Correlation Method Based PCA Subspace using Accelerated Binary Particle Swarm Optimization for Enhanced Face Recognition

Ms. Navpreet Kaur
M.Tech Scholar
Department of Computer Science And Engineering,
Global Institute of Management And Emerging Technologies,Amritsar,punjab,India.
navpreet761@gmail.com

Ms. Rasleen Kaur
Assistant professor
Department of Computer Science And Engineering
Global Institute of Management And Emerging Technologies,Amritsar,punjab,India.
rasleendeol@gmail.com

Abstract**--**The capacity to perceive human countenances is an exhibit of unfathomable human insight. Clinicians inferred that comprehensive and highlight based methodologies are double courses to the face acknowledgment [1]. Most early methodologies in face acknowledgment extricate nearby highlights from face pictures. Be that as it may, the kind of nearby highlights which are most steady and discriminative for face acknowledgment is obscure. Because of challenges in heartily separating nearby highlights from face pictures, analysts started to utilize the entire face area as the crude info to an acknowledgment framework, and created all-encompassing coordinating strategies. There are a large number of productions in face acknowledgment utilizing all-encompassing methodologies. Furthermore, for the most part this kind of methodologies can attain to preferred execution over highlight based methodologies [2], [3]. Notwithstanding, the execution of comprehensive coordinating techniques will drop when there are varieties because of outflows or postures. Also, neighbourhood highlights extricated from nearby districts of a face picture are stronger to these varieties than the worldwide highlights. This inspires us to re-ponder the highlight based methodologies.

Keywords*: Face recognition, Particle Swarm Optimization (PSO), PCA, Correlation method.*

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I. INTRODUCTION

Face Recognition System is one of the most successful applications of enhanced computational ability and image processing. Automatic face recognition is intricate primarily because of difficult imaging conditions, ageing, facial expression, occlusion etc. Thus, image pre-processing is used to resize (to reduce the dimensionality of feature subset), adjust contrast, brightness and filter the noise in an image. Face Recognition (FR) has evolved drastically over the last decade and has found innumerableapplications in various fields. Major advancements in the recent past have propelled FR technology intothe spotlight. FR is used for both verification and identification.

In this work we propose Accelerated Binary Particle SwarmOptimization (ABPSO) algorithmbased on an intelligently updated velocity equation. We apply ABPSOfor feature selection and establish its improved performance over the basic Binary PSO algorithm. The setof selected features are found to be significantly reduced. This causes a reduction in the memory spacerequired for storing face features in the face feature gallery of the proposed FR system. Theexperiments are conducted for ORL databases.

A. Why Face Identification Is Required?

The improvement of programmed visual reconnaissance framework is a famous exploration point in PC vision. For observation as well as be utilized to plan frameworks for computerized finance, visual sensors, machine learning and so on [8, 9].

The fundamental undertaking of the proposed face acknowledgment framework is acknowledgment which all for all situation intends to figure out if or not a given test picture is exhibit in the display. In spite of the fact that acknowledgment is our principle issue, in the analyses, we consider distinguishing proof which is a general exploratory evidence of acknowledgment. ID includes deciding the best conceivable match for a given test (Forced decision test) and henceforth it may give false positives. To conquer this we utilize positioning [10], with the assistance of which, we can extend distinguishing proof as the issue of acknowledgment in the Cumulative Match Curve (CMC).

B. Face Recognition Challenges:

Challenges of a face recognition system.

- *The Image Quality*: The primary requirement of face recognition system is suspect's good quality face image and a good quality image is one which is collected under expected conditions. For extracting the image features the image quality is important. Without the accurate computations of facial features the robustness of the approaches will also be lost. Thus even the best recognition algorithm deteriorate as the quality of the image declines.

- *Illumination Problem:* Same face appears differently due to change in lighting. Illumination can change the appearance of an object drastically. We must overcome irregular lighting.
- *Illumination problem approaches*: The illumination problem can be faced employing different approaches
- *Multi-spectral imaging:* Multi-Spectral Images (MSI) are those that capture image data at specific wavelengths. The wavelengths can be separated by filters or other instruments sensitive to particular wavelets. MSI enables the separation of spectral information of illumination from other spectral information [13].
- *Pose Variation Usually:* the training data used by face recognition systems are frontal view face images of individuals. Frontal view images contain more specific information of a face than profile or other pose angle images. The problem appears when the system has to recognize a rotated face using this frontal view training data. User need together multiple views of an individual in a face database [14].
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II. METHODOLOGY

A. *Accelerated Binary Particle Swarm Optimization(ABPSO):*

For binary discrete search space, Kennedy and Eberhart have adapted the PSO to search in binary spaces by applying a sigmoid transformation to the velocity component in the equation to squash the velocities into a range [0,1] and force the component values of the positions of the particles to be 0's or 1's.Particle Swarm Optimization is evolutionary algorithm based on swarms and it has been introduced by Kennedy. PSO shares many features with other evolutionary algorithms. The system is initialized with number of populations. Then searching for optima is done. Unlike GA, PSO has no operators like mutation, fitness etc. In PSO, there are potential solutions called PSO. Each particle in PSO moves after another particle in its space for searching for new solutions. Each particle has its own coordinate and velocity and all the particles move through the search space. Each particle has vector x, that is moving with velocity b. suppose search space is in m- dimensional, then o^{th} individual can be represented as [17];

X_o={ $X_o 1, X_o 2, \dots \dots \dots \dots . . X_o m$}

V_o={ $V1, V_o 2, \dots \dots \dots \dots . . V_o m$}

O=1, 2, 3………..m.

Where m is the size of the swarm population. Previous experience can be represented as below;

A_{of}_f= {A_{of}_f1, A_{of}_f2……….A_{of}_fm}

So, PSO algorithm can be represented as below;

- Create initial particles.
- Evaluate the objective function of each particle.
- Choose new velocities
- Update each particle location.
- Iterate until a solution is reached.

B. *Principal component analysis (PCA):*

Principal component analysis is a classic method used for compress higher dimensional data sets to lower dimensional ones for data analysis, apparition, feature extraction, or data compression. PCA involves the calculation of the Eigen value decomposition of a data covariance medium or singular value decay of a data matrix, usually after mean centering the data for each attribute [18].

Step 1: Get normalizes data from the iris regions. 2-D iris image is represent as 1-D Vector by concatenating each row (or Column) into a long vector

Step 2: Take away the mean image from each image vector.

Step 3: Compute the covariance matrix.

Step 4: Analyze the eigenvectors and Eigen values of the covariance matrix.

Step 5: The eigenvectors are sorted from high to low according to their corresponding Eigen values. Choose components and forming a feature vector

Step 6: Derive the new data set once we have chosen the components, we simply take the transpose of the vector and increase it on the left of the original data set, transposed.

Final Dataset = RowFeatureVector x Row Mean Adjust

Where RowFeatureVector is the matrix with the eigenvectors in the columns transposed so that the eigenvectors are now in the rows, with the most major eigenvector at the top, and RowMeanAdjust is the mean used to data transposed. The data items are in each editorial, with each row holding a split dimension.Principal components analysis is basically useful for dropping the number of variables that consists a dataset while retaining the contradiction in the data and to identify unknown patterns in the data and to classify them according to how much of the information, stored in the data, they report for.

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PCA allows scheming a linear alteration that maps in order as of a high dimensional space to a lower dimensional space [19]:

$$b_1 = t_{11}a_1 + \dots\dots\dots T_{1n}a_N$$

$$b_2 = t_{21}a_1 + \dots\dots\dots T_{2n}a_N$$

$$b_k = t_{K1}a_1 + \dots\dots\dots T_{13n}a_N$$

III. ALGORITHM :

• Initialize the particle position by assigning location p = (p0, p1…., pN) and velocities v = (v0,v1, …,vN).

• Determine the fitness value of all the particles: f (p) = (f (p0), f (p1)… f (pN)).

• Evaluate the location where each individual has the highest fitness value so far: p= ($p0^{best}$, p1best… pNbest).

• Evaluate the global fitness value which is best of all p^{best}: G (p) = max (f (p)).
The particle velocity is updated based on the p^{best} and g^{best}.

• v_i new = v1 + c1 × rand ( ) × (p_i^{best} - pi) + c2 × rand ( ) × (p_g^{best} - pi)

For 1 < i< N. (1)

• Where c1 and c2 are constants known as acceleration coefficients and rand () are two separately generated uniformly distributed random numbers in the range [0, 1].

• Update the particle location by: p_i^{new} = pi + v_i^{new} for 1 < i < N.

• Terminate if maximum number of iterations is attained or minimum error criteria is met.

• Go to step 2.

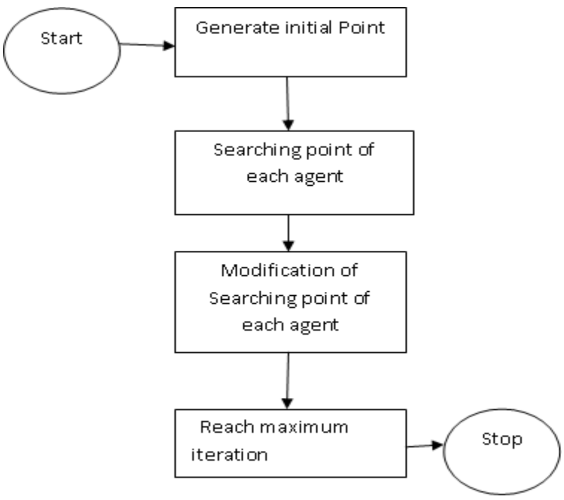

Figure.1 PSO Algorithm

IV. RESULTS

Some observations that were concluded from this experimental study of diffrent images and the results was comparied with the Traditional methods[20].

S.no	FAR	FRR	Accuracy
1.	1.99	0.841	97.15
2.	1.98	0.983	97.35
3.	1.97	0.845	97.44
4.	1.96	0.845	97.33
5.	1.99	0.85	97.67
6.	1.992	0.851	97.67
7.	1.993	0.843	97.89
8.	1.981	0.843	97.78
9.	1.965	0.832	97.8
10.	1.981	0.822	97.44

Table I Comparison Table

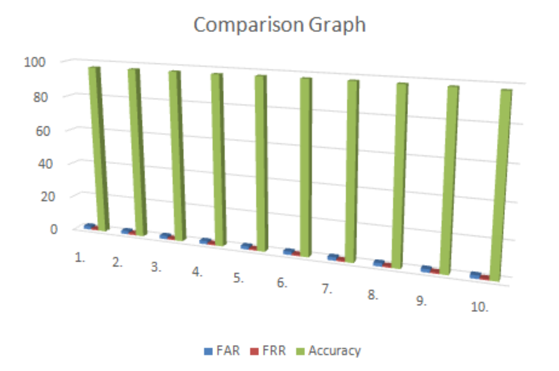

Figure 1.2 Comparison Graph

Methods	Accuracy
Traditional Method [45]	86%
Proposed Method	97%

Table II Traditional Method Comparison

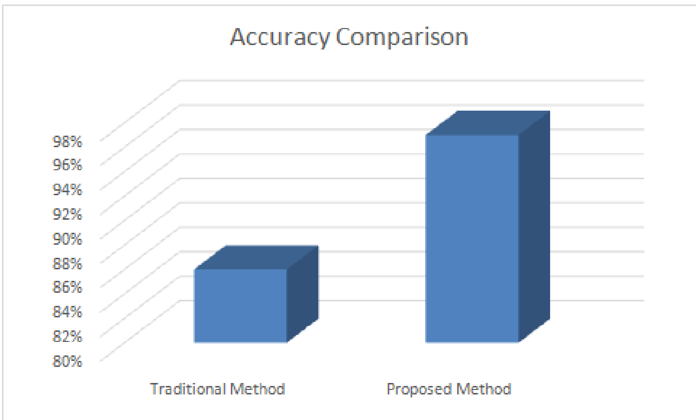

Figure 1.3 Traditional Method Comparison

V. CONCLUSION

It is our opinion that research in face recognition is an exciting area for many years to come and will keep many scientists and engineers busy. In this proposal, we have given concepts of face recognition methods & its applications.

Also a model of face acknowledgment System utilizing PCA and ABPSO method has been talked about. Here a static face acknowledgment framework has been created. Firstly various pictures has been taken and afterward highlight extraction is done in which expansive number of highlights has been extricated. After that acceptance check has been executed utilizing Euclidian distance as a part of which exactness has been gotten of 97%.

VI. FUTURE SCOPE

Future scope lies in the usage of any other PSO based feature optimization method like PSO fuzzy, PSO clustering etc.

VII. REFERENCES

[1]. W. Zhao, R. Chellappa, P.J. Phillips, and A. Rosenfeld, “Face recognition: A literature survey,” ACM Computing Surveys, vol. 35, no. 4, pp. 399–458, 2003.
[2]. B. Heisele, P. Ho, J. Wu, and T. Poggio, “Face recognition: Component-based versus global approaches,” Comput. Vis. Image Understand, vol. 91, no. 1, pp. 6–12, 2003.
[3]. Q. Yang and X.O. Tang, “Recent advances in subspace analysis for face recognition,” in Advances in Biometric Person Authentication, pp. 275–287. 2005.
[4]. M. Brown and D.G. Lowe, “Invariant features from interest point groups,” in British Machine Vision Conference, 2002, pp. 656–665.
[5]. D.G. Lowe, “Distinctive image features from scale-invariant keypoints,” International Journal of Computer Vision, vol. 60, pp. 91–110, 2004.
[6]. T. Lindeberg, “Feature detection with automatic scale selection,” International Journal of Computer Vision, vol. 30, no. 2, pp. 79–116, 1998.
[7]. M. Bicego, A. Lagorio, E. Grosso, and M. Tistarelli, “On the use of sift features for face authentication,” Computer Vision and Pattern RecognitionWorkshop, 2006 Conference on, pp. 35–35, June 2006.
[8]. D.R. Kisku, A. Rattani, E. Grosso, and M. Tistarelli, “Face identification by sift-based complete graph topology,” Automatic IdentificationAdvanced Technologies, 2007 IEEE Workshop on, pp. 63–68, June 2007.
[9]. Hua Gu Guangda Su Cheng Du, “Feature Points Extraction from Faces”, Image and Vision Computing NZ, pp.154-158, 2006.
[10]. T. Baltrušaitis, D. McDuff, N. Banda et al., “Real-time inference of mental states from facial expressions and upper body gestures,” in Proceedings of the IEEE International Conference on Automatic Face and Gesture Recognition and Workshops (FG '11), pp. 909–914, March 2011
[11]. M. Pantic, A. Pentland, A. Nijholt, and T. Huang, “Human computing and machine understanding of human behavior: a survey,” in Proceedings of the 8th International Conference on Multimodal Interfaces (ICMI '06), pp. 239–248, ACM, New York, NY, USA, November 2006.
[12]. A. Wendemuth and S. Biundo, “A companion technology for cognitive technical systems,” in Cognitive Behavioural Systems, A. Esposito, A. Esposito, A. Vinciarelli, R. Hoffmann, and V. Mller, Eds., vol. 7403 of Lecture Notes in Computer Science, pp. 89–103, Springer, Berlin, Germany, 2012.
[13]. G. Littlewort, M. S. Bartlett, L. P. Salamanca, and J. Reilly, “Automated measurement of children’s facial expressions during problem solving tasks,” in Proceedings of the IEEE International Conference on Automatic Face and Gesture Recognition and Workshops (FG '11), pp. 30–35, 2011.
[14]. Jun Luo, Yong Ma, ErinaTakikawa, Shihong Lao, Masato Kawade, Bao-Liang Lu: Person-Specific SIFT Features for Face Recognition. ICASSP (2) 2007: 593-596.
[15]. Wei-Lun Chao,” Face Recognition”, International Journalof Engineering Science and Technology, vol. 83, no. 5, pp. 705-74,2006.
[16]. Geng, Cong, and Xudong Jiang. "Face recognition using sift features." Image Processing (ICIP), 2009 16th IEEE International Conference on. IEEE, 2009.
[17]. Gunjan Dashore proposed An Efficient Method For Face Recognition Using Principal Component Analysis (PCA).," ACM Comput. Surv, Vol. 35, pp. 399- 458, 2012.
[18]. Correa, E. S., Freitas, A. A., and Johnson, C. G., \A new discrete particle swarm algorithm applied to attribute selection in a bioinformatics data set," in [GECCO '06: Proceedings of the 8th annual conference on Genetic and evolutionary computation], 35{42, ACM, New York, NY, USA (2006).
[19]. Martinez, A. M. and Kak, A. C., \PCA versus LDA," IEEE Transactions on Pattern Analysis and Machine Intelligence 23(2), 228{233 (2001).
[20]. Abhjeet, “Face Recognition using Back Propagation Neural Network Technique”,International Conference on Advances in Computer Engineering and Applications (ICACEA) IMS Engineering College, Ghaziabad, India, 2015.