

STUDY OF NATURAL INSPIRED COMPUTING TECHNIQUE TO CAPTURE THE TERRAIN FEATURES

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ABSTRACT : In recent year's image classification has come up the most powerful area of research in the field of nature inspired computing. Image classification helps us to get the geo-spatial information from the satellite data which can be useful to industries like defence, intelligence, natural resources etc. Image classification is further classified into supervised and unsupervised classification. In this Paper we have discussed various applications of nature inspired computing techniques that are used in solving the shortcomings in the area of image classification like Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), Cuckoo Search (CS), Artificial Bee Colony Optimization (ABC), Biogeography Based Optimization (BBO), and Self Organizing Features Maps (SOFM), CS/PSO, ACO/CS etc for image classification.

KEYWORDS : Image classification, Artificial intelligence, Nature inspired computing, Terrain features, Multi spectral.

I. INTRODUCTION

1.1 IMAGE CLASSIFICATION

The term image classification refers to the labeling of images into one of some predefined categories. [1]Image classification is an attempt to label (often textual) an image with appropriate identifiers. These identifiers are determined by the area of the interest, whether it is natural classification for arbitrary pictures (for instance, from the internet), or a specific of the domain, for instance, medical x-ray images and geographical images of terrain. Image classification is related to image annotation, although image note generally uses a larger vocabulary (that is, number of classes) than image classification. Image classification is the process of the assigning all pixels in a digital image to particular classes according to their characteristics. This characterized data may then be used to the produce thematic map of the image itself. The objectives of image classification is to identify and copy, as a unique grey level (or color), the features occurring in an image. Image classification is the most powerful part of digital image analysis. It is very nice to a have a pretty picture, or an image, showing a magnitude of the colors lay out various features of the images, but it is quite useless you know what the colors mean. Therefore, it is essential to extract the features of the images efficiently, without losing

important color information, and reduce redundant color information.

Image classification is further classified into two type of classes that is supervised and unsupervised.

A. Supervised Classification

When there is preceding information about the classes current in the image the method using to classify the image is supervised classification. Some common supervised classification techniques are: Maximum likelihood classifier, parallelepiped classifier.

B. Unsupervised Classification

When there is no preceding information about the classes current in the image the method used to classify the image is unsupervised classification. Some of the common unsupervised classification methods are: K Means, Simple one pass clustering, minimum distribution angle, Fuzzy logic..

1.2 Nature inspired computing

Natural computation techniques (or nature inspired algorithms) such as BBO [2], ACO [3], Particle Swarm Optimization (PSO) and Artificial Neural Networks (ANN) which are being Appling in the field of image classification. Thus, the decision about the classify to be used for a full task is to be taken by the analyst. Though various Natural Computation techniques have before been introduced as a classifier, Cuckoo Search which also comes under the Natural Computation was very recently introduced in this category. In recent years, there was a living interest on the use of nature inspired computing techniques for image classification. There are various nature inspired based techniques like Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), Cuckoo Search (CS), Artificial Bee Colony Optimization (ABC), Biogeography Based Optimization (BBO), Flower Pollination by Artificial Bees (FBAB) and Self Organizing Features Maps (SOFM),CS/PSO,ACO/CS[4].

Overall accuracy: The Overall accuracy of terrain Classification for proposed algorithm is 97.15%, which shows that the observed classification is better as the value of Overall accuracy of BBO, PSO, ABC,CS, Fuzzy set, hybrid rough/BBO, hybrid fuzzy/BBO, are 0.7487, 0.7705, 0.8141, 0.9170 respectively. The graphical comparison of these algorithms is shown by figure 1.

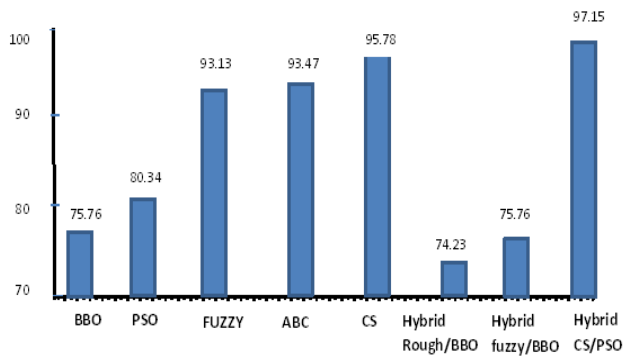


Figure 5: Comparison of overall accuracy.

1.3 PROPOSED METHODOLOGY

The proposed methodology will consist of the following steps:

1. Study color image classification, color spaces and need for color image classification.
2. To study the need to adopt swarm intelligence techniques to be used for color image classification.
3. Study the techniques for color image classification and its performance in terms of time for color image classification and memory consumption is analyzed.
4. Study different Algorithms concerned to swarm intelligence techniques.
5. Design an Algorithm which is best suited for Color Image classification using nature inspired computing.
6. Prepare the performance matrix by comparison with the results of other techniques.

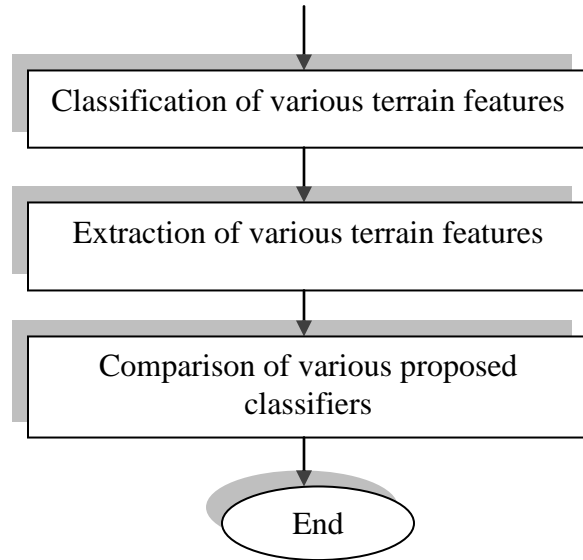
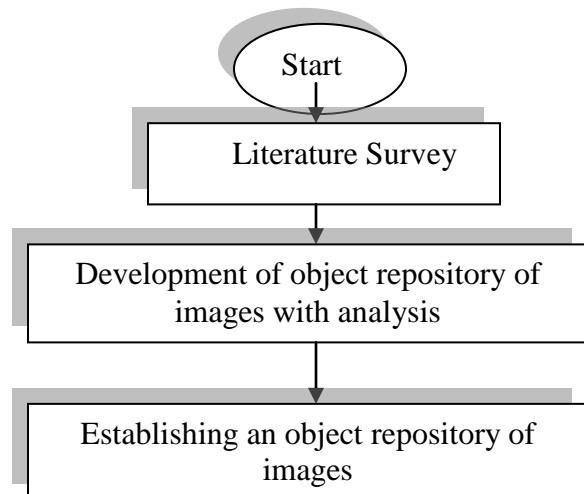


Fig 2 Flow chart for proposed methodology for image classification.

The rest of the paper is organized as follows: Section II describes Related Researches: A Review that is used for the classification of image, and Section III AND IV gives the conclusion and future work.

II. RELATED RESEARCHES: A REVIEW

2.1 Comparative Study of Particle Swarm Optimization based Unsupervised Clustering Techniques.

*H. Kundra et al 2009:[5]*In order to overcome the shortcomings of traditional clustering algorithms such as local optima and sense to initialization, new Optimization technique, Particle Swarm Optimization is used in association with Unsupervised Clustering techniques . This new algorithm uses the capacity of global search in PSO algorithm and solving the problems associated with traditional clustering techniques. This merge bypass the local optima problem and raise the convergence speed. Parameters, time, distance and mean, are used to be comparing PSO based Fuzzy C-Means, PSO based Gustafson’s-Kessel, PSO based Fuzzy K-Means with added grades and PSO based K-Means are suitably plotted. Thus, Performance evaluation of the Particle Swarm Optimization situated Clustering techniques is achieved. Results of the PSO based clustering algorithm is used of the remote image classification. Finally, accuracy of this image is computed along with its Kappa Coefficient.

2.2 Novel approaches for classification based on Cuckoo Search Strategy.

S. Goel et al 2013:[6] have proposed a technique for an image classification introduces a novel bio inspired clustering algorithm called Cuckoo Search Clustering Algorithm (CSCA). This algorithm is based on the recently proposed Cuckoo Search

Optimization technique which mimics the breeding design of the parasitic bird-cuckoo. The algorithm is further extend to be a classification method, Biogeography Based Cuckoo Search Classification Algorithm (BCSCA), which is the hybrid approach of the two nature inspired met heuristic techniques. The proposed algorithms are valid with real time remote sensing satellite image data sets. The (CSCA) was first test with benchmark dataset, which income good results. Inspired by the results, its was test on two real time remote sensing satellite image datasets for extraction of the water body, which itself is a actually complex problem. A news method for the generation of new cuckoos search has been proposed, which is used in algorithms.

2.3 Image Classification Technique using Modified Particle Swarm Optimization.

M. Afziet et al 2011 [7] Image classification is becoming ever more powerful as the amount of available multimedia data increases. With the rapid gain in the number of images, there is an increases demand for effective and efficient image index mechanism. For large image databases, successful image index will indeed improve the efficiency of content based image classification. One attempt to solving the image index problem is using image classification to get high-level concepts. In such systems, an image is usually represented by various low-level features, high-level concepts are learned from these features. PSO has newly attracted growing research interest due to its skill to learn with small sample and to optimize high-dimensional data. Therefore, introduce the related work on image feature extraction. Then, several techniques of image feature extraction will be the introduce which include two main methods. These methods are RGB and Discrete Cosine Transformation (DCT).

2.4 Remote Image Classification Using Particle Swarm Optimization.

J. Kaur et al 2012:[8] In order to have purity in the satellite images we have used Particle Swarm Optimization technique. When joined with traditional clustering algorithms, problems such as local optima and sensitivity to initial are reduce, thus research a greater area using global search. This segment image is a further classified using Kappa coefficient.

2.5 Information Sharing in Swarm Intelligence Techniques: A Perspective Application for Natural Terrain Feature Elicitation.

V.K Panchal et al.2011:[9] Swarm intelligence (SI) is an Artificial Intelligence technique based on the study of collective behavior in decentralized, self-organizing systems. It enables relatively simple agents to collectively perform complex tasks, which could not be performed by individual's agents separately. Particles can interacts the either directly or indirectly. A mathematical formulation of the concept of information sharing in each of the swarm intelligence techniques of Biogeography based optimization (BBO), Ant Colony Optimization (ACO), Particle Swarm optimization (PSO),cuckoo search (CS) and Bee Colony Optimization (BCO) which are the major constituents of

the SI techniques that have been used till date for classifying topographical facets over natural terrain.

2.6 Fusion of Biogeography based optimization and artificial bee colony for identification of Natural Terrain Features.

*H. Kundra et al 2012:[10]*Swarm Intelligence techniques assist the configuration and collimation of the important ability of groups members to reason and learn in an environments of contingency and corrigendum from their peers by sharing information. A introduces a novel approach of fusion of two intelligent techniques generally to adding tot the performance of a single intelligent techniques by means of information sharing. Biogeography-based optimization (BBO) is a recently developed heuristic algorithm, which proves to be a strong's entrant in swarm intelligence with the hopeful and consistent performance.

2.7 Hybrid Algorithm of CS and ACO for Image lassification of Natural Terrain Features.

H. Kundra et al 2013:[11] have proposed a technique for an image classification the finding of the recent study has left the great information to the fact that Remote Sensing can be using for the knowledge exertion of natural land cover and atmospheric features. One of the broadly used applications of remote sensing is land cover mapping by which geo-spatial information and data can be acquired. In this paper, we are applying a Swarm intelligence based hybrid algorithm of Cuckoo Search (CS) and Ant Colony Optimization (ACO) to perform the satellite image classification. Although both are met heuristic bio-inspired techniques, but still combining them gives a the great impacts especially in the application fields of the remote sensing. The test of hybrid algorithm is conducted by classifying a multi-spectral, high resolution satellite image of Alwar region.

2.8 Hybrid Algorithm of Cuckoo Search and Particle Swarm Optimization for Natural Terrain Feature Extraction.

*H. Kundra et at 2015:[12]*Swarm intelligence is a global research area to improve the optimization of various soft computing and nature inspired techniques. In this study, we have applied the hybrid algorithm of Cuckoo Search (CS) and Particle Swarm Optimization (PSO) for remotes sensing image classification of nature terrain features. Remote sensing is the methods of acquiring, processing and interpreting the satellites the images and related geo-spatial data without any physical contacts of the region. The main advantage of using the hybrid concept is that the research strategy used in CS for finding the best host nest for cuckoo egg is resolved by the best position of PSO concepts. Bused this proposed algorithm, it becomes easier to classification the terrain features and obtained results shows the higher efficiency and greater kappa coefficient value as compared to other nature inspired techniques ..

III. CONCLUSION

A large numbers of soft computing techniques have been used for the classification of multi-spectral satellite image. All these techniques classified the terrain features but suffered from some uncertainties. This paper deals with image classification by using swarm computing technique like Cuckoo search (CS) ,particle swarm optimization(PSO),Biogeography Based Optimization (BBO), Ant Colony Optimization (ACO) etc for image classification .

IV. FUTURE SCOPE

Natural Computing is concerned with this type of computing as well as with its main benefit for informatics, viz., human-designed computing inspired by nature. Research in natural computing is genuinely interdisciplinary, and therefore natural computing forms a bridge between informatics and natural sciences. It has already contributed enormously to human-designed computing: consider, e.g., all the advances made through neural networks, evolutionary algorithms, quantum computing and molecular computing. Most importantly, this research has led already to a deeper and broader understanding of the nature of computation.

In the coming years the development and the application of new powerful Natural Computing data processing tools will become all the more crucial, given the fast growing volume of available biological data.

ACKNOWLEDGEMENT

This work is supported and guided by my Research guide Er. Harish Kundra, HOD, Computer Science Engineering, Rayat Institute of Engineering and IT. I am thankful to him for his continuous guidance and support. I fail with my words, if I fail to thank my parents, my family, and god who made it possible.

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