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IMPROVED COLOR SATELLITE IMAGE SEGMENTATION USING CUCKOO SEARCH ALGORITHM

[1]Vennila.S, [2]Gayathridevi.N,
[1]PG Scholar, Dept Of CSE, Ganadipathy Tulsi's Jain Engineering College, Vellore,
[2]Asst Prof, Dept Of CSE, Ganadipathy Tulsi's Jain Engineering College, Vellore.

Abstract:

The project is to improve the segmentation of the color satellite images. In this proposed method the color satellite image can be segmented by using Tsallis entropy and Granular computing methods with the help of Cuckoo search algorithm. The Tsallis and Granular computing methods will used to find the maximum possibility of threshold limits and the Cuckoo search will find the optimized threshold values based on threshold limit. The feasibility of the proposed Cuckoo search and Tsallis entropy based approach was tested on different satellite images and bench marked with differential evolution and solving the multilevel colored image thresholding problems. The multilevel thresholding will be used for the segmentation of color satellite images. By using these Cuckoo search algorithm experimental results will help to select the optimized threshold values for multilevel thresholding effectively and properly.

Keywords: Cuckoo search, Segmentation, Tsallis, Granular computing, Optimize.

1. INTRODUCTION

Decades ago, much attention has been paid to the multi-resolution characteristic of processes and patterns in general. Good examples are image-processing, which provide different information and noise at various spatial scales. Analysts have become aware that image enhancement could be considerably improved if the scenes are viewed at multiple resolutions (Afruz et al., 2010). Basically, all satellite image-processing operations can be grouped into three categories: Image Rectification and Restoration, Enhancement and Information Extraction. Image processing with better flexibility and adaptability is highly enviable in many applications such as image transformation, correctionof distortion effects, noise purge, histogram equalization and more (Krishna et al., 2010). The objective of image enhancement is to classify and portray, as a unique grey level (or colour), the features occurring in an image in terms of the object or type of land cover these features actually represent on the ground. Normally, noise reduction is the initial process in the analysis of digital images (Nadernejad et al., 2008). Image contrast enhancement, noise elimination, thresholding, edge detection and image segmentation are the major steps involved in digital image processing techniques (Zelelew et al., 2008). The image can be affected by noise unavoidably in the process of saving and transmission and produces bad effects on the imageprocessing. For eliminating such effects, it is indispensable to remove or diminish the noise and at the same time, to preserve the image information as much as possible (Singh and Kathane, 2011). Image enhancement acting an essential role in several image processing applications, where the experts make decisions based on the image information (Al-Samaraie, 2011). To complete this task, it is imperative to increase the dynamic range of the selected features in the image, which is basically the process of image enhancement (Al-Samaraie and Majied Al Saiyd, 2011). When images change from one form to another through the processes such as imaging, scanning, or transmitting, the quality of the output image may be subordinate than that of the original input image. Thus, there is a need to enhance the quality of such images (Vij and Singh,

2011). The purpose of image enhancement is to enhance the image quality such that the processed image is superior to the original image for a certain application or set of objectives. Preprocessing the image with an enhancing filter will produce good segmentation results (Gorai and Ghosh, 2011).

2. CUCKOO SEARCH ALGORITHM

Cuckoo Search Algorithmis based on the brood parasitism of some cuckoo species (Brajevic et al., 2012). In addition, CS algorithm is improved by the socalledLévy flights, rather than by simple isotropic random walks (Layeb and Boussalia, 2012; Valian et al., 2011a). The CS was inspired by the obligate brood parasitism of some cuckoo species by laying their eggs in the nests of host birds. Some cuckoos have evolved in such a way that female parasitic cuckoos can imitate the colors and patterns of the eggs of a few chosen host species (Valian et al., 2011b). This reduces the probability of the eggs being abandoned and, therefore, increases their re-productivity. It is worth mentioning that several host birds engage direct conflict with intruding cuckoos (Yildiz, 2012; Tiwari, 2012). In this case, if host birds discover the eggs are not their own, they will either throw them away or simply abandon their nests and build new ones, elsewhere (Dhivya et al., 2011; Babukartik and Dhavachelvan, 2012). For simplicity in describing the cuckoo search, consider the following three idealized rules: (1) Each cuckoo sets one egg at a time and dump its egg in randomly chosen nest; (2) The best nests with high quality of eggs will carryover to the next generations; (3) The number of available host nests is fixed and the egg laid by a cuckoo is discovered by the host bird (Rani et al., 2012; Noghrehabadi et al., 2011).In this study, we enhance the image using CS algorithms and morphological operations (Ma et al. 2011). The contrast and intensity parameters of the image are adjusted by means of CS algorithm. After enhancing the input image by CS algorithm, we apply morphological operations for further enhancement of the image. The rest of the study is organized as follows: Section 3 reviews the recent research works related to the image enhancement techniques, section 4 details the steps involved in the proposed technique with necessary illustrations and mathematical formulations, section 5 discusses about the implementation results and section 6 concludes the study.

3. RELATED WORK

In this section, a handful of recent research works available in the literature are briefly reviewed. For image enhancement, (Weigel et al., 2013) have proposed a method to combine Image Inversion Microscopy (IIM) with digital holography. Furthermore, they presented a setup and some measurements as proof of principle. The Point Spread Function (PSF) of a holographic image inversion microscope was compared to the conventional PSF. They have demonstrated that the distance between the first zeros is reduced by a factor of about two. Additionally, they recorded images of 10 gratings to demonstrate the enhanced resolution and to measure a part of the optical transfer functions of the coherent, the incoherent and the image inverted case. Lin (2011) have proposed a technique for an image enhancement approach to Infrared (IR) images for long-range surveillance. The IR images captured at long range usually have low contrast, low brightness and small hot objects of interest. The main characteristics of the proposed approach were that no prior knowledge aboutthe IR image was necessary and no parameters must be preset. Two main goals are sought: Adaptive contrast enhancement and enhancement of the power of high spatial frequency in IR images. In this proposed work, a novel Adaptive Histogram-Based Equalization (AHBE) was used for adaptive contrast enhancement. In this way, the proposed adaptive equalization approach can improve the enhancement effect on small hot objects embedded in an image. In addition, using a high-boost filter enhances the power of high spatial frequency in IR images and maintains the information about

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the original images. As a result, the diffraction effects on IR images caused by the IR optical system was ameliorated through the high-boost filter.have an image enhancement method based on Gravitational Search Algorithm (GSA), which was used for optimizing the parameters of the normalized incomplete Beta function using the characteristics of the original image, the acquired function was employed to enhance the degraded image. The simulation results show the method can effectively enhance the global contrast of the image and vision.

4. METHODOLOGY

In this section, the contrast value of the image is improved by using the morphological operations. Here, the dilation process is performed by placing the constructing element of the image and descending it transversely to the image in a routine related to complexity. The output image is acquired by utilizing a structuring element in the input image. The value of each pixel in the output image is constructed by measuring the conformed pixels in the input image. By adjusting the contrast and intensity parameters, the image I is converted into binary form Ib. Then, by applying the Equation 5, an enhanced image is obtained through the morphological operation that utilizes the structuring element 'se':Cuckoo Search (CS) is an optimization algorithm.

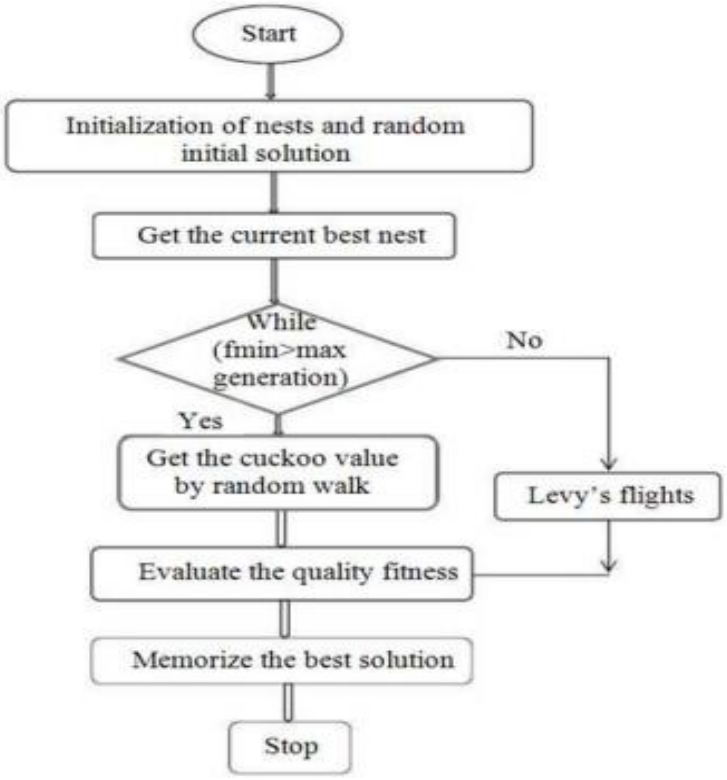

Fig.1. Proposed CS algorithm for Image enhancement

Each egg in a nest represents a solution and a cuckoo egg represents a new solution. This algorithm is inspired by the aggressive reproductive strategy of somecuckoo species such as the Ani and Guira cuckoos. The aim is to use the new and potentially better solutions (cuckoos) to replace a not-so-good solution in the nests. These cuckoos lay their eggs in communal nests,though they may remove others' eggs to increase the hatching probability of their own eggs. Quite a number of species engage the obligate brood parasitism by laying their eggs in the nests of other host birds. This algorithm works

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with three basic principles. First principle: Each cuckoo lays one egg at a time and dumps its egg in a randomly chosen nest. Second principle: The best nests with high quality of eggs will carry over to the next generation and third principle: The number of available host nests is fixedWhich has an infinite variance here, the consecutive jumps/steps of a cuckoo essentially form a random walk process which obeys a power-law steplength distribution with a heavy tail. It is worth pointing out that, in the real world, if a cuckoo's egg is very similar to a host's eggs, then this cuckoo's egg is less likely to be discovered, thus the fitness should be related to the difference in solutions. Therefore, it is a good idea to do a random walk in a biased way with some random step sizes.

5. RESULT ANALYSIS

Approaches for modifying images to achieve visually acceptable images. The choice of such techniques is a function of the specific task, image content, observer characteristics, and viewing conditions. The point processing methods are most primitive, yet essential image processing operations are used primarily for contrast enhancement. By observing of this image enhancement by using a CS algorithm and morphological operation.

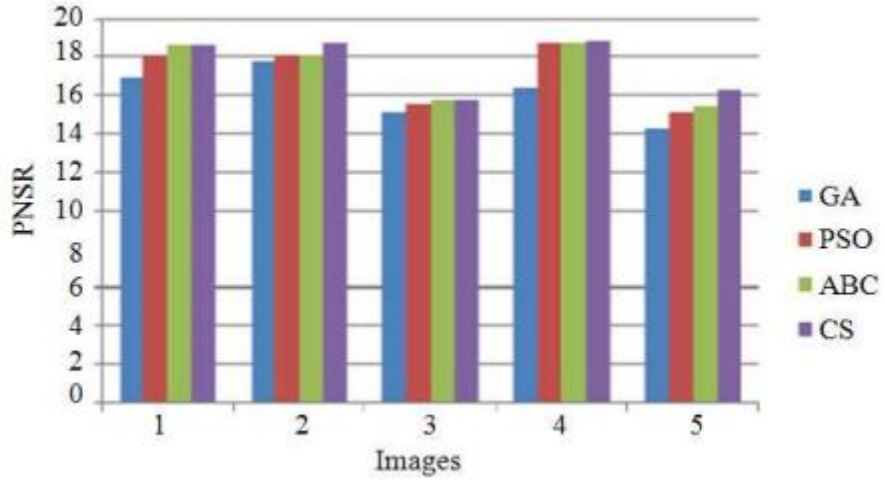

Fig.2. Comparison of proposed work with our previous works

The image enhancement process is implemented with different images and the upcoming value have shown the performance. In Fig. 2-6, have to used input image and output result with compare all previoue result and then for improving the image, the morphological operation is implemented. Digital observasions were done by matching the reconstructed frames in Fig. 2 to 6. Digitally, the dewarped enhanced result is closer to the original image compare to the enhanced image. It can be seen from Table 1, that the Image enhancement algorithms gives smaller PSNR value, hence we can conclude that this technique perform better than the original technique.

CONCLUSION

We have presented an image enhancement technique using CS algorithms and morphological operations in the digital world. In the beginning, the original color image was converted into grayscale image and then, the contrast value of the image was attained by calculating the fitness through CS algorithm. Later for further improvement, in order to improve the quality of the image the best contrast value of the image was selected and morphological operations were done by adjusting the intensity parameters. Finally, the grayimage was again converted into original color image without

noise. Similarly, with the previous three works the proposed work was compared and it has proved to be more precise. The keeping of the parameters of our discusstion and approach to improving the image enhancement technique.

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