization, velocity updating, update of position, update of memory and finally the termination criteria.

1) Intialization - At the first step the position and velocity of the particle is initialized in the search space. The fitness value of the each particle is initialized by analyzing the parental character. The memory of the each individual particle is initialized and then achieve the fine personal best value. After finding the personal best value, the global best value of the search space is identified. Finally the generation number of the each particle is increased.

2) Velocity Updating - After performing the each iteration, the velocity of each particle is updated**.** The velocity of the each particle is updated by,

$$v_{id}^{t+1} = w * v_{id}^{t} + c_1 * r_1 * (p_{id} - x_{id}^{t}) + c_2 * r_2 * (p_{gd} - x_{id}^{t})$$

where t and d indicate the t_{th} iteration and d_{th} dimension in the search space.3. Position Updating - After performing the successive iterations the position of the particle is updated by,

$$x_{id}^{t+1} = x_{id}^{t} + v_{id}^{t+1}$$

where the new velocity and position of the particle is taken into the account. It ensures all the feasibility of the potential solutions. If the inequality of the individual particle is violated hence the maximum and minimum position of the individual particle is taken into the account.

3) Memory Updating - Here the fitness evaluation of the particle is compared with the personal best values. If the current value is better than the global best value then the global best value of the current particle is reset. In the memory updating the orginal swarm of individual particles is present on the non replaceable memory.

5. Termination - The step 2 to step 4 of the algorithm should be repeated until a better fitness value is achieved or a maximum iteration is reached. If the termination process is clearly executed then the personal best values and the global best values is considered as the solution.

3.2 Optimal Solution of PSO

The optimal solutions of the particle swarm optimization can be defined by,

1) Size of the population is 50
2) The total number of iterations performed is 100
3) The value of c1, c2 is two
4) The inertia weight w is varied from 1.4 to 0.4
5) The maximum velocity is limited to 10% of the total dynamic range.

The personal best solution [PBEST] is the best solution which is accompanied by the particle yielding high fitness values. The global best [GBEST] maintains only a single particular solution over the entire swarm of the particle. The global best provides a high convergence rate and robustness. After getting the fitness points from both global best and personal best, the particles analyze the best solution in the overall swarm.

3.3 Genetic Algorithm

As an explanation for the genetic algorithm, from a set of individuals, the required individuals are selected from the set and from the selected individual's offsprings are generated and the set is replaced with the generated offspring. Hence its a technique based on optimization. Usually, it is used to find the optimal value whereas other technique will take a long period to solve the optimal value. The best output refers to our required need. For each problem, the best output varies. To get the best value there will be a search area, this area may be limited which means searching area depends only on the given input. From this search area i.e. from the given input, an optimal value is sorted out. That is the goal of optimization is to find the optimal value or a set of optimal values from the given inputs. The working principle of the genetic algorithm is almost similar to the particle swarm optimization. It also enables to find out the best solution for the problem solving.

3.4 Flow chart of Genetic Algorithm

The flowchart representation of the genetic algorithm concept is defined by,

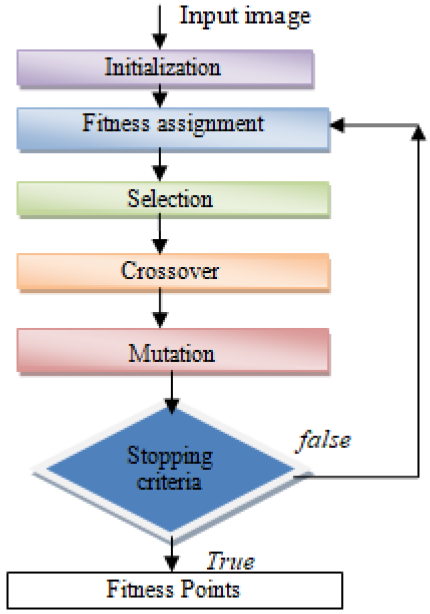


Figure Flow chart of genetic algorithm

3.5 Basic Operation

The basic operation of the genetic algorithm consist of initialization, selection, reproduction and termination.

1) Intialization - At first the intial population is formed by the numerous possible solutions. The size of the population mainly depends on the type of the problem. Normally numerous solution are present in the population where we have to find out the optimal solution from the cluster of solution present on the population.
2) Selection - After every successive operation a portion of existing population is taken into the account to form a new population. The new population is selected according to their fitness function where the fitness function is determined by the fitness values. The fitness value of the particle is determined by the following equation,

$$fitness(c) = w_a * accuracy_c + w_f * (number - features_c)^{-1}$$

where w_a and w_f are two predefined weights for finding the accuracy of the classifier. By comparing with the other methods the selection process is a time consuming and an efficient process.

3) Reproduction - After the selection process we have to generate a new population. The new population is mainly generated by the two processes mainly crossover or mutation. In the reproduction process the offspring are generated from the parents where the generated offspring shows the dominated characters of the parents. In the breeding process the best organisms having the best fitness value is selected.
4) Termination - The above mentioned steps are repeated simultaneously until the termination condition is reached. The commonly generated terminating conditions are,

a) The generated solution must satisfies the minimum criteria.

b) The total number of generations must be fixed.
c) Computational time should be limited

4. Proposed Recognition System

The entire work comprises of three main divisions:
1) Feature Extraction
2) Feature Optimization
3) Emotion Classification

The block diagram representation of the facial emotion recognition system is defined by,

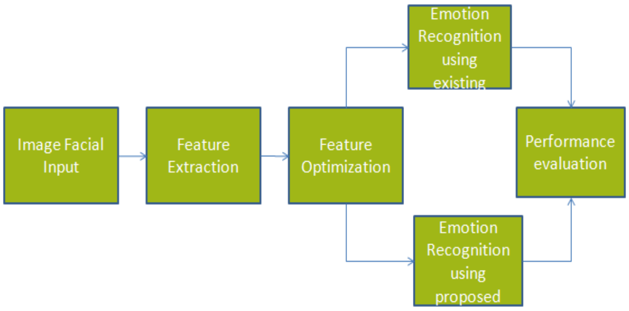


Figure: Block diagram for proposed work

4.1 Feature Extraction

There are four steps in the feature extraction process:

Preprocessing, HAAR face detection, Gabor filter hvn LBP operation.

The main aim of the preprocessing technique is the extracting of image data that avoids unwanted distortions or enhances the image features for further processing. The preprocessing technique mainly consist of Histogram equalization and bilateral filtering techniques. The histogram equalization is the process of adjusting the image intensities to enhance the contrast of the image. The histogram equalization is useful in both bright and dark images. It improves the global contrast of many images where the usable data is represented by the close contrast values. A histogram is estimate of the probability distribution of continuous variable.

A bilateral filter is a non linear, edge preserving and noise reducing smoothing filter for images. Since it is non linear, the change of output is not propotional to the change of input. The intensity values of the each pixel is replaced by the weighted average of the intensity values from the nearby pixel. The average weight of the pixel is mainly based on the guassian distribution. The gabor filter analyzes the frequency content in the specific direction in a localized region. The impulse response of the gabor filter is obtained by multiplying the sinusoidal wave with a guassian function.

The LBP operation is mainly performed by the hvn LBP comparison, where in the normal LBP the centre pixel is compared with the other neighborhood pixel. In the hvn LBP comparison the pixel values are compared horizontally and vertically and the values having the high weight age is taken into the account.

The mathematical explanation of the proposed horizontal and vertical neighborhood pixel comparison operator is defined by,

$$hvnLBP_{p,r} = \begin{Bmatrix} S(\max(l_0,l_1,l_2)), S(\max(l_7,l_3)), \\ S(\max(l_6,l_5,l_4)), S(\max(l_0,l_7,l_6)), \\ S(\max(l_1,l_5)), S(\max(l_2,l_3,l_4)) \end{Bmatrix}$$

where p represents the number of pixels, and r represents the radius.

$$S(\max(l_j,l_k,l_m)) = \begin{cases} 1 \\ 0 \end{cases}$$

where l_j, l_k, and l_m represent the adjacent pixels in the nearby row or column

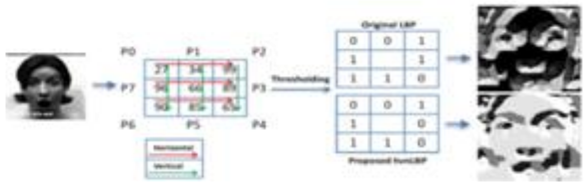
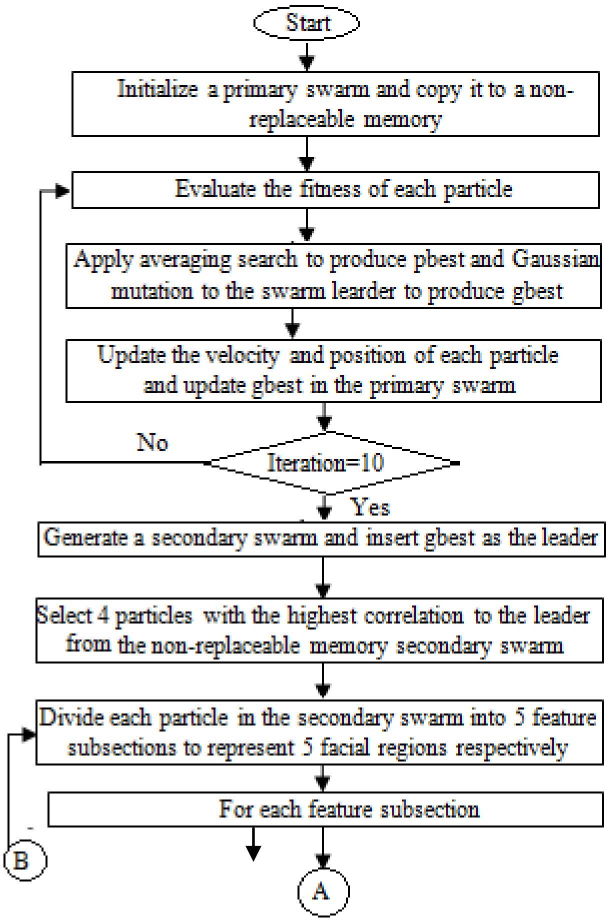


Figure: comparison between normal LBP and hvnLBP

4.2 Feature Optimization

To obtain the characteristics of each emotions, a PSO embedded with the micro genetic algorithm is used. It reduces the premature convergence problem of the normal PSO.



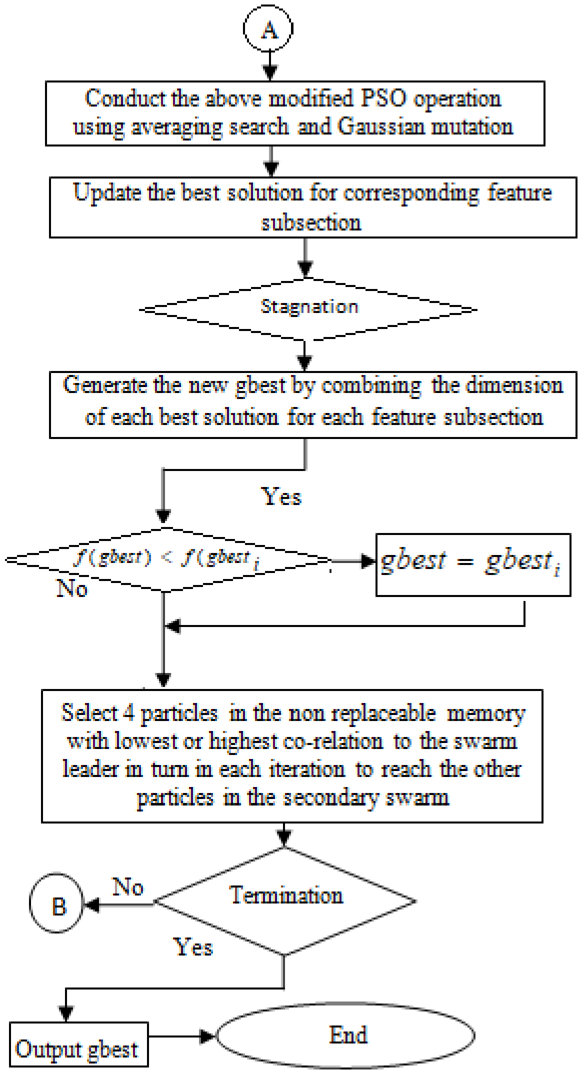


Figure: Flowchart of proposed PSO algorithm

First initialize the primary swarm and copy it to the non replaceable memory. Then find the fitness of each particle. Update the position and velocity of the each particle and update gbest in the primary swarm. The position and the velocity of the each particle is updated by,

$$x_{id}^{t+1} = x_{id}^{t} + v_{id}^{t+1}$$

$$v_{id}^{t+1} = w * v_{id}^{t} + c_1 * r_1 * (p_{id} - x_{id}^{t}) + c_2 * r_2 * (p_{gd} - x_{id}^{t})$$

where t and d indicate the t_{th} iteration and d_{th} dimension in the search space. Then generate a secondary swarm and update gbest as a leader. Four particles are selected with highest correlation to the leader in the primary swarm.
The correlation of the particle is identified by,

$$corr(H_1, H_2) = \frac{\sum_l (H_1(l) - H_1')(H_2(l) - H_2')}{\sqrt{\sum_l (H_1(l) - H_1')^2 \sum_l (H_2(l) - H_2')^2}}$$

Each particle in the secondary swarm is divided into five subsections which represents five facial regions such as eye, eyebrow, nose, mouth and cheek. The updated equations are given by,

$$v_{id}^{t+1} = w * v_{id}^{t} + c_1 * r_1 * (p_{id}^{'t} - x_{id}^{t}) + c_2 * r_2 * (p_{gd}^{'t} - x_{gd}^{t})$$

$$p_{id}' = \frac{\sum x_{id}}{t}$$

$$p_{gd}' = p_{gd} + (x_{max}^{d} - x_{min}^{d}) * \Phi(0, h)$$

where p_{id} and p_{gd} represent the pbest and gbest values. The fitness value obtained during the feature optimization process is given by,

$$fitness(c) = w_a * accuracy_c + w_f * (number - features_c)^{-1}$$

where w_a and w_f are two predefined weights for finding the accuracy of the classifier.

4.3 Emotion recognition

The emotion recognition in the facial emotion recognition system is mainly done by the sparse classifier.
While defining the sparse estimate of β the redundant components should be defined as zero. The sparseness technique used in the learning process can be defined by:

a. The simplified structure of the probability estimated function can be defined by sparsity.
b.
c. The generalization performance also increases with the degree of sparseness of β normally in kernel classifiers.

To improve the application-specific properties mere sparsity in classifier learning process, we proposed a term with the least absolute shrinkage and selection operator (LASSO) penalty

$$J(a) = \alpha \|\tau a\|_2^2 + \beta \|a\|_1$$

where the classifier weights are represented by a vector, Γ is a matrix for modeling the associations, and the regularization is controlled by the factor α and β. Normally in image analysis applications Smooth LASSO and modeling correlations are proposed.

$$\hat{a} = \min_a \|l_g - f(X_a)\|_0 + \alpha \|\tau a\|_2^2 + \beta \|a\|_1$$

Where f(·) maps X_a onto the label space, and l_g is a vector containing the ground truth labels. To reduce the complexity of classification, we propose a two step optimization technique.

Step 1: constraint-free optimal projection of the training data X is obtained using the graph embedding (GE):

$$W_y = \lambda D y$$

where y is the projection of X in the subspace of W.

Step 2: The weight of y and X_a are obtained during the classification process given by:

$$\hat{a} = \min_a \|y - Xa\|_2^2 + \alpha \|\tau a\|_2^2 + \beta \|a\|_1$$

The classification problem is changed into a regularized regression problem by the two step optimization technique.
The LASSO regression problem is obtained by,

$$\hat{a} = \sqrt{1+\alpha} \min_{\tilde{a}} \|\tilde{y} - \tilde{X}\tilde{a}\|_2^2 + \beta \|\tilde{a}\|_1$$

The spatiotemporally smooth sparse LDA (STSLDA) classifier is defined for finding the solution of y is given by,

$$W_{ij} = \begin{cases} 1/m_c & l_i = l_j = c \\ 0 & otherwise \end{cases}$$

where m_c is the number of samples in class c. We then optimize with Γ being a spatiotemporal Laplacian operator:

$$\tau_{p_k q_s} = \begin{cases} -1, q_s \in N_{p_k} \\ 0, otherwise \end{cases}, \tau_{p_k p_k} = -\sum_{q_c \neq p_k} \tau_{p_k q_s}$$

where N_{pk} is the "spatiotemporal" neighborhood.

4.4 Results and Discussion

In this proposed work, nine emotions are successfully derived by the facial emotion recognition system. The output images of the emotion recognition includes the following steps, namely face detection ,image cropping, Grayscale image conversion, Histogram Equalization, Bilateral Filtering, orientation of the image , LBP operation and finally the emotion recognized is displayed on the screen

Figure: surprise emotion

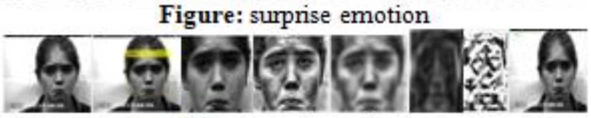


Figure: sad emotion

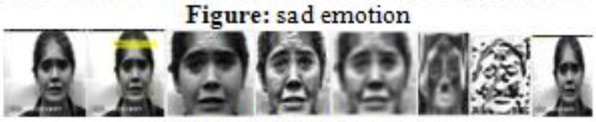


Figure: Depressed emotion

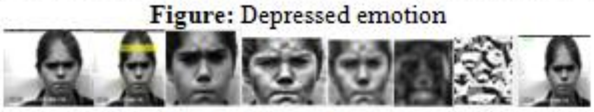


Figure: Akward emotion

Figure: Disgust emotion

Figure: Happy emotion

Figure: Anger emotion

Figure: Terror emotion

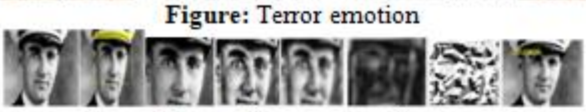


Figure: Courage emotion

The nine emotions analyzed by the facial emotion recognition system with modified PSO is defined by Surprise, Sad, Depressed,, Akward, Disgust, Happy,Anger, Terror, Courage. The efficiency of the emotion recognition may depends on the clarity and accuracy of the images given for testing. The accuracy of the emotion recognition can also be improved by increasing the number of training images. The overlapping of the emotions can be clearly removed in this type of technique. The execution time of the emotion recognition is quite faster as compared to the other technologies.

4.5 Performance Evaluation

In this project, a comparison is performed between the existing and proposed technologies in terms of success ratio. Success ratio is defined as the ratio of accurately recognized emotions to the total number of test performed.

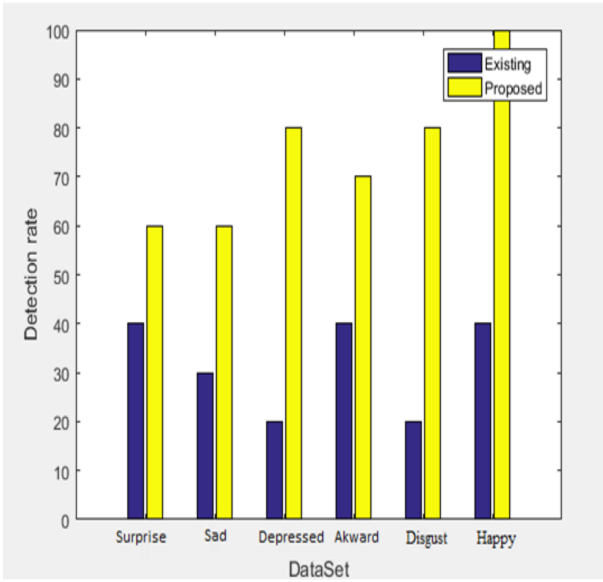


Figure: Performance evaluation

The datasets 1,2,3,4,5 and 6 describes the emotions surprise, sad, depressed, akward, disgust and happy. The evaluations results, the proposed technology is more accurate as compared to the existing technique. In the proposed technique, the support vector machine classifier is changed by sparse classifier for the efficient classification process.

5. Conclusion

The proposed facial emotion recognition system employs the classification of nine facial expressions such as surprise, sad, depressed, akward, disgust, happy, terror and courage. The classification is mainly done with the help of a sparse classifier where the efficiency is very high as compared to the other classifiers. Here the modified local binary pattern is proposed where the horizontal and vertical neighbourhood pixel comparison is obtained. The feature optimization is mainly done by the modified PSO, where the genetic algorithm is implemented on the conventional PSO. The fitness points are obtained from the facial regions by finding the best solution by the particle. Here additional three emotions such as anger, terror and courage is efficiently obtained with the help of a sparse classifier.

References

[1] A Micro-GA Embedded PSO Feature Selection Approach to Intelligent Facial Emotion Recognition Kamlesh Mistry, Li Zhang, Member, IEEE, Siew Chin Neoh, Chee Peng Lim, and Ben Fielding ,june 2017

[2] .Emotion Recognition from Facial Expressions using Multilevel HMM Ira Cohen, Ashutosh Garg, Thomas S. Huang Beckman Institute for Advanced Science and Technology.The University of Illinois at Urbana-Champaign.

[3] Facial Emotion Recognition and Classification Using Hybridization Method. Anchal Gar Dr. Rohit Bajaj Deptt. of CSE, Chandigarh Engg. College, Mohali, Punjab, India International Journal of Engineering Research and General Science Volume 3, Issue 3, May-June, 2015.

[4] Real-time Area Based Traffic Density Estimation by Image Processing for Traffic Signal Control System 2nd Int'l Conf. on Electrical Engineering and Information & Communication Technology (ICEEICT) 2015 Jahangirnagar University, Dhaka-1342, Bangladesh, 21-23 May 2015.

[5] EMOTION RECOGNITION FROM FACIAL EXPRESSION BASED ON BEZIER CURVE Shruti Bansal1 and Pravin Nagar2 1Department of Computer Science ,Pranveer Singh Institute of Technology, Kanpur, Uttar Pradesh 2Assistant Professor Pranveer Singh Institute of Technology, Kanpur, Uttar Pradesh, International Journal of Advanced Information Technology (IJAIT) Vol. 5, No. 3/4/5/6, December 2015.

[6] Face Based Automatic human Emotion Recognition Anuradha Savadi, Chandrakala VPatil, IJCSNS International Journal of Computer Science and Network Security, VOL.14 No.7, July 2014.

[7] Automatic facial emotion recognition, Aitor Azcarate, Felix Hageloh, Koen van de Sande, Roberto Valenti, june 2015.

[8] Real Time Facial Emotion Recognition based on Image Processing and Machine Learning, Rituparna Halder ,Sushmit Sengupta, International Journal of Computer Applications (0975 – 8887) Volume 139 – No.11, April 2016.

[9] An Embedded PSO Approach to Facial Emotion Recognition, Semna K, Najla PR, International Journal of Advanced Research in Computer and Communication Engineering, Vol. 6, Special Issue 3, March 2017.

[10] Facial Emotion Recognition Using Context Based Multimodal Approach, Priya Metri, Jayshree Ghorpade, Ayesha Butalia International Journal of Artificial Intelligence and Interactive Multimedia, Vol. 1, Nº 4.,

[11] Facial Emotion Recognition with Facial Analysis, İsmail Öztel, Cemil Öz, International Journal of Scientific Engineering and Applied Science (IJSEAS) - Volume-1, Issue-5, August 2015.

[12] Vision and Attention Theory Based Sampling for Continuous Facial Emotion Recognition, Albert C. Cruz, Student Member, IEEE, Bir Bhanu, Fellow, IEEE, and Ninad S. Thakoor, Member, IEEE.

[13] Facial Emotion recognition using Log Gabor filter and PCA, Ms Neelum Mehta, Ms Neelum Mehta Dr. Sangeeta Jadhav.

[14] Emotion detection using Kinect 3D facial points, Zhan Zhang, Liqing Cui, Xiaoqian Liu*, Tingshao Zhu School of Computer and Control Engineering, University of Chinese Academy of Sciences, Beijing, China Institute of Psychology, Chinese Academy of Sciences, Beijing, China.

[15] Automatic Emotion Detection Model from Facial Expression, 1Debishree Dagar, 2Abir Hudait, 3 H. K. Tripathy, 4 M. N. Das 2016 International Conference on Advanced Communication Control and Computing Technologies (ICACCCT).