Improved the Perfromance Of Face Detection Based On Partial Feature and TLBO

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ABSTRACT
Face detection and recognition is important area of researcher in biometric security system. The changing of face expression and some physical component accrued for the process of face is major problem for face detection and recognition. For the improvement of face detection and recognition used various algorithm such as LBP, wavelet and many more function. In this paper proposed a hybrid method for face detection. The hybrid method of face detection is basically enhancement of local binary pattern method. For the improvement of LBP method used optimization technique for better face detection. The teacher learning based optimization is dynamic optimization technique and gives better result instead of PSO and ACO. The proposed algorithm implemented in MATLAB software and used google image database for face detection. For the evaluation of performance used hit and miss ratio.

Keywords: - Biometric Face Detection, TLBO, Classification, Feature extraction

INTRODUCTION

Biometric identification plays very important role in authentication and authorization. The process of authentication and authorization required security measure parameter for the validation of human identification. Face recognition systems have gained a great deal of popularity due to the wide range of applications that they have proved to be useful in. Broadly, two main categories for these applications exist: commercial applications and research applications. From a commercial standpoint, face recognition is practical in security systems for law enforcement situations [4]. It is in places like airports and international borders that the need arises for a face recognition system that identifies individuals. Another application of face recognition is the protection of privacy, obviating the need for exchanging sensitive personal information. Instead, a computer-based face recognition system would provide sufficient identification. For instance, PIN numbers, user ID's, and passwords would be replaced by face recognition in order to unify personal identification. Finally, face recognition systems can be used for entertainment purposes in areas like video games and virtual reality [1]. In research applications, face recognition has opened the door for research in areas like image and video processing [10]. The approaches used in face recognition are useful in the general area of pattern recognition and data classification. .Rest of this paper is organized as follows in Section II discusses about TLBO machine, Section III proposed algorithm IV. Experimental result analysis Finally, concluded in section V.

II TEACHER LEARNING BASED OPTIMIZATION (TLBO)

This optimization method is based on the effect of the influence of a teacher on the output of learners in a class. It is a population based method and like other population based methods it uses a population of solutions to proceed to the global solution. A group of learners constitute the population in TLBO [17]. In any optimization algorithms there are numbers of different design variables. The different design variables in TLBO are analogous to different subjects offered to learners and the learners' result is analogous to the 'fitness', as in other population-based optimization techniques. As the teacher is considered the most learned person in the society, the best solution so far is analogous to Teacher in TLBO. The process of TLBO is divided into two parts. 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. In the sub-sections below we briefly discuss the implementation of TLBO.

INITIALIZATION

Following are the notations used for describing the TLBO
N: number of learners in class i.e. "class size"
D: number of courses offered to the learners
MAXIT: maximum number of allowable iterations
The population X is randomly initialized by a search space bounded by matrix of N rows and D columns. The jth parameter of the ith learner is assigned values randomly using the equation

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

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

$$X_{(i)}^{g} = \left[x_{(i,1)}^{g}, x_{(i,2)}^{g}, \ldots\ldots\ldots\ldots x_{(i,j)}^{g} \ldots\ldots x_{(i,D)}^{g}\right] \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

II 1 TEACHER PHASE

The mean parameter Mg of each subject of the learners in the class at generation g is given as

$$M^{g} = \left[m_1^{g}, m_2^{g} \ldots\ldots\ldots\ldots m_j^{g} \ldots\ldots m_D^{g}\right] \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The learner with the minimum objective function value is considered as the teacher Xg Teacher for respective iteration. The Teacher phase makes the algorithm proceed by shifting the mean of the learners towards its teacher. To obtain a new set of improved learners a random weighted differential vector is formed from the current mean and the desired mean parameters and added to the existing population of learners.

$$Xnew_{(i)}^{g} = X_{(i)}^{g} + rand \times \left(X_{Teacher}^{g} - TFM^{g}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

TF is the teaching factor which decides the value of mean to be changed. Value of TF can be either 1 or 2. The value of TF is decided randomly with equal probability as,

$$T_F = round[1 + rand(0,1)\{2 - 1\}] \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Where TF is not a parameter of the TLBO algorithm. The value of TF is not given as an input to the algorithm and its value is randomly decided by the algorithm using Eq. (5). After conducting a number of experiments on many benchmark functions it is concluded that the algorithm performs better if the value of TF is between 1 and 2. However, the algorithm is found to perform much better if the value of TF is either 1 or 2 and hence to simplify the algorithm, the teaching factor is suggested to take either 1 or 2 depending on the rounding up criteria given by Eq. (5). If Xnew is found to be a superior learner than Xg in generation g , than it replaces inferior learner Xg in the matrix.

II 2 LEARNER PHASE

In this phase the interaction of learners with one another takes place. The process of mutual interaction tends to increase the knowledge of the learner. The random interaction among learners improves his or her knowledge. For a given learner Xg , another learner Xg is randomly selected (i≠ r). The ith parameter of the matrix Xnew in the learner phase is given as

$$Xnew_{(i)}^{g} = \begin{cases} x_i^{g} + rand \times (x_i^{g} - x_r^{g}) \text{ if } f(x_i^{g}) < f(x_r^{g}) \\ x_i^{g} + rand \times (x_r^{g} - x_i^{g}) \text{ otherwise} \end{cases} \ldots\ldots\ldots\ldots (6)$$

III PROPOSED ALGORITHM

In this section discuss the proposed algorithm of face detection based on feature selection and feature optimization process. Initially used face image database and passes through partial feature extractor and this feature extractor gives a shape feature off ace image database. The extracted shape features pass through TLBO algorithm and selects the proper feature and optimized the feature and finally passes through thesupportvectormachineforclassificationoffeatureandfinallyd etectedthefaceandcalculatethehit and miss ratio of detected face. The process of algorithm discusses step by step in below section. Here discusses the step

1. Input F1,F2…….Fn in O1,O2,……..On fo F total population
2. Map feature to search space(Si,Oi)
3. Define feature as teacher and pass
4. Do
5. feature each teacher do
6. feature each Oi do
7. Select next feature
8. End for
9. Estimate feature template
10. Passes through LSVM
11. If estimated valueVi equal to template, then
12. Load map (Oi, Si)
13. Update the face template
14. End if
15. End for
16. Population is empty
17. Faceis detected
18. Process is terminated

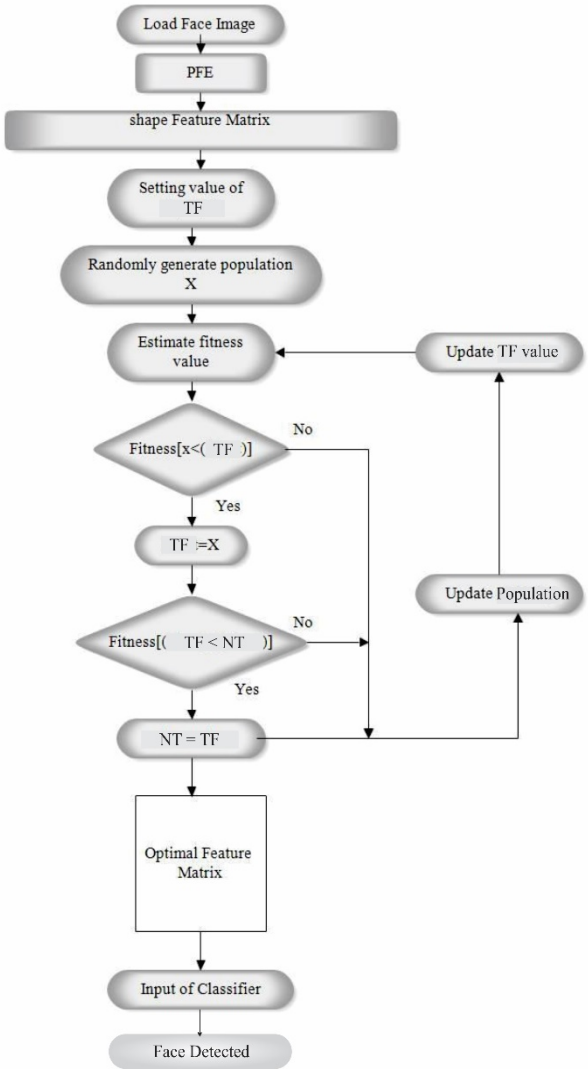

Figure 1: Shows the proposed block diagram of face detection

IV 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.

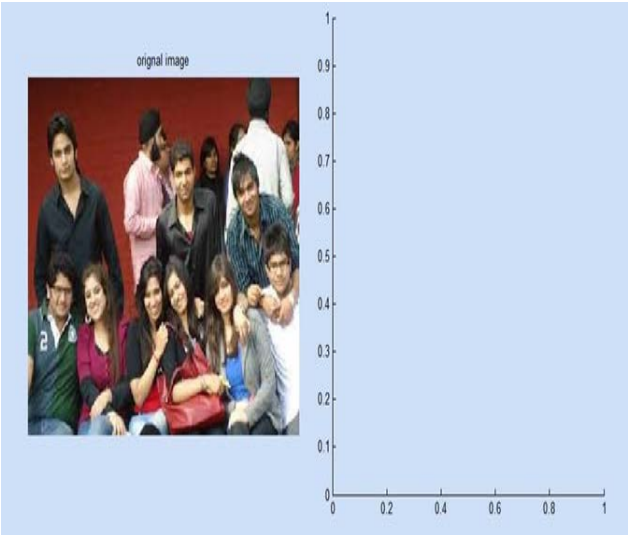

Fig. 2: Shows that the original input image 2 for face detection using LBP method.

Fig 3: Shows that the result image 2 for face detection using 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 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 2	LBP	15	1	1	6.66
	Proposed	15	3	1	20

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 3	LBP	25	8	0	32
	Proposed	25	21	1	84

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 4	LBP	6	5	1	83.33
	Proposed	6	6	4	100

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 5	LBP	4	1	0	25
	Proposed	4	4	0	100

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

In this section we show the comparative result analysis in the form of graph for various group images using for face detection on LBP and proposed method. The result shows the no. of person in a group images and we find the miss ratio, hit ratio and detection ratio for respective image. The summary of each group images describe below:

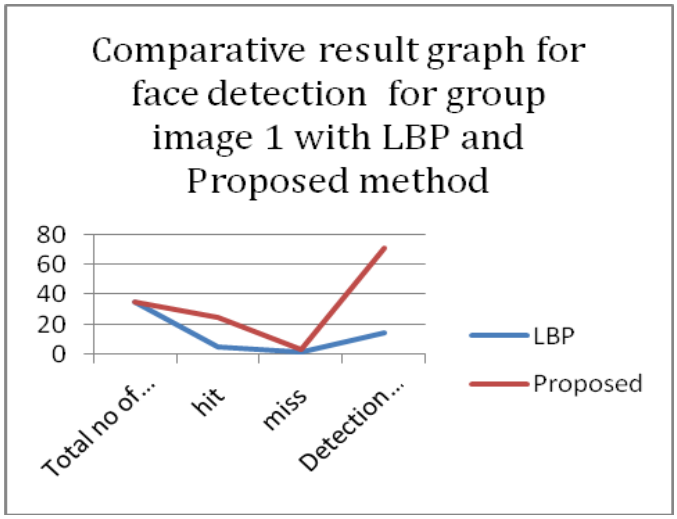

Fig.4: Shows that the Comparative result graph for group image 1 and find the no. of person in an image, hit ratio, miss ratio and detection ratio on the basis of LBP and our proposed method, then we find that the our proposed method result is always better than the LBP method.

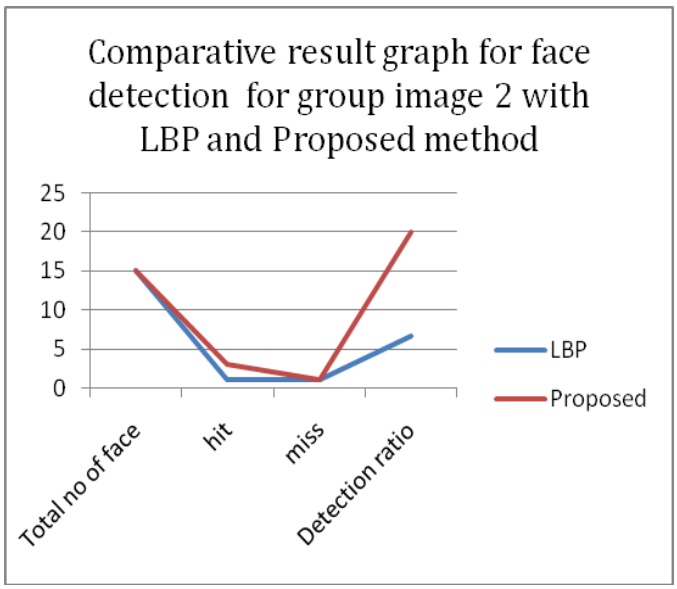

Fig.5: Shows that the Comparative result graph for group image 2 and find the no. of person in an image, hit ratio, miss ratio and detection ratio on the basis of LBP and our proposed method, then we find that the our proposed method result is always better than the LBP method.

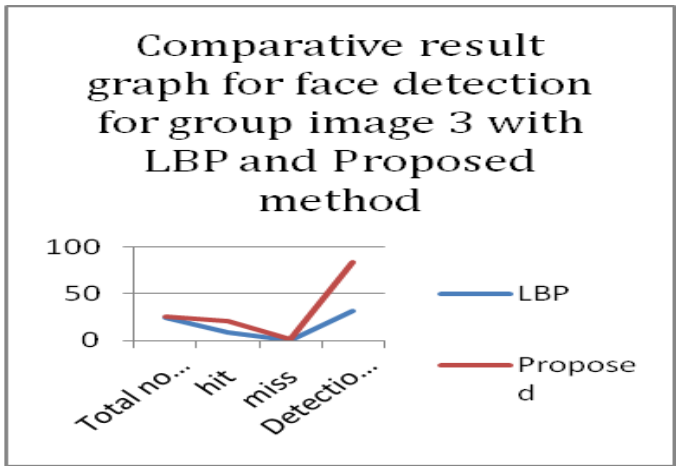

Fig.6: Shows that the Comparative result graph for group image 3 and find the no. of person in an image, hit ratio, miss ratio and detection ratio on the basis of LBP and our proposed method.

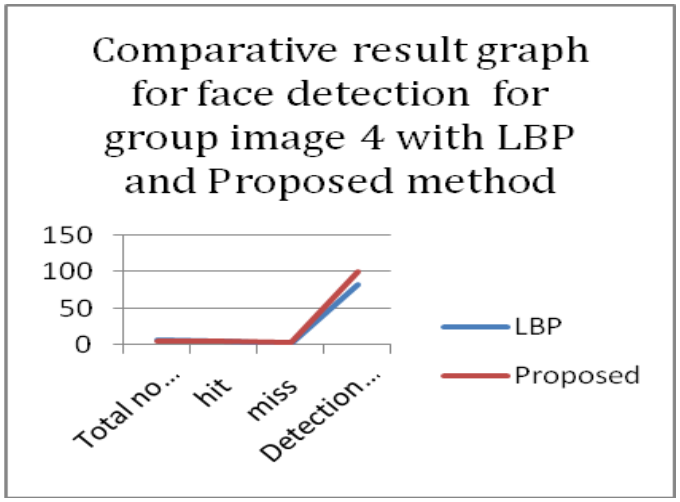

Fig.7: Shows that the Comparative result graph for group image 4 and find the no. of person in an image, hit ratio, miss ratio and detection ratio on the basis of LBP and our proposed method..

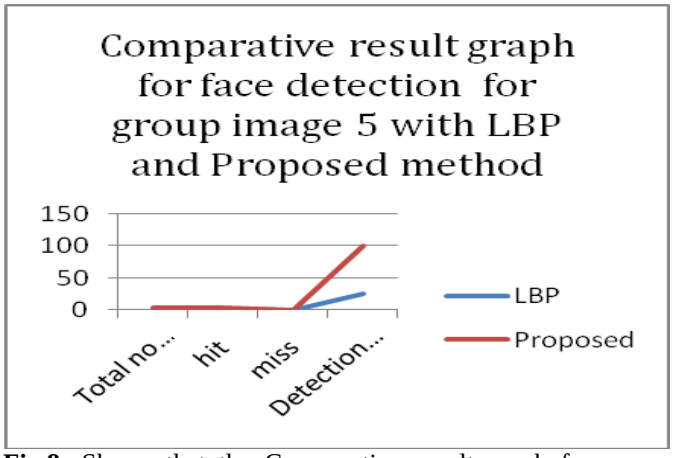

Fig.8: Shows that the Comparative result graph for group image 5 and find the no. of person in an image, hit ratio, miss ratio and detection ratio on the basis of LBP and our proposed method.

V CONCLUSION & FUTURE SCOPE

In this paper proposed the hybrid method of face detection. The hybrid method is combination of partial feature extractor and teacher learning based optimization technique. the teacher learning based optimization technique optimized the feature of face data and improve the performance of face detection. The proposed algorithm implemented in MATLAB software and for the validation of algorithm used google image dataset. For the evaluation of result used hit and miss ratio of face image. The proposed method gives better result instead of LBP method. The improved method of face detection increases the time complexity of detection. Now in future reduces the time complexity of algorithm.

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