IJETMR
International Journal of Engineering Technologies and Management Research
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HYBRID APPROACH FOR HUMAN FACIAL EXPRESSION DETECTION THROUGH TLBO AND PFEF

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Abstract:
This paper introduces facial expression detection method which is based on facial's selected feature and optimized those selected features. The study says that human face generally faced generally consist of skin color, texture shape and size of face in this paper we study skin color and texture of human face .This process consist two steps for the same. In first known as detection of expression which uses PFEF (partial feature extension function) and in second, for optimization we used TLBO algorithm is basically a population base searching technics. Also uses soft computation technics because we cannot actual and accurate for human related activity. Varieties of technic are used for the same purpose this as per use hybrid approach to get better result.

Keywords: *TLBO; PIFR; PFEF; Feature Extraction.*

Cite This Article: Samta Jain Goya, Dr. Arvind K. Upadhyay, Dr. R. S. Jadon, And Rajeev Goyal. (2018). "HYBRID APPROACH FOR HUMAN FACIAL EXPRESSION DETECTION THROUGH TLBO AND PFEF." *International Journal of Engineering Technologies and Management Research*, 5(2:SE), 328-333. DOI: https://doi.org/10.29121/ijetmr.v5.i2.2018.664.

1. Introduction

Facial expression recognition challenging area in the search which is rapidly expanded by scientist, researcher, neuroscientist in the field of HCI, access control system and many more. Faced detection is first step of in any automatic facial expression recognition system which is also challenging face due to variety of reasons such as variation of image appearance, pose variation, lightening condition, occlusion, image orientation etc.

Figure 1: Configuration of general face detection structure

There are many methods to handle all these variation of image[5], for detection some human face is primary attentive part to convey emotion. During daily routine, many times we change our

expression based on condition. Being a human we understand emotion of other human and react accordingly but the same cannot be happen with system.

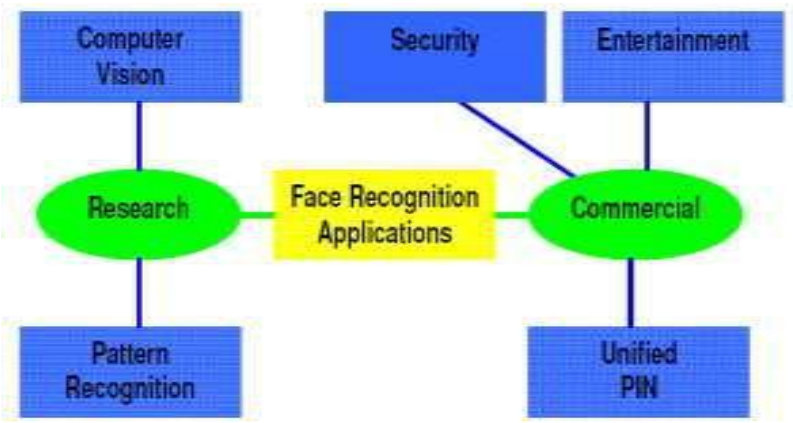

Figure 2: Applications of face recognition

To recognize facial expression, first we have to detect face from an image then extract feature from that face. Classify those features based on pre-define category of emotion and then we conclude which expression is exactly detected so that machine can react accordingly.

About Human Face and its Expressions

They are many expressions we see in our daily routine life. But for machine it's difficult to understand. Also difficult specially when machine have to react based on human 'expressions. Scientists found distinct facial emotions which include basic happiness and sadness, 'happily disgusted', fear, anger, surprise and disgust, they were also asked to act out so-called 'compound emotions', such as being 'happily surprised', 'sadly angry' or 'happily disgusted'.

2. Teacher Learning Based Optimization (Tlbo)

Teaching-Learning based Optimization (TLBO) algorithm is a global optimization method. It is basically a population- based iterative learning algorithm, used to get optimal feature set. It is very popular and successful technique which applied to many real world problems. It's very simple and very efficient. The convergence rate is important factor to solve an optimization issues, especially in evolutionary algorithms [2][3]. TLBO really used to improve the quality of results in compare to other techniques used in evolutionary computing such as Genetic Algorithm (GA), Particle Swarm Optimization (PSO), Differential Evolution (DE), and Artificial Bee Colony. The main issues with the real world applications are used to reduce convergence time without compromising the quality of results.

In this work, each learner in the class of learners can be divided into several partial vectors. This optimization method is based on the effect of the influence of a teacher on the output of learners in a class. In any optimization algorithms there are numbers of different design variables. The different design variables in TLBO are used to offers learners and the learners' result as a 'fitness', same as any other population-based optimization techniques. TLBO process is divided into two parts [8]. The first part consists of the "Teacher phase" and the second part consists of

the "Learner phase". The "Teacher phase" means learning from the teacher and the "Learner phase" means learning through the interaction between learners.

Initialization

Following notations are used to describe TLBO-
N: Represent Class size
D: Represents the Courses which are offered to the learners
MAXIT: maximum allowable iterations 'numbers
A search space is bounded by the matrix of rows and columns which is initialized by the population.

$$x^{0}_{(i,j)}=x_j^{min}+\text{rand}\times(x_j^{max}-x_j^{min})\text{----------} \quad (1)$$

Where *rand* represents a uniformly distributed random variable within the range (0, 1), xminj and xmaxj represent the minimum and maximum value for *jth* parameter. The parameters of *ith* learner for the generation [14] *g* are given by

$$X^{g}_{(i)}=[x^{g}_{(i,1)}, x^{g}_{(i,2)}, x^{g}_{(i,3)}, \ldots x^{g}_{(i,j)}. \ldots \ldots . x^{g}_{(i,D)} \quad]\text{----------} \quad (2)$$

Proposed Algorithm

This paper presenting proposed work in the form of algorithm. This algorithm is used to detect and optimized human facial features to get expressions.

Step-1: Initially uses image database, taken it from google for feature extraction.
Step-2: Then uses partial Feature Extraction which is used to generate feature matrix as a shape feature, known as "shape feature matrix".
Step-3: This matrix used to make vector of each features.
Step-4: Initiate Shape Feature SF N=100 and compare N with "Distance Vector"
Step-5: If (Value of Feature) > (Vector Value), processed for new set of student.
Step-6: Now set value of TF and generate random population 'X'.
Step-7: After Getting these values, calculate Fitness value 'X'.
Step-8: If X<TF then assign fitness value to TF.
Step-9: If (TF<NT)Then assign NT=TF
Else update population with the updating of TF-Value.
Step-10: After assigning value of TF to NT, get "optimal Feature Matrix" which takes as an input for classification process.
Step-11: At last we get final facial expression.

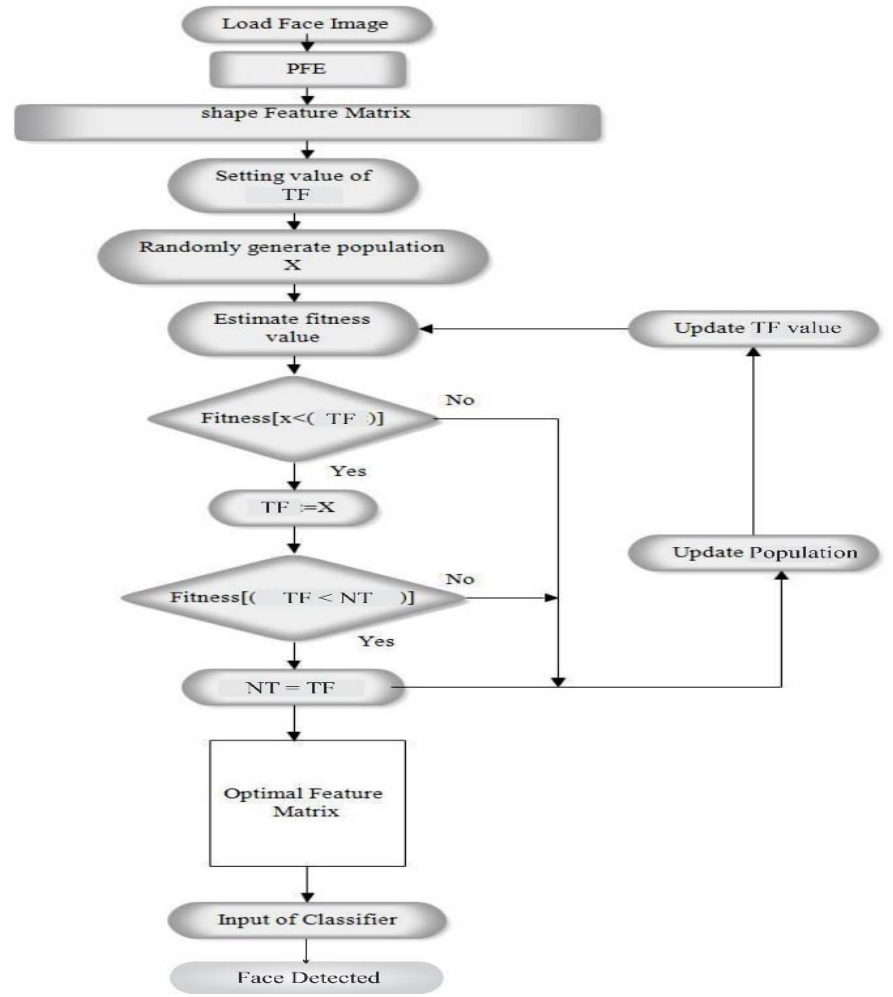

Figure 1: Shows the proposed block diagram of face detection

3. Experimental Analysis

In this section discuss the experimental result analysis. The proposed algorithm implemented in MATLAB software and used google image database for face detection. For the evaluation of performance measure hit and miss ratio of detected face.

Table 1: Shows that the comparative study for group image 1 with using LBP and proposed method

Group Image Name	**Method**	**Total No Of Face**	**Hit**	**Miss**	**Detection Ratio %**
Group image 1	LBP	35	5	2	14.28
	Proposed	35	25	3	71.42

Table 2: Shows that the comparative study for group image 2 with using LBP and proposed method

Group Image Name	**Method**	**Total No Of Face**	**Hit**	**Miss**	**Detection Ratio %**
Group image 2	LBP	15	1	1	6.66
	Proposed	15	3	1	20

Table 3: Shows that the comparative study for group image 3 with using LBP and proposed method

Group Image Name	**Method**	**Total No Of Face**	**Hit**	**Miss**	**Detection Ratio %**
Group image 3	LBP	25	8	0	32
	Proposed	25	21	1	84

Table 4: Shows that the comparative study for group image 4 with using LBP and proposed method

Group Image Name	**Method**	**Total No Of Face**	**Hit**	**Miss**	**Detection Ratio %**
Group image 4	LBP	6	5	1	83.33
	Proposed	6	6	4	100

Table 5: Shows that the comparative study for group image 5 with using LBP and proposed method

Group Image Name	**Method**	**Total No Of Face**	**Hit**	**Miss**	**Detection Ratio %**
Group image 5	LBP	4	1	0	25
	Proposed	4	4	0	100

4. Conclusion

This paper improves the process of facial expression detection using PFEF and TLBO algorithm. This process converts or transform layered form of an image to extract feature or face. To get optimized feature set, PIFR and SVM This whole process done through two phases in first phase,

optimized facial feature and second phase detect facial expression. During implementation of this work, hit ratio detection 40 TLBO is better than PIFR method this work is compatibly better, efficient for the individual face or in a group.

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