International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 4 Issue 02, February-2015

Object recognition in Image using Hybrid (DRA-CSO) Architecture

Hamid Ali Abed AL-Asadi, Hussein Ali Al_Iedane and Nadra J. Ali AL-Saad
Karamat-Ali, Computers Sciences Department, Education for Pure Science College, University of Basra, 61004, Basra, Iraq

***Abstract*—Image recognition motion estimation plays a very important role in computer vision systems. This manuscript presents the cat swarm optimization (CSO) and its variants based algorithm to recognition of simple objects in image. Conventional algorithms require complex calculation and large time for object recognition. In the proposed work, we have successfully employed hybrid architecture to solve the object recognition problem based on the Dimension-Reduction Approach (DRA) template matching and the CSO. The result shows that the proposed DRA-CSO based method can provide better in computation time and computation efficiency. In DRA-CSO algorithm the time taken for recognition of object is nearly 0.05 sec.**

Keywords—Image Recognition; cat swarm optimization (CSO); Image processing and computer vision.

I. INTRODUCTION

Computer vision is a research area probably the most exciting branch of image processing, including object recognition and feature detection. Object recognition is a fundamental component of artificial intelligence. It has been widely and very good used to recognize the objects of the same type even when they are viewed from different viewpoints [1-3]. Many types of artificial intelligence (AI) have been proposed over the years. In fact, because AI is studied by many sciences such as computer vision, the image analysis and object recognition problems can be often reformulated as optimization tasks [4-7].

Cat Swarm Optimization (CSO) is categorized as swarm based algorithms and is a recent computational intelligence method, introduced by Chu et al. in 2006 for global optimization [8, 9]. The CSO algorithm depends upon the behavior of the cats which have two modes of behavior: seeking mode and tracing mode [10]. The metaheuristic algorithm (CSO) based on inspecting the behavior of the cat. The two behavioral traits of cats: the curiosity of moving objects (seeking mode) and the hunting skill (tracing mode) are modeled for CSO [11]. The main goal of this paper is to implement a system in MATLAB that is able to recognize the objects in an image using IR-CSO Architecture.

The organization of the paper is as follows: Section 2 describes template matching. A brief review of cat swarm optimization (CSO) algorithm is presented in section 3. Numerical illustration results and discussion are made in section 4. The conclusions present in section 5.

II. TEMPLATE MATCHING

An important technique in pattern recognition, video coding and image processing is a Pattern matching. Template matching technique has many applications in computer vision applications. The most popular matching methods are Sum Square T-distribution Normalized (SSTN), Chi-Square distribution (Chi2), Optimized Sum of Absolute Difference (OSAD1 & OSAD2 & OSAD3), Optimized Sum of Squared Differences (OSSD1 & OSSD2) Sum of Absolute Differences (SAD), Zero-mean Sum of Absolute Differences (ZSAD), Locally scaled Sum of Absolute Differences (LSAD), Sum of Squared Differences (SSD), Zero-mean Sum of Squared Differences (ZSSD), Locally-scaled Sum of Squared Differences (LSSD), Normalized Cross Correlation (NCC), Zero-mean Normalized Cross Correlation (ZNCC), Sum of Hamming Distances (SHD) have been used as the measure for similarity [12-16]. In this paper, Dimension-Reduction Approach (DRA) will be used for image template matching. The DRA is applied for the template image (TI) and the input image (II). To explain the meaning of this approach by the following flowchart:

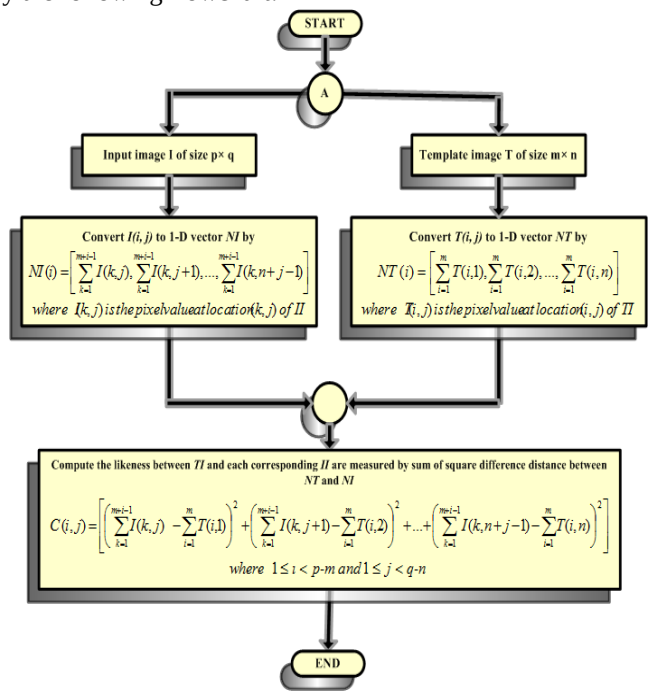

Fig. 1. Dimension-Reduction Approach flowchart for image template matching.

III. CAT SWARM OPTIMIZATION

Recently found many algorithm optimization techniques that mimic animal behavior. The new algorithm is introduced by Chu, Tsai and Pan in 2006 and was named Cat swarm optimization (CSO) [8]. This algorithm is a kind of swarm intelligence that is based on stochastic optimization inspired by social behavior [17], as well as contributing to computer engineering applications.

. The problem faced in few researches is how to develop Cat Swarm Optimization algorithm that can be used in in data mining, especially for the case of classification, but rarely or never used until now in pattern matching Problems. CSO has a number of advantages in pattern matching Problems of optimization compared to previous techniques such as Genetic algorithm (GA), Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO) and binary Particle Swarm Optimization (BPSO). With CSO algorithm development, expected can produce a faster time and has a better accuracy rate compared to existing algorithms [18, 19].

In the CSO, a set of cat and behavior in two different modes: searching mode (TM) and the tracing mode (SM) are used to resolve the optimization problem. The first mode of the CSO is to determine how many cats will be used in iteration, then use the cat in the CSO to resolve the problem. CSO is an evolutionary optimization algorithm that models of two major behavioral traits of cats. These behaviors are termed as Seeking mode (Cats move slowly when resting but being alert) and Tracing mode (Cats move slowly when resting).

In seeking mode, we define four important factors: seeking memory pool (SMP), seeking range of the selected dimension (SRD) (to find a range of selected dimensions), counts of dimension to change (CDC) (to calculate dimensions will change), and self-position considering (SPC) (to consider the position). The tracing mode of CSO algorithm that describes the cat is being followed the lead of the target. Once a cat goes into tracing mode, it moves according to its' own speed for each dimension. The detailed descriptions of these modes are given in flowchart in Figure (2).

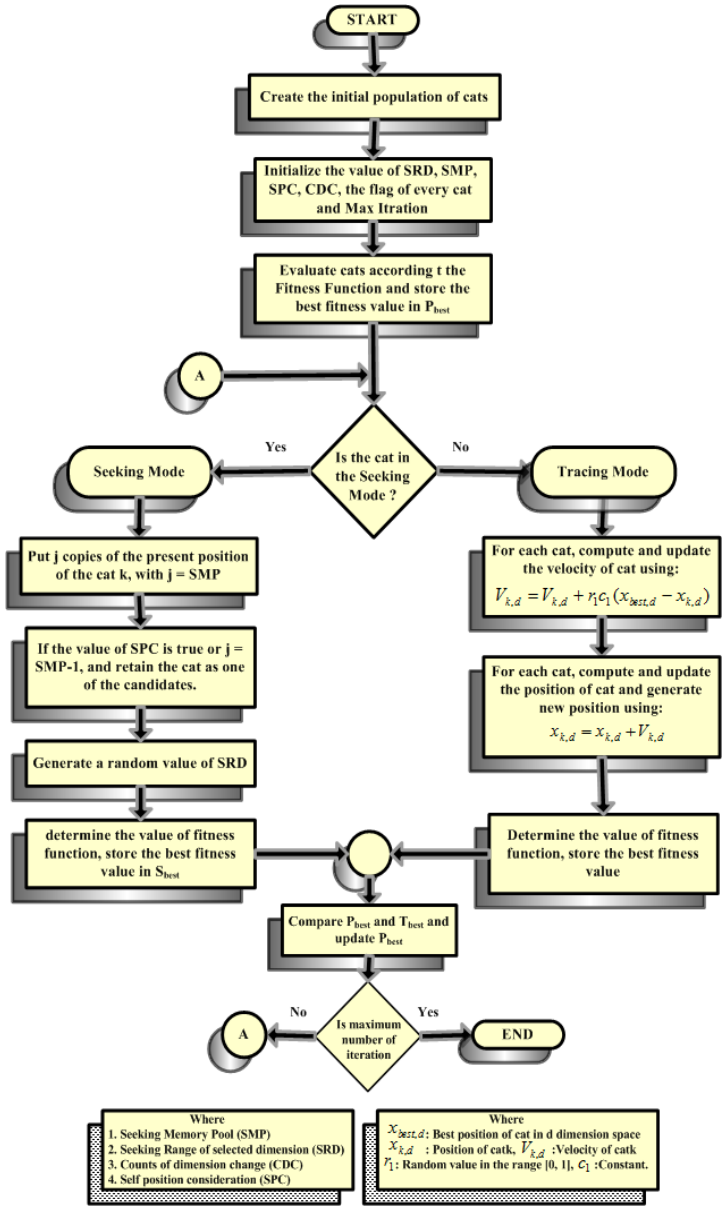

Fig. 2. Flow chart for the CSO Algorithm.

IV. RESULTS AND DISCUSSION

The problem of pattern recognition and Pattern matching optimization is a common problem in have studied at long time, but must be search a several heuristic in order to produce the optimal solutions of the problem. In this research work, we discuss an implementation of the cat swarm optimization (CSO), on the optimization of object recognition.

To test the effectiveness of the hybrid algorithm (cat swarm optimization (CSO) and Dimension-Reduction Approach (DRA)), it is applied for different sport balls images and different templates for solving object recognition problem. In this paper, simulation experiments are conducted with the following setting parameters for the proposed Architecture: seeking memory pool (SMP=5), seeking range of the selected dimension (SRD=20%), counts of dimension to change (CDC=80%), and self-position considering (SPC), the population size is 60 and the percentage of cats in tracing mode versus seeking mode (MR=25%) and experimental

results indicate that it is better to choose C_1=2.05 and in the range of [0, 1]. Different test sport balls images and templates on which the hybrid algorithms are tested and discussed are shown in Figure (3).

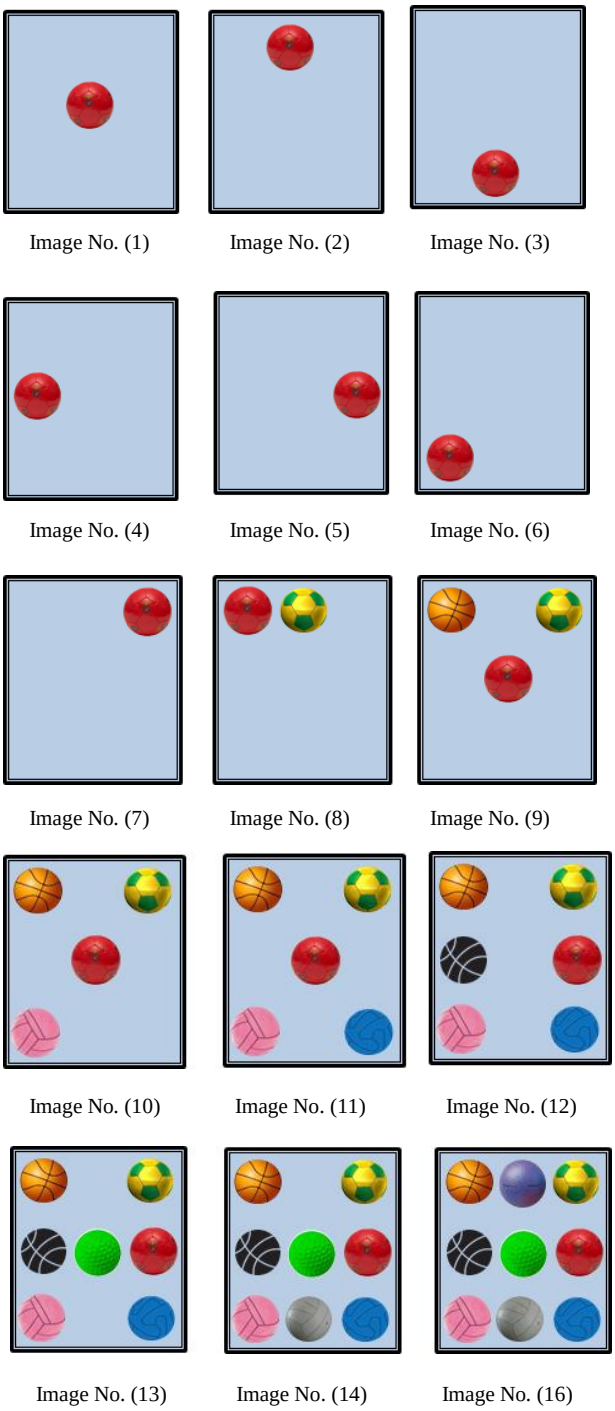

Image No. (1) Image No. (2) Image No. (3)

Image No. (4) Image No. (5) Image No. (6)

Image No. (7) Image No. (8) Image No. (9)

Image No. (10) Image No. (11) Image No. (12)

Image No. (13) Image No. (14) Image No. (16)

Fig. 3. Different test sport balls images.

The hybrid DRA-CSO architecture was implemented in MATLAB software. Total number test images built in this work is fifteen times by CSO based object recognition program. This stage is the stage of evaluation architecture, where the architecture tested whether it has been able to provide the recognition results in accordance with the original images.

When the test images are tested on DRA-CSO based architecture for recognition and detecting the position of object then it is found that architecture are capable of recognition the position of object in image with very less time, it's less than 05 sec as shown in Figure in Figure (4).

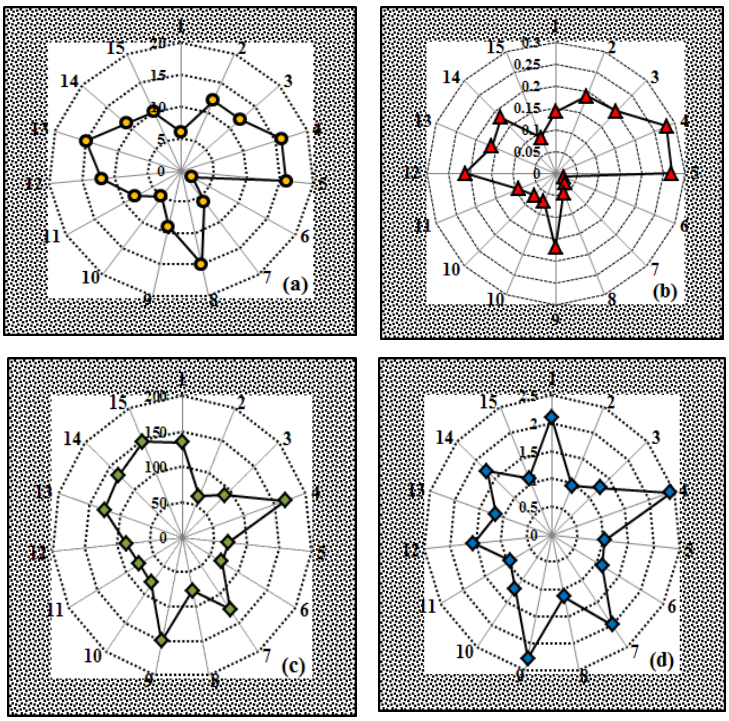

Fig. 4. Figure (4) DRA-CSO Based architecture, (a) Minimum Iteration Taken, (b) Minimum Time Taken, (c) Maximum Iteration Taken, (d) Maximum Time Taken.

V. CONCLUSION

The hybrid architecture based on the cat swarm optimization (CSO) algorithm with Dimension-Reduction Approach (DRA) template matching has been implemented and successfully applied to solve object recognition problem. From the work and analysis of the results after applying on number of different test sport balls images and templates, came to conclusion that DRA-CSO architecture takes less time than 0.05 seconds to recognize the objects. The obtained results demonstrate the high performance of the proposed architecture in terms of time reduction.

REFERENCES

[1] Y.Amit, 2d Object Detection and Recognition: Models, Algorithms and Networks. MIT Press, Cambridge, MA, 2002..

[2] P.Felzenszwalb, D. Huttenlocher Pictorial structures for object recognition. International Journal of Computer Vision, , 61(1), 2005, pp. 55-79.

[3] P. Felzenszwalb, R. Girshick, D. McAllester, D. Ramanan, Object detection with discriminatively trained part based models. IEEE Transactions on Pattern Analysis and Machine Intelligence 32(9), 2010. Pp. 1627-1645.

[4] R. M. Dufour, E. L. Miller, and N. P. Galatsanos. Template matching based object recognition with unknown geometric parameters. IEEE Trans. Image Process. , 11(12), 2002, pp. 1385–1396.

[5] Guo Yong fang, Huang Kai, "Efficient Image Matching Algorithm Using Distance Transform and Particle Swarm Optimization", Advanced Materials Research, 2012, pp 753-757.

[6] J. Senthilnath, S.N.Omkar, V.Mani,and T. Karthikeyan, "Multi objective Discrete Particle Swarm Optimization for Multi sensor Image Alignment", IEEE Geo science and Remote Sensing Letters, Vol. 10, No. 5, pp. 1095- 1099, 2013.

[7] Serkan Kiranyaz, Turker Ince, Alper Yildirim and Moncef Gabbouj, "Fractional Particle Swarm Optimization in Multi-Dimensional Search Space," IEEE Transactions on Systems, Man, and Cybernetics: Part B, vol. 40, no. 2, pp.298-319, 2010.

[8] S. C. Chu, P. W. Tsai and J. S. Pan, Cat swarm optimization, proceedings of the 9th Pacific Rim International Conference on Artificial Intelligence, pp. 854-858, 2006.

[9] S. C. Chu and P.W. Tsai, Computational intelligence based on the behavior of cats, International Journal of Innovative Computing, Information and Control, 3(1), 2007, pp. 163-173.

[10] J. Paul and T. Yusiong, "Optimizing Artificial Neural Networks using Cat Swarm Optimization Algorithm," I. J. Intelligent Systems and Applications, vol. 1, pp. 69-80, 2013.

[11] S. Chittineni, K. Abhilash, V. Mounica, N. Sharada, and S. Satapathy, "Cat swarm optimization based neural network and particle swarm optimization based neural network in stock rates prediction," in Proc. the 3rd International Conferences on Machine Learning and Computing, pp. 292-296, 2011,.

[12] Thi Thi Zin, Slmg Shik KOH, and Hiromitsu HAMA,"Novel Template Matching for Extremely Deteriorated Images" Mem. Fac. Eng., Osaka City Univ., Vol. 48, pp. 9-16, 2007.

[13] T. Kawanishi, T. Kurozumi, K. Kashino, S. Takagi, " A Fast Template Matching Algorithm with Adaptive Skipping Using Inner-Subtemplates' Distances" Proc. a/the 17/h Inti. Con! on Pattern Recognition, vol. 3, pp. 654-657, Aug. 2004.

[14] D. Schonfeld, "On the relation of order-statistics filters and template matching: optimal morphological pattern recognition," IEEE Trans. on Image Process., vol. 9, no. 5, pp. 945-949, 2000.

[15] Mohammmad Gharavi-Alkhansari, "A Fast Globally Optimal Algorithm for Template Matching Using Low-Resolution Pruning" IEEE Trans. Image Processing, vol. 10, no. 4, pp. 526-533, 2001.

[16] H. Peng, F. Long and Z. Chi, "Document image recognition based on template matching of component block projections," IEEE transaction on Pattern Analysis and machine Intelligence, Vol. 25, no. 9, pp 1188-1192, 2003.

[17] T. T. Nguyen, S. Yang and J. Branke, Evolutionary dynamic optimization: a survey of the state of the art, Swarm and Evolutionary Computation, 6, pp. 1-24, 2012.

[18] James Kennedy, William M. Spears, "Matching algorithms to problems: An experimental test of the particle swarm and some genetic algorithms on the multimodal problem generator". In Evolutionary Computation Proceedings, IEEE World Congress on Computational Intelligence, pp. 78-83, 1998.

[19] Amit Konar, "Computational intelligence principles, techniques and applications". In Springer Verlag, 2005.