# CUCKOO SEARCH ALGORITHM FOR IMAGE SEGMENTATION: A REVIEW

## MOHAMMAD JALALI VRNAMKHASTI

Department of Science

Isfahan (Khorasgan) Branch

Islamic Azad University

Isfahan

Iran

e-mail: m.jalali@khuisf.ac.ir

## Abstract

Image segmentation is one of the significant duty of image processing. Image segmentation include of diverse duties comprising item discovery feature exploitation, item cognition and classification depend on the modality of segmentation procedure. This research gives an overview of application Cuckoo Search (CS) algorithm for image segmentation. In order to show the status of this application research in image segmentation, this review primarily features a survey of some algorithms application articles.

## 1. Introduction

Cuckoo search (CS) is an efficient swarm-intelligence-based algorithm. The cuckoo's algorithm is inspired by the way cuckoo is laying the egg in the nest of another bird. In this algorithm, three rules that based on regular life of cuckoo bird is considered.

• Each cuckoo only puts once egg at a time and places it in a randomly chosen nest.

• The next generation is the result of the best egg and the most suitable nest.

• The host nests is fixed in each generation and the host bird can save egg's of cuckoo or abandon the nest and build a new nest [1].

As other meta-heuristic algorithms, cuckoo algorithm is used in image processing domain including image segmentation, fractal image encoding, incremental binary classifier for data, multilevel thresholding, satellite images, medical data classification, intrinsic discriminant analysis, brain tumor, MRI image, magnetic resonance images, image compression, computed tomography image enhancement and etc.

## 2. Literature Review

In fractal image segmentation the search time and loss in compression are important limitation. Mohammed Ismail et al. [2] presented a cuckoo inspired fast search (CIFS) for fractal image encoding. In this algorithm they ordered vector of range blocks based on similarity and coordinate distance correspondingly. The results obtained show a relative superiority of this method to methods partial swarm optimization and genetic algorithm.

One of the important subjects in image segmentation is classification of data. There are some significant constraints in classifier of data as timeliness, linearity of computational complexity and incremental update of the classifier. Abdualrhman and Padma [3] introduced a Cuckoo Search (CS) based incremental binary classifier. In this algorithm, they considered some class labels from training data and they utilized cuckoo search as fasten the class search. This technique is tested on some data and they showed that the proposed algorithm is robust and scalable. In another study on the topic of medical data classification, Mohapatra et al.

[4] proposed an improved CS based on extreme learning machine. In this way, unlike the usual CS method that the values of probability is fixed are used larger probability value, but gradually their values are updated to fine-tune the solution vectors. The consequences of this research showed proposed algorithm is very proficiently the ill-condition problem and that indications to better performance in comparison with simple extreme learning machine.

Threshold procedure is significant technique. In this technique usually utilize the gray level information of pixels in the image. When the gray level of the pixel is used in MT may be the spatial correlation information between pixels is ignored. For avoiding of this problem in MT Panda et al. [5] proposed a multilevel threshold selection based on edge magnitude of an image. In their research showed the correlation among gray levels in an image improved thresholding performance. In the other research, Suresh et al. [6] considered a CS algorithm based on MT for segmentation of satellite images. They explored the influence of Mantegna's technique for levy flight generation in CS algorithm. Samanta et al. [7] offered a CS for choosing of optimal threshold value for Multilevel Thresholding Technique (MTT). In their examination of some problems compare to genetic algorithm showed the proposed algorithm is faster. In another work, Jain Preetha et al. [8] suggested a threshold optimization procedure utilizing CS for initial seed selection. Because the drawback of the usual multilevel thresholding approaches has high computational cost, Brajevic et al. [9] introduced a multilevel image thresholding selection based on CS algorithm in order to overcome this obstacle.

Bhandari et al. [10] presented a contrast increment approach which is based on CS and discrete wavelet transformation (DWT) and singular value decomposition (SVD) for ameliorating satellite image contrast. In the normal way, the singular value matrix demonstrates the severity information of the given image, any variations on this parameter variation the severity of the input image. The proposed method superiority in comparison with previous methods on similar images.

For improving quality of satellite image with low contrast in other study Prachi and Kaur [11] used a hybrid attitude of CS and ant colony optimization (ACO). In this research they used DWT-SVD. At first DWT is utilized for splitting the image into some parts and then CA-ACO is applied for optimization of these parts. In this technique when singular value matrix low-low units is calculated invers improved image is constructed. The results of this technique for various performance metrics showed that, this method is higher than DWT-SVD, DCT-SVD, and CSDWT-SVD.

Vennila and Venkatesan [12] for color satellite images utilized a CS algorithm. They considered a technique for segmentation by utilizing Tsallis entropy and Granular computing approaches with CS algorithm. The Tsallis entropy and Granular utilized for discovering the maximum opportunity of threshold restrictions and the CS will find the optimized threshold values based on threshold restriction. The results of testing this algorithm on some color satellite images and benchmark problems showed this method is superior compare to the previous algorithms.

An adaptive CS algorithm for optimization problems presented by Naik and Panda [13]. They utilized the step size, from the information of its fitness function value, and its existing position for adaptive CS for intrinsic discriminant analysis based face recognition. The performance of this adaptive CS algorithm is evaluated in 23 usual benchmark test functions, and the results revealed suggested algorithm outperforms the standard CS algorithm in a faster way to find the local optimal or suboptimal results.

In medical image specially for brain tumour image the main goal is to identify abnormal tissues and changes in tissues over time. Then image segmentation for brain tumors is important and there is a lot study with this subject. Ilunga-Mbuyamba et al. [14] suggested active contours driven technique by CS approach for brain tumour images segmentation.

In this technique, CS algorithm based Lévy flights paradigm is used for minimization of snake energy in image segmentation. The outcomes showed that the proposed technique performance the comparative active contour model.

In most cases, checking the quality of agricultural products through their appearance. The use of natural models to evaluate the quality of products is also very important. In some studies, heuristic methods have been used to analyze product quality. The CS algorithm, like other heuristic methods, has been used. In research of Das [15], CS is utilized to evaluate the quality of white poppy seeds. In this way, first, the CS applied to increase the image quality and then swarm intelligent algorithm utilized to survey and quality monitoring.

One of the replicate a wide collection of colors is RGB which comes from blending red, green and blue colors. Raja and Vishnupriya [16] proposed an algorithm based on Kapur's entropy and CS for segmentation and analysis of RGB images. They compared their algorithm with the firefly and PSO algorithms and take better results on the considered image.

Magnetic resonance imaging (MRI), is a medical imaging radiology procedure for make pictures from structures inside the body. In this technique is utilized magnetism, radio waves, and a computer to produce images. In the processing of MRI images, meta-heuristic algorithms are used. In some research CS algorithm is utilized for image segmentation as [17-19].

Compressing images is one of the most important issues in analyzing images and sending them. Usually we can utilize propose compression methods for images but, finding optimal technique is significant. Pradeep and Manavalan [20] proposed a technique for compression of images based on hybrid of CS and genetic algorithm with discrete cosine transform. Babu and Sunitha [21] utilized CS hybrid with morphological operation for enhancing digital images. In their technique, at first principal color image was transformed into grayscale image and then, the

contrast value of the image was reached by calculating the fitness through CS algorithm. For improving the quality of the images, value contrast of the images are considered and the best contrast value chosen and morphological operations are done by adjusting the intensity restrictions.

## 3. Conclusion

We have presented in this work a review of recent development of cuckoo search algorithm and techniques for image segmentation. These all techniques and algorithms are suitable for many medical image applications, distinguish cancer, satellite images and etc.

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