World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:10, No:3, 2016

Manipulation of Image Segmentation Using Cleverness Artificial Bee Colony Approach

Y. Harold Robinson, E. Golden Julie, P. Joyce Beryl Princess

***Abstract*—**Image segmentation is the concept of splitting the images into several images. Image Segmentation algorithm is used to manipulate the process of image segmentation. The advantage of ABC is that it conducts every worldwide exploration and inhabitant exploration for iteration. Particle Swarm Optimization (PSO) and Evolutionary Particle Swarm Optimization (EPSO) encompass a number of search problems. Cleverness Artificial Bee Colony algorithm has been imposed to increase the performance of a neighborhood search. The simulation results clearly show that the presented ABC methods outperform the existing methods. The result shows that the algorithms can be used to implement the manipulator for grasping of colored objects. The efficiency of the presented method is improved a lot by comparing to other methods.

***Keywords*—**Color information, EPSO, ABC, image segmentation, particle swarm optimization, active contour, GMM.

I. INTRODUCTION

A branch of nature-inspired algorithms known as swarm intelligence is focused on insect activities in order to develop some meta-heuristics which can mimic insects' problem solution abilities [6]. Ant colony optimization, PSO, wasp nets etc. are some of the well-known algorithms that mimic insect activities in problem modeling and solution for mounting innovative intellectual search algorithms [14]. There are two possible options related to residual amount of nectar for the foraging bee:

i. If the nectar amount decreased to a low level or exhausted, foraging bee abandons the food source and becomes an unemployed bee.
ii. If there is still sufficient amount of nectar in the food source, it can continue to forage without sharing the food source information with the nest mates.

A bee waiting on the dance area for making decision to choose a food source is called an onlooker. A bee carrying out random search is called a scout. The architecture for image segmentation from image processing in detail process is shown in Fig. 1. The intention of the hand-eye homogeny is to guesstimate the statistical renovation connecting the hand and the eye [1]. The Watershed procedure is used to determine the objects can be trapped in the reduced learning speed and the object movement is faster than other methods [8].

Y. Harold Robinson is an Associate Professor, with the Department of Computer Science and Engineering, SCAD College of Engineering and Technology, India (e-mail: yhrobinphd@gmail.com).
E. Golden Julie is an Assistant Professor, with the Department of Computer Science and Engineering, Anna University, Chennai, India (e-mail: goldenjuliephd@gmail.com).
P. Joyce Beryl Princess is an Assistant Professor, Department of Computer Science and Engineering, KPR Institute of Engineering and Technology, Coimbatore, Tamilnadu, India (e-mail: princessjoyceberyl@gmail.com)

II. RELATED WORK

Under the foundation framework, a globally optimum labeling is finally obtained [2]. This paper describes an applied mathematics methodology for segmenting a color image into multiple regions [3]. This method is employed in any atmosphere containing tabular structures. It should facilitate increasing tabular regions that different strategies cannot discover or separate. Registering has been conducted solely from the primary image to the other; however, no coherence from the registering within the opposite sense has been verified [4].

In this paper, the task is developed as a retardant of graph-based transductive classification. Particularly, given a picture window, the color of each pixel will be reconstructed linearly with those of the remaining pixels in this window [5].

A procedure model for gestalt-based segmentation is called as Competitive Layer Model (CLM). A background/reject layer may be used to perform a lot of advanced actions [7].

Color segmentation on mobile robots facilitates autonomous color-based mobile automaton operations: Real-time processing, readying while not intensive manual coaching or previous info, and adaptation to antecedently unseen environmental conditions, characteristic the probable assumption, limiting constraints, the data offered to the automaton [9]. It needs high process value. Object incorporates a (partly) swish surface that contains some distinctive visual options and moves as a rigid body. The segmentation rule is predicated on pushing theoretic objects by the automaton that provides an ample quantity of data to differentiate the article from the background [10]. It proposes a replacement approach for segmentation and learning of recent, unknown objects with an automaton. The automaton uses its visual and artful capabilities to phase and learn unknown objects in unknown environments. No previous information concerning the objects or the surroundings is required. It helps to find out the looks of the article from multiple viewing directions [11]. It overcomes the limitation of the present improvement rule as well as gradient descent ways, genetic algorithms and classical PSO can use the accuracy of speech recognition. Accuracy still will be improved [12].

The benefits of the PSO algorithm include time decrease, value decrease, dependableness maximization and it is also helpful in finding MO-MRSCOS issues. We have an affinity to tune six thresholds to limit the HSV color house manually

World Academy of Science, Engineering and Technology
International Journal of Computer and Information Engineering
Vol:10, No:3, 2016

for color image segmentation. However, it takes an excessive amount of time to attain the most effective eye-to-hand cooperation system within the setup time [13].

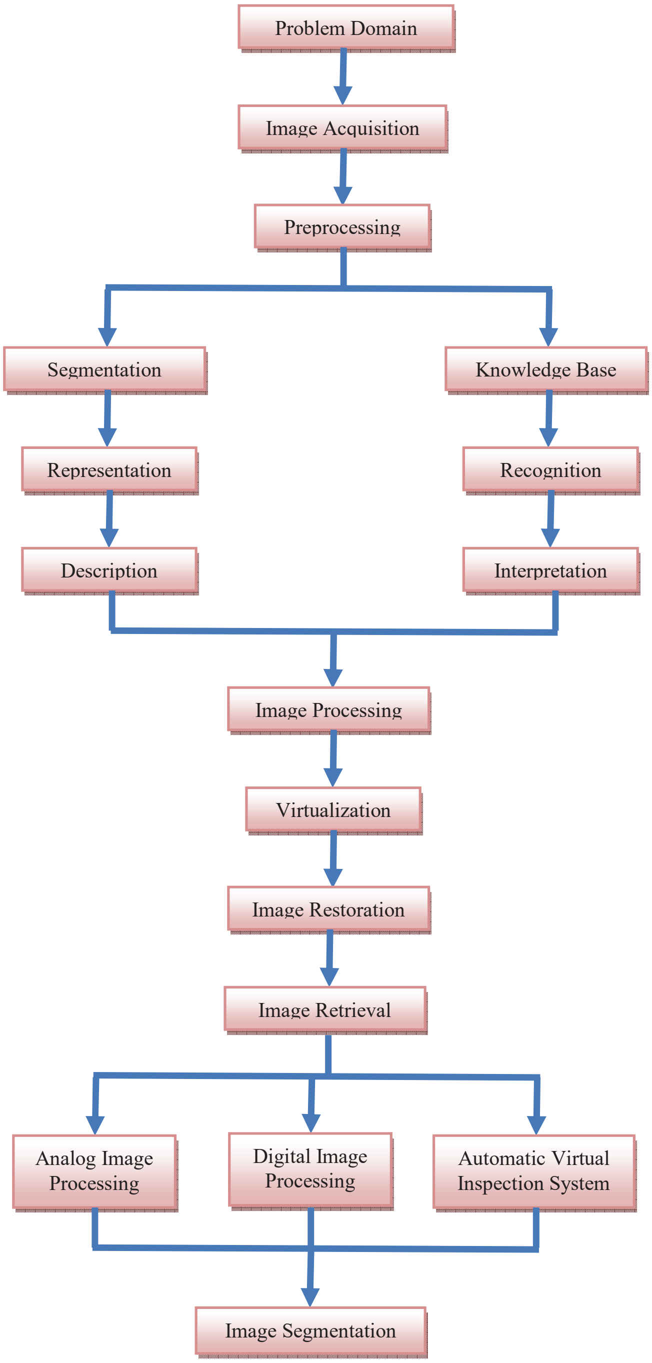

Fig. 1 Architecture for Image Segmentation

In order to demonstrate the performance of the first rudiment formula, PSO, PS-EA, GA and first rudiment algorithms were tested on a collection of multi-dimensional numerical optimization issues. Within the first rudiment formula, the colony of artificial bees contains three teams of bees: used bees, onlookers and scouts [14].

Clustering, a tool for a range of applications, aims gathering information into clusters. Clustering is a crucial important classification technique that gathers information into categories (or clusters) specified the information [15]. During this work, first rudiment formula is extended for finding strained optimization (CO) issues. Extension of the formula depends on substitution choice. It is not clear what characteristics of the test problems make it difficult for ABC [16].

This paper presents a global multi-level threshold method for image segmentation. For the TSALLIS entropy algorithm, we used ABC approach, since execution of an exhaustive algorithm would be too time-consuming.

III. Presented System

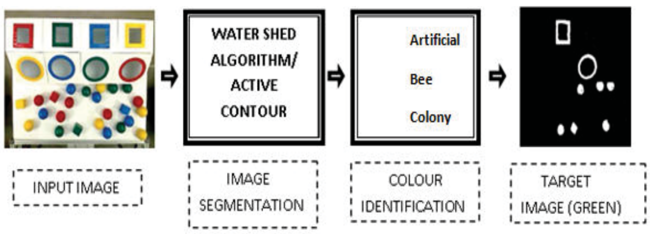

Fig. 2 Architecture

Fig. 2 shows the architectural description, which consists of the following detailed description. Fig. 3 shows the flowchart for image segmentation process.

A. Input Images

The original input color image can consist of an image in which the user interactively marks some specified strokes in the desired region. Image segmentation is the method of dividing a picture into multiple components.

B. Color Identification

Color is important information for image processing and the concept of evolutionary programming (EP) technique is used to obtain the information distribution of the color images. ABC algorithm is used for the implementation of color identification, which is an efficient search algorithm for numerical optimization problem.

C. Segmentation

The watershed method is applied to find the target image; the watershed algorithm incorporates user interactions to segment the color image. Then, the target image is compared with the original image to compute the distribution of the HSV color space and obtain the target image. The watershed method is applied to the interactive mark of the image with some specified strokes in some regions.

D. Feature Extraction

For finding the colors of each segmented part we need to find the feature of segmented images. The feature extraction is done with corresponding hue, saturation, value (HSV) color model. The Hue is one of the main properties of a color, a hue refers to a pure color one without tint or shade black pigment, a hue is an element of the color wheel.

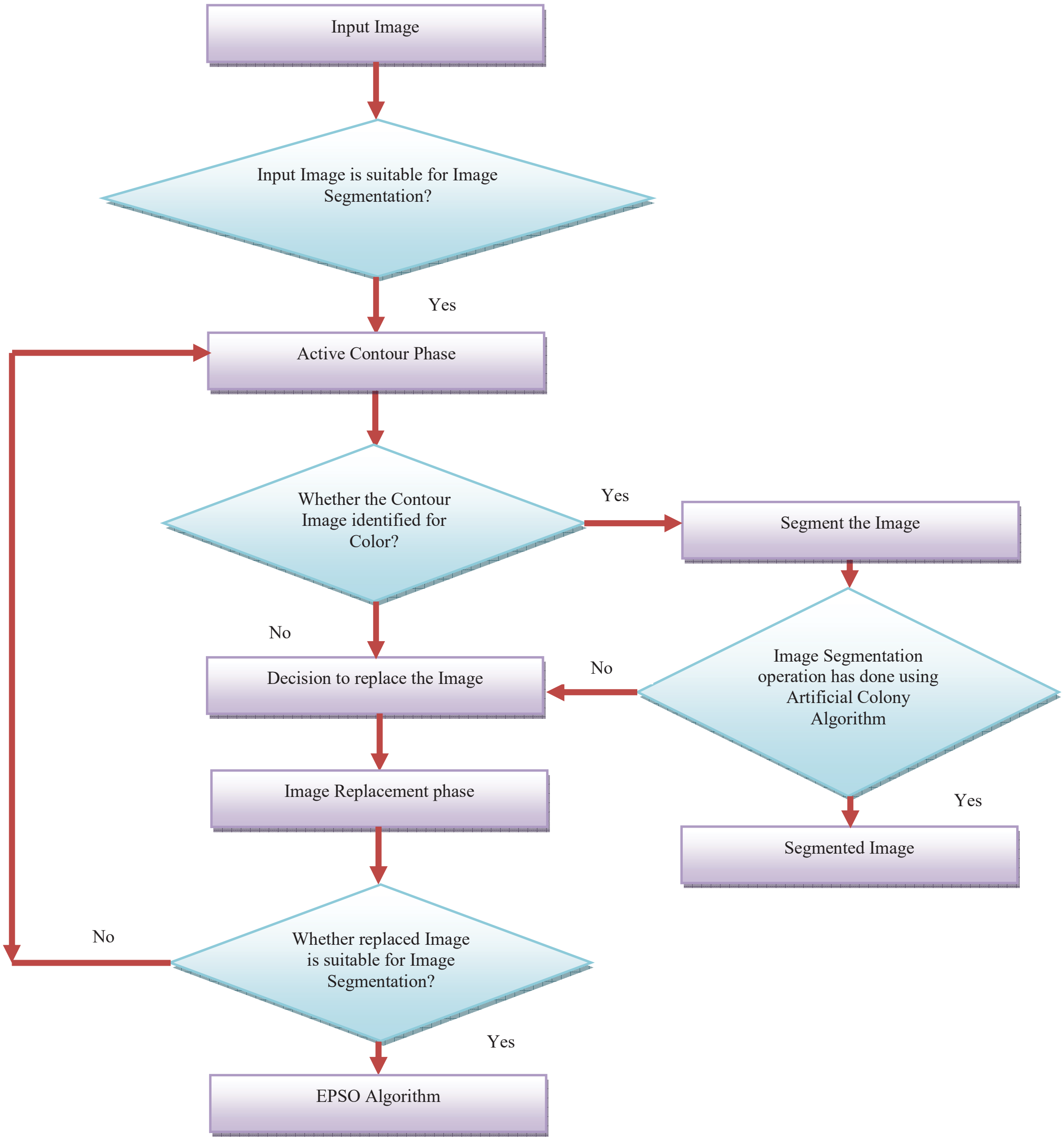

Fig. 3 Flowchart for Image Segmentation Process

E. Active Contour Method

Active contour model, conjointly referred to as snakes, may be a framework for delineating associate degree object define from a presumably reedy second image.

F. Optimization

For the existing technique, we are using PSO. PSO algorithm is a useful tool for optimization but still has some problems including how to accelerate the convergence speed and how to avoid converging to a local minimum. For the presented system, we are using PSO-EP based hybrid algorithm, which used the mutation strategy and reproduction to improve the variant PSO. The improved PSO method can reduce the probability of being stuck in the local minimum.

G. Analysis

The performance results are compared with different iterations. The presented procedure offers the particles a more powerful global exploration capability. Experimental results will demonstrate that the proposed EPSO methods not only can determine the particles stuck in the local minimum but can also enhance learning speed.

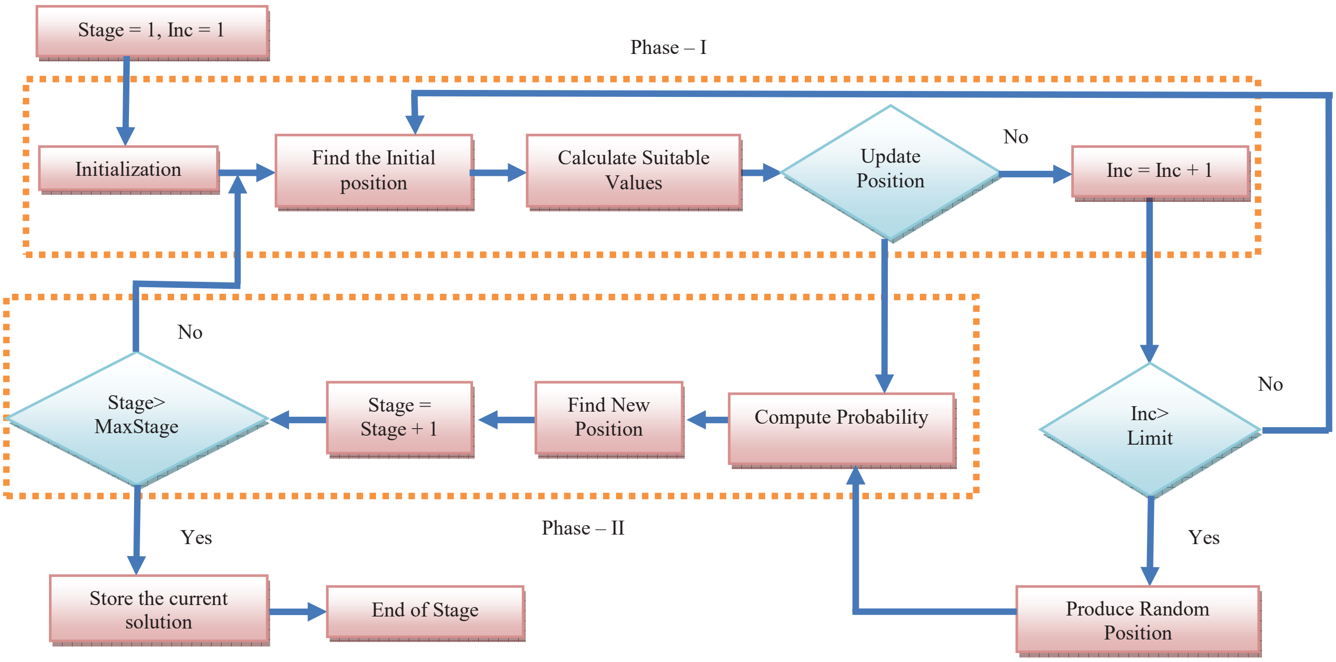

Fig. 4 Flowchart for Algorithm

H. Algorithm: Image Segmentation

i. Segment the image into clusters, $I_1, I_2, \ldots, I_n$ with the initial segment point $s_1, s_2, \ldots, s_n$.

ii. To calculate the image pixel values with initial segment point s_i and neighbor points, the difference is less than the criterion and the neighbor point must be segmented into x_i, where I = 1, 2, …, n.

iii. Recompute the maximum value of x_i and set the maximum points as latest segment point $s_i(a)$.

iv. The mean of the pixel values of x_i must be recomputed.

v. The initial process of x, contains one pixel of image, the compose process of a set of clusters $s_1, s_2, \ldots, s_n$.

vi. Find unsigned pixels with borders

$$\alpha\,(a, x_i) = \left|\,f(x) - mean\,(f(y))\right| \tag{1}$$

vii. To compute a point c ε x and x_j where j ε [0,n] such that

$$\alpha\,(c, x_i) = \min\{\,\alpha\,(c, x_k)\} \tag{2}$$

viii. Mean pixel value can be calculated as z.

$$z = \min\,\{\alpha\,(c, x_k)\} \tag{3}$$

ix. If α (c, x) < t, then we must allocate the pixel to x.

x. Iterate (i) to (ix) until all the pixels must have the clusters with assignment.

IV. Cleverness Artificial Bee Colony Algorithm

A. Parameter Splitting

Let $S_1, S_2, \ldots, S_R$ sets demonstrate the district minima of an image g(x, y), where g(x, y) is the pixel value of synchronize (x, y). Indicate $C(S_i)$

$$X\,[a] = \{(n, d) | f(n, d) < a\} \tag{4}$$

B. Segmentation Computation

Let $C_a(S_i)$ be the synchronization process associated with smaller amount of S_i are segmented in the process 'a'.

$$C_a(S_i) = C(S_i) \cap X[a] \tag{5}$$

If $(x, y) \in C(S_i)$ and $(x, y) \in X\,[a]$, then $C_a(S_i) = 1$ with location of (x, y); otherwise $C_a(S_i) = 0$. Then $X\,[a]$ can be calculated as

$$C\,[a] = \cup_{i=1}^{R} C_a(S_i) \tag{6}$$

C. Components Connection

Obtain the group of components to be connected in X [a] demonstrating as P. Construct C[a] based on 3 conditions:

(i) Condition 1:

If p $\cap\, C[a-1]$ is empty, component q is connected to C[a – 1] to form C[a], since it is the new minimum value.

(ii) Condition 2

If p $\cap\, C[a-1]$ consists of one component of C[a-1], q is connected to C[a – 1] to form C[a], since it is the new minimum value which lies in value p.

(iii) Condition 3

If p $\cap\, C[a-1]$ consists of more than one component of C[a-1], it segmented into 2 regions.

D. Threshold Formation

Image segmentation can be classified using the Cluster. Every cluster can have own Threshold Value, Th. The Mean Value, M can be calculated by computing average value of pixels for every cluster P_i.

Begin
  If $|P_j - M(P_i)| \leq Th$, then
    we merge the two cluster
  Else if $|P_j - M(P_i)| \leq Th$, then
    we set P_j is the new cluster
  End If
End

Fig. 5 illustrates the process of Image Segmentation and the use of Cleverness ABC Algorithm.

Fig. 5 Segmentation Result of Lena Image using Image Segmentation Algorithm with Cleverness Artificial Bee Colony Algorithm

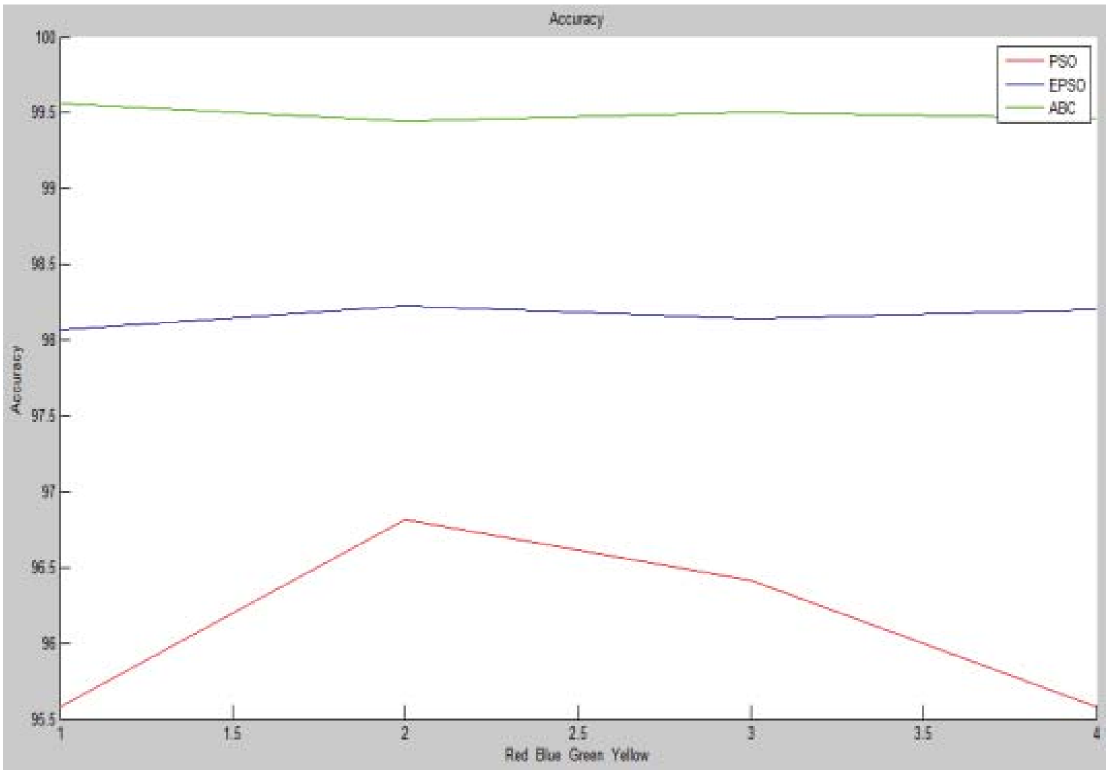

Fig. 6 Result of segmentation

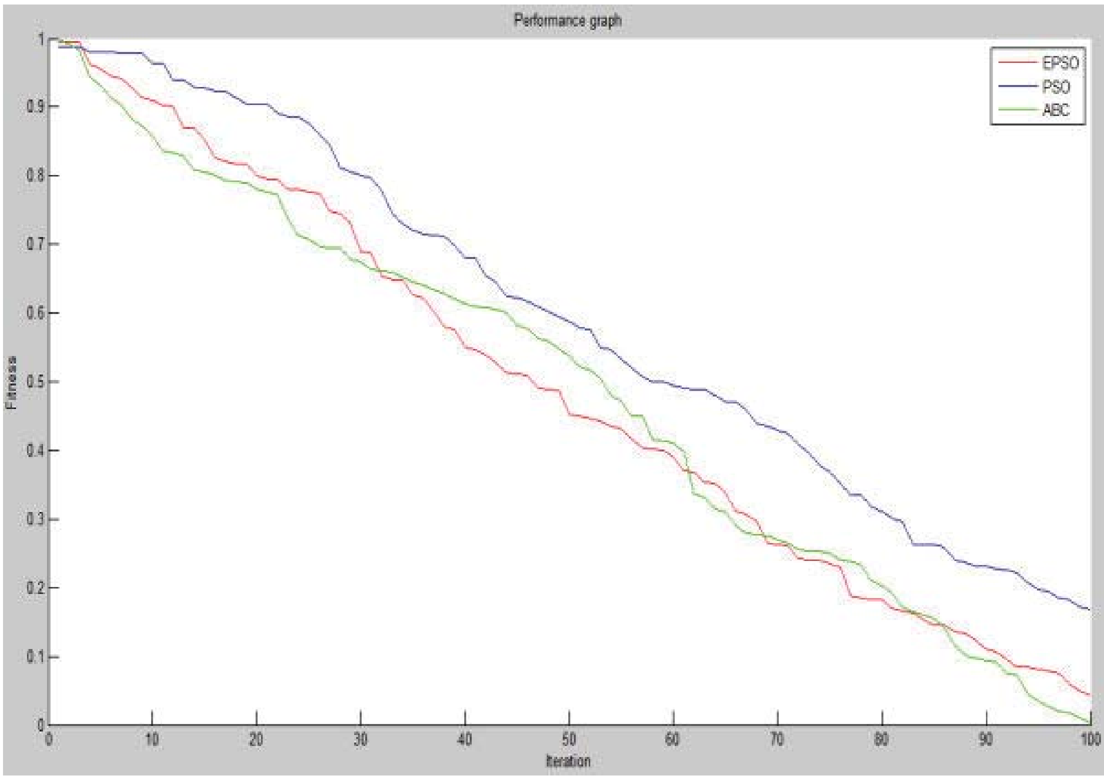

Fig. 7 Performance Graph

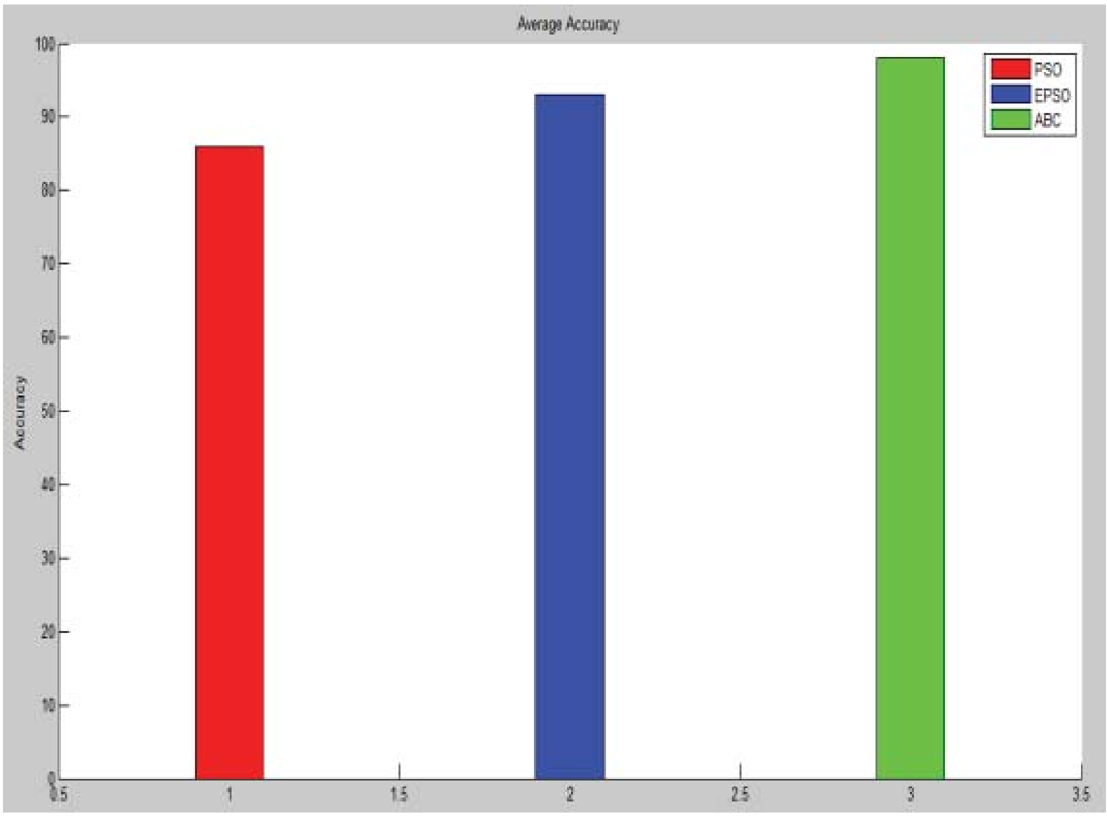

Fig. 8 Performance Analysis

V. Performance Evaluation

The accuracy of the PSO, EPSO and ABC is plotted against each other with respect to three different colors i.e. Red, Blue, Green. As per the expectation it is observed that ABC has the highest accuracy as compared to the PSO and EPSO. The implementation consists of calculating of the best weights, for the optimization, of the employee bee, onlooker bee and the scout bee respectively.

The fitness of the PSO and EPSO is plotted with respect to the ABC algorithm by making use of the training input by loading the corresponding data. The fitness is plotted against the different iterations, with the PSO value shown in blue, EPSO in red and ABC in green.

It is observed by Fig. 8, that the performance of ABC is about 98% compared to approx. 93% for PSO with respect to red. The blue color has an approx. value of 93% in case of EPSO compared to about 88% for PSO. The green is consistent with the similar trend as other plotted graphs and shows a much higher performance of 98% for ABC compared to 93% for EPSO A similar trend is observed for green, with a higher and efficient performance above 98% is compared to approx. 88% for PSO. Hence, the analysis clearly shows the better performance of the ABC algorithm as compared to EPSO and PSO for the mentioned colors. The above implementation of the algorithms can be used for the manipulator grasping of colored objects. Figs. 6-8 describe the performance analysis for the proposed system compared to the existing system.

VI. Conclusion

The aim of this work was to find out how to segment a color image in real-time for a vision system. Image segmentation is important in image processing whose intent is to separate the desired objects from the complex back ground. In general, it is very hard to fully automatically segment color and texture in a natural image. In this paper, cleverness ABC algorithm, which is a powerful and efficient algorithm for numerical function optimization, is implemented along with the EPSO method to reduce the probability of being stuck in the local minimum; the watershed method is applied to find the target image. We applied the watershed method to the interactive mark with some specified strokes in some regions in order to obtain the binary target image then, the target image is compared with the original image to compute the distribution of the HSV color space. It is also used for color identification for grasping of the objects by the manipulator. The plotted graphs show the better performance of the presented method as compared to the widely used PSO method.

References

[1] J. S. Hu and Y. J. Chang, "Calibration of an eye-to-hand system using a laser pointer on hand and planar constrains," in Proc. IEEE Int. Conf. Robot. Autom., Shanghai, China, 2011, pp. 982–987.

[2] J. Ning, L. Zhang, D. Zhang, and C. Wu, "Interactive image segmentation by maximal similarity based region merging," Pattern Recognit., vol. 43, no. 2, pp. 445–456, Feb. 2010.

[3] H. Li and C. Shen, "Interactive color image segmentation with linear programming," Mach. Vis. Appl., vol. 21, no. 4, pp. 03–412, Jun.2010.

[4] J. F. Vigueras and M. Rivera, “Registration and interactive planar segmentation for stereo images of polyhedral scenes,” Pattern Recognit., vol. 43, no. 2, pp. 494–505, Feb. 2010.

[5] Robinson, Y.H. and Rajaram, M., 2015. Energy-aware multipath routing scheme based on particle swarm optimization in mobile ad hoc networks. The Scientific World Journal, 2015.

[6] A. Noma, A. B. V. Graciano, R. M. C., Jr, L. A. Consularo, and I. Bloch, “Interactive image segmentation by matching attributed relational graphs,” Pattern Recognition., vol. 45, no. 3, pp. 1159–1179, Mar.2012.

[7] M. Pardowitz, R. Haschke, J. Steil, and H. Ritter, “Gestalt-based action segmentation for robot task learning,” in Proc. 8th IEEE-RAS Int. Conf. Humanoid Robot., Daejeon, Korea, Dec. 2008, pp. 347–352.

[8] Robinson, Y.H., Rajaram, M. and Raju, H., 2015. Evolutionary Program Based Approach for Manipulator Grasping Color Objects. World Academy of Science, Engineering and Technology, International Journal of Computer, Electrical, Automation, Control and Information Engineering, vol. 8, no. 12, pp.2141-2146.

[9] W. R. Tan, C. S. Chan, P. Yogarajah, and J. Condell, “A fusion approach for efficient human skin detection,” IEEE Trans. Ind. Informat., vol. 8, no. 1, pp. 138–147, Feb. 2012.

[10] D. Schiebener, A. Ude, J. Morimotot, T. Asfour, and R. Dillmann, “Segmentation and learning of unknown objects through physical interaction,” in Proc. 11th IEEE-RAS Int. Conf. Humanoid Robot., Bled, Slovenia, Oct. 2011, pp. 500–506.

[11] K. Y. Chan, C. K. F. Yiu, T. S. Dillon, S. Nordholm, and S. H. Ling, “Enhancement of speech recognitions for control automation using an intelligent particle swarm optimization,” IEEE Trans. Ind. Informat., vol. 8, no. 4, pp. 869–879, Nov. 2012.

[12] F. Tao, D. Zhao, Y. Hu, and Z. Zhou, “Resource service composition and its optimal-selection based on particle swarm optimization in manufacturing grid system,” IEEE Trans. Ind. Informat., vol. 4, no. 4, pp.315–327, Nov. 2008.

[13] Harold Robinson, Y., &Rajaram, M. (2015), “Establishing pairwise keys using key Predistribution schemes for sensor networks”, World Academy of Science, Engineering and Technology International Journal of Computer, Electrical, Automation, Control and Information Engineering, vol. 9, no.2, pp. 608–612.

[14] Harold Robinson, Y., & Rajaram, M. (2015). “Trustworthy link failure recovery algorithm for highly dynamic mobile adhoc networks”, World Academy of Science, Engineering and Technology, International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering, vol.9, no.2, 233–236.

[15] Dervis Karaboga, Bahriye Basturk” Artificial Bee Colony (ABC) Optimization Algorithm for Solving Constrained Optimization Problems”. Vol no.5, pp 39:459–471 April 2009.

[16] Princess, P.J.B. and Robinson, Y.H., 2015.Discrete and Stationary Adaptive Sub-Band Threshold Method for Improving Image Resolution. World Academy of Science, Engineering and Technology, International Journal of Computer, Electrical, Automation, Control and Information Engineering, 9(4), pp.957-960.

Y. Harold Robinson is currently working as an Associate Professor, dept. of CSE in SCAD College of engineering and Technology, Tirunelveli. He finished ME degree in Anna University, Chennai. He is Pursuing his Ph.D. from Anna University Chennai. His research interests are Wireless Networks Mobile Computing, Wireless Sensor Networks. He has published several Research papers in International Journals. He has presented many papers in National and International conferences in Network security, Mobile Computing and Cloud Computing.

E. Golden Julie received her B.E degree in Computer Science and Engg in 2005 from Anna University Chennai and ME degree in Computer Science and Engineering in 2008 from Anna University Chennai. Currently she is Pursuing her Ph.D. from Anna University Chennai. Presently she is working as assistant professor in Regional centre Anna University, Tirunelveli, India She has published many research papers in various fields. Her research area includes Wireless Sensor Adhoc Networks and Image Processing. She is a member of ISTE.

P. Joyce Beryl Princess is currently working as an Assistant Professor, dept of CSE in KPR Institute of Engineering and Technology, Coimbatore. She finished BE in Karunya University, Coimbatore, ME degree in Anna University, Chennai. Her research interests are Wireless Networks Mobile Computing. She has published several Research papers in International Journals.