# HYBRID ALGORITHM OF PSO AND BCO FOR IMAGE CLASSIFICATION OF NATURAL TERRA FEATURES

**Dr. Harish kundra,[1]Er. Anika Rana[2]**
[1]Head of Department, [2]Research Scholar
[1,2]Department of Computer Science and Engineering, Rayat Institute of Engineering and Information Technology College, Railmajra,SBS Nagar, (Punjab) India
[1]hodcseit@rayatbahra.com, [2]nkrana9@gmail.com

***ABSTRACT:-*In this research paper we will implement new approach in order to find optimized path which is different from the conventional approaches. The newly developed approach will acknowledge the problems like terrain mapping, obstacle detection and avoidance, and goal seeking in cross-country using Swarm Intelligence. This approach will be used as combination of techniques PSO(Particle Swarm Optimization) for finding out the natural paths moreover keeping the obstacle detection from the satellite image and BCO(Bee Colony Optimization) algorithm for obstacle avoidance and shortest path to the goal.**

***KEYWORDS:-*Satellite image, Path planning, terrain mapping, obstacle detection and avoidance, and Swarm Intelligence.**

## I. INTRODUCTION

Supporting swarm intelligence we can universally classify the two approaches i.e. PSO and BCO. These two approaches/techniques are used to review the actions of social insects and as well as the particles whereby the unified actions of (unsophisticated) agentmerges locally with their neighborhood cause lucid functional global instructions to materialize.Thiscombinational technique of Particle Swarm Optimization (PSO) and Bee Colony Optimization (BCO) defines uncontrolled navigation for rustic vehicles that involves terrain aligning, obstruction detection and evasion, and goal hunting in snappy-country using Swarm Intelligence. The algorithm accomplished will be beneficial sorting the dilemma related to off-road uncontrolled navigation. In snappy -country, satellite pictures of those human oriented objects and creature like insects which cannot be attained easily are seized and after that these are executed on various dilemma like military transportation, robot navigation etc.

## *II. CONCEPTUAL DEFINITION AND DETAILS*

### *2.Satellite Image*

### *2.1 Satellite Image*

Remote sensing affords us capability to indeed see the invisible. It is can be thought of as the eyes of manysystemslike GIS, providing repeated, synoptic visions of earthsurfaces from an aerial or space asset point [1].Satellite remote sensing images are map of earth surfaces as seen from space.Remote sensing with multi-spectral satellite image is based on the image that different features/objects constituting the land cover reflect the electromagnetic radiations over a wide range of wavelength in its own local way.Remote sensing is the science and art of obtaining information about an object, an area through is the analyses of the data acquired by device that is not in data with the object, area under case. Using various the sensors, we remotely collection data that may be used the analyzed is to obtain information about the objects, area, and the being investigated. The remotely collected data can be the many forms, including variations in force distribution or electromagnetic energy distributions, the two basic processes involved are DATA ACQUITIONS and DATA ANALYSIS.[2].

### *2.2 Particle Swarm Optimization:*

[3]Ingenious technique of artificial intelligence i.e. swarm intelligence that is focused due to prodigious efficiency and incredible abilities of social insects to sort out their simple food or shelter concerned problems and now it is considered as the most efficient optimization technique. In 1989, swarm intelligence was introduced by Beni and Wang in the global optimization framework as a set of algorithms for controlling robotic swarm. Her, we are applying the hybridization of particle swam optimization (PSO) for natural terrain feature extraction[4]PSO is a met heuristic because of the reason that it makes very few or no assumptions about the complexities after being optimized and can search large spaces of candidate solution. However, met heuristic such as particle swarm optimization does not guarantee an optimal solution is ever found. It is a population-based search algorithm that finds optimal solution using a set of flying particles.[5]Particle Swarm Optimization (PSO) was introduced by Russell Eberhart, an electrical engineer, and James Kennedy, asocial psychologist, in 1995. PSO was originally used to solve non-linear continuous optimization problems, but more recently it has been used in many practical, real-life application problems. PSO ties influence from sociological attitude associated with bird flocking. It is believed to be innate conclusion that birds can fly in large groups with no collision for protracted long distances, making use of their effort to maintain an optimum distance

between are usually influenced by food. They have dramatic capabilities in flocking all together for food seeking and long-radius migration.[6]This section involves some details about birds in nature and analysis their capabilities and their sociological flocking behaviour. Perceptions studied as most vital impression for flock alignment. The eyes of maximum of birds are on both fronts of their heads, granting to visualize objects on each side at the same time. The larger diameter of bird eyes analogous to other animal groups is a reason that why birds have the most exceedingly matured impression of perception in the animal kingdom. As a conclusion of such large sizes of bird eyes and the way their heads and eyes are formed, maximum species of birds have broad field of aspect[7][8]

### 1.1 General Algorithm:

1. For every particle Initialize particle with available random number
   END
   Do
2. For every particle. Evaluate the fitness value. If, fitness value is good than the finest fitness value (pbest) in past. Set on-going value as the new pbest
   End
3. Select the particle with finest fitness value of all particles as the gbest. For every particle evaluate particle velocity as per the velocity modified equation
4. Modify particle position as per the position modified equation
   End
5. While maximum no. of iterations or minimum error criteria is not attained

### 2.3 Bee colony Optimization:

Bee Colony Optimization algorithm is influenced by the action of a honey bee colony in nectar assembly.It is a lately proposed, nature-inspired meta-heuristic as it serves a general algorithmic structure applicable to different optimization dilemma in management, engineering, and supervision, and it always be bespoken for a specific dilemma. It has been strongly and profitably applied to most of the combinational optimization dilemma, mostly in transportation, location and organizing fields. The artificial bee colony acts partially same, and partially varies from bee colonies in behavior. The algorithm was influenced bythe technique adopted of a swarm of honey bees to find food sources. There are two disparate honey bee groups that proportion knowledge in order to strongly locate such origins. We can thus preserve a colony of bees, where every bee will negotiate a potential solution way. Once a reasonable or practical solution is found, each bee will back to the hive to operate a waggle dance. The waggle dance will be revealed by anindex of "elite solutions", from which rest of the bees can choose to follow another bee's way.[9] Bees with a best make compass will have a greater probability of calculating its way to the index of "elite solutions", successfully a convergence to an optimal elucidation.

## *III. METHODOLOGY*

Interference detection and way extraction of image agenda is to automatically classify all pixels in picture into roads, forest, desolate land, water frame and settlements. We infuse the ways from image with the help of PSO algorithm. To perform this, accurate threshold values have to be calculated and then segmentation is operated. After performing this we will purview the goal through shortest path using BCO approach.

### *3.1 Obstacles detection*

Interference detection (OD) is one of the important components of the supervising system of uncontrolled vehicles. In the cover of indoor navigation, interferences are typically explained as surface title that is higher than field plane, but in snappy-country and random environments the opinion of "field plane" is often raw.

### *3.2 Computing the Threshold using PSO*

To calculate the threshold values, we constructed ten agents that scan their respective regions allotted to them from the picture. Each agent scans the picture row wise to locate local best values for every row and eventually calculates its global best for the allotted region. Among these regional comprehensive bests the agents chooses the most sufficient candidate result by communicating with each other. This is defined as the Threshold value or the Global best.

### *3.3 Morphological operations*

Morphology is an approach of image conversion based on pattern. The value of every pixel in the output picture is depends on differentiating of the comparable pixel in input segment with itssurrounding. By selecting the size and pattern of the surrounding, you can create a morphological operation which isresponsive to specific patterns in the input segment.

### *3.4 Path Planning Using BCO*

This approach represents a novel technique to solve the dilemma of path outlining for mobile robots depending on bee colony algorithm. The process is influenced by collective action of honeybees to locate food sources surrounding the hive. The suggested method involves two steps. The very first step is to utilize a simple principle to inaugurate an initial encounter-free way from the initial point to the target and the second step is using bee colony algorithm to optimize the starting path.

### *3.5 Simulation*

The suggested algorithm is processed with MATLAB. The algorithm depends on combinational technique of PSO and BBO applicable on satellite picture. In the first case, red band satellite picture was captured and evaluated threshold using PSO for ways extraction and interference detection. To find out the threshold result, agents were regardless initialized in a particular area among the global best location was calculated. Then attained paths were polished using morphological procedures to

cut down to size the detection of penumbra, trees and unseasonable areas.It shows the polished picture after morphological procedures. Finally, BCO was applied in which ants were started and observed thus, they find the shortest path bypassing the interference from given origin to destination as per the goal defined.

***The pseudo-code of the proposed algorithm is given in as:***
*Step 1*: take satellite image as input image

*Step 2*:for each agent

Initialize the random position

Calculate the fitness value at that position

if fitness(n)<fitness(n-1)

then update best position

else not update

end-for

find global best position

for each agent

update position and velocity

end-for

*Step 3*: calculate the threshold value (path extracted and obstacles detected)

*Step 4*: refine paths using morphological operations

*Step5:* Initialization: Spray *ne* percentage of the populations into the solution space randomly, and then calculate their fitness values.

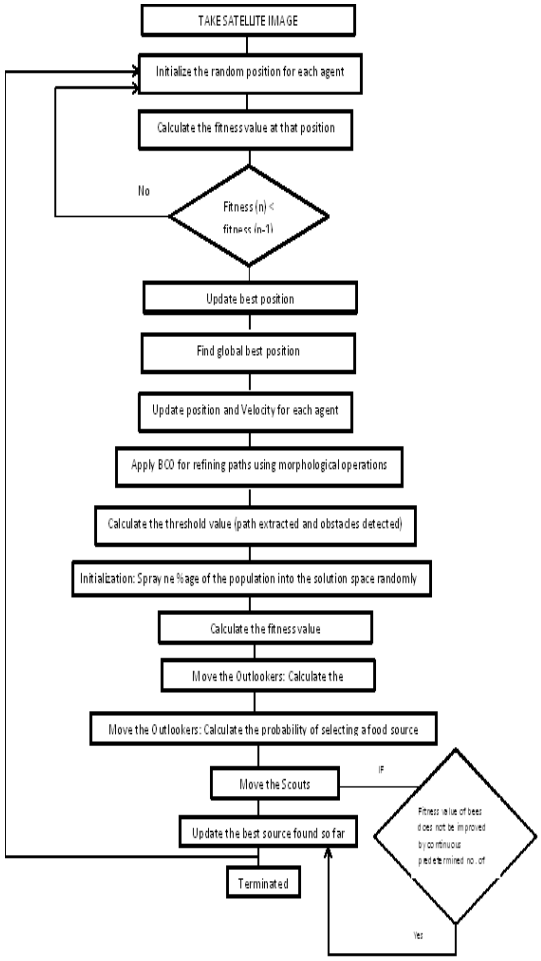
*Step 7*. Move the Onlookers: Calculate the probability of selecting a food source

*Step 8*. Move the Scouts: If the fitness values of the employed bees do not be improved by a continuous predetermined number of iterations

*Step 9*. Update the Best Food Source Found So Far

*Step 10*. Termination Checking otherwise go back to the Step

**FLOWCHART**




## *IV EXPERIMENTAL RESULTS AND COMPERISON*

### *A. DATASET CONSIDERED*

We have applied this hybridization concept for the classification of terrain image. For this, we have considered a multi-spectral, multi sensor a high resolution image of Alwar area in Rajasthan with a dimension 472*546 for classifying the various terrain features. The satellite image of 7 bands listed as Red, Green, Near Infra-Red (NIR), Middle Infra-Red (MIR), Radarsat-1 (RS1), Radarsat-2 (RS2) and Digital Elevation Model (DEM). The Red, Green, NIR and MIR band images are taken from Linear Imaging Self Scanning Sensor-III (LISS), sensor of Resource sat an Indian remote sensing Satellite. RS1 and RS2 are the images from Canadian Satellite Radars at. DEM is derived by using images from RS1 and RS2. The size of the image is 472*546 and it contains 2,57,712 pixels. The green level 7-band satellite images of Alwar are fig 2.

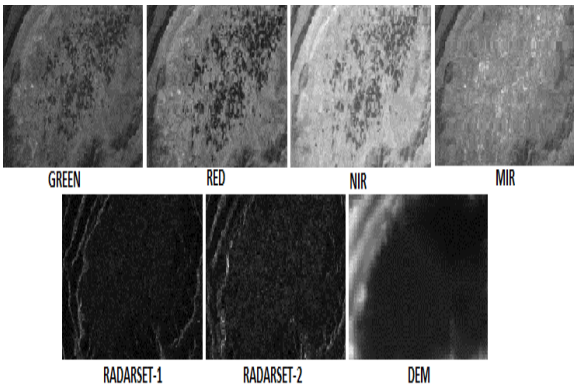



**Figure 4**.satellite image of Alwar 7 band.

### *B. IMAGE CLASSIFICATION*

We have taken a multispectral satellite image of Alwar Rajasthan for experimental study. A size of the image is taken 472*546 pixels. A area is select since it contains the good land cover features like Water, Vegetation, Urban, Rocky and Barren areas. After applying the proposed algorithm to the Alwar image, the classified image is obtained as shown in figure 3 (Bottom). The different terrain features are defined by different colors used. The Red color represents Water region, Green color represent Vegetation region, Blue color represents Urban region, Yellow color represents Rocky region and Cyan color represents Barren region. This classified image (Bottom) can be compared with the original satellite image (Top) as shown in figure 4.1:

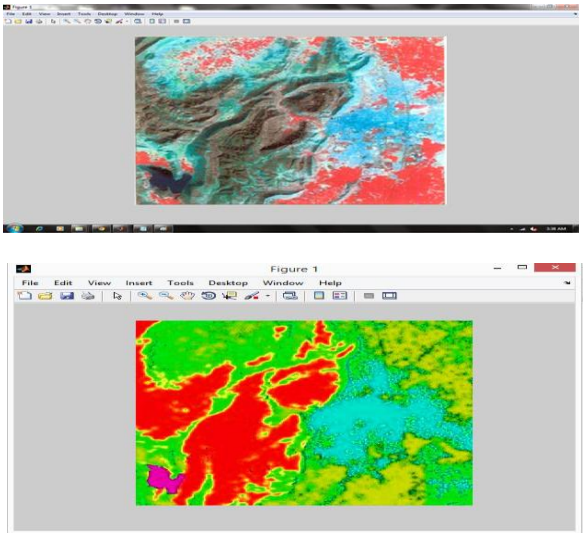



**Figure 4.1:** Comparison of Original Alwar image (Top) with Classified Alwar image (bottom)

### *C. COMPARISON WITH OTHER HYBRID ALGORITHMS*

#### *A) OVERALL ACCURACY:*

The Overall accuracy of terrain classification for proposed algorithm is 97.08%, which shows that the observed classification is better as the value of Overall accuracy of Hybrid FPAB/BBO, Hybrid ACO/SOFM, Hybrid ACO/BBO and Hybrid ABC/BBO are 0.7487, 0.7705, 0.8141, 0.9170 respectively. The graphical comparison of these algorithms is shown by figure 4.2.

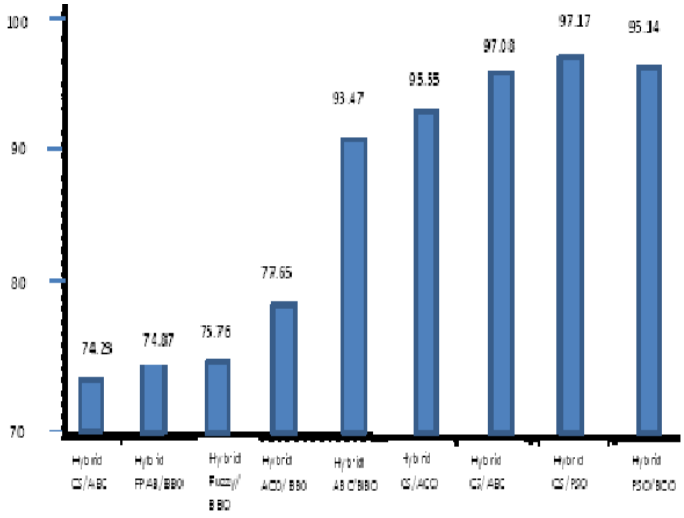
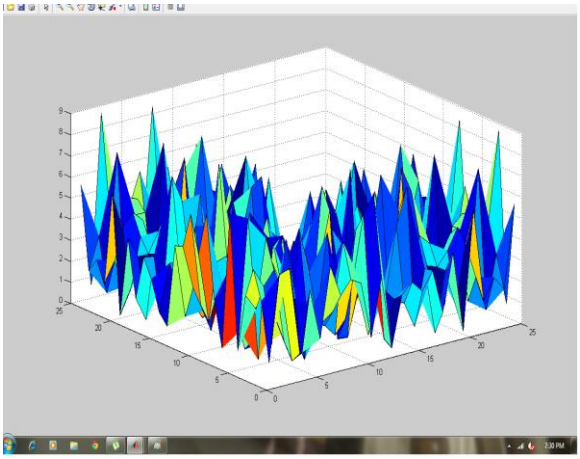



**Figure 4.2**: Comparison of overall accuracy.

Below Figure 4.2 shows bar graph of calculated values of Alwar region image. This Graph clearly mentions the results of the thesis.



## *V. CONCLUSION*

In the suggested paper, PSO is defined for path extraction and BCO is utilized for sorting the shortest path.To arrange a path more smooth morphological procedure were implemented to cut down the effects of penumbra region, trees and inconvenient areas. It can rigorously plan an optimized way even in complex surroundings. The values and results prove that suggested approach efficiently and effectively extracts the interferences and sorts the shortest and safest way.

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## REFERENCES

**[1]** T.M. Lillesand and R.W. kiefer "Remote Sensing & Image Interpretation", 6th edition, Wiley, 2008.

**[2]** Ergezer, M., Simon, D. and Du, D. (2009), "Population Distributions in Biogeography- BasedOptimization Algorithms with Elitism", In Proceedings of IEEE International Conference onSystem, Man and Cybernetics, San Antonio, U.S.A., pp.3-8.

**[3]** H. Ahmed, School of Computing, Queen's University, Swarm Intelligence: Concepts, Models and Applications, Technical Report

**[4]** Hemlata S Uradeand Prof. Rahila Patel. Study and Analysis of Particle Swarm Optimization: A Review. IJCA Proceedings on 2nd NationalConference on Information and Communication Technology NCICT(4):1-5, November 2011.

**[5]** R. Kumar, A new hybrid multi-agent-based particle swarm optimisation technique. Int. J. Bio-Inspired Computation.

**[6]** H. Kundra, Hybrid Algorithm of Cuckoo Search and Particle Swarm Optimization for Natural Terrain Feature Extraction. Research Journal of Information Technology 7(1): 58-69, 2015 ISSN 1815-7432

**[7]** H. Kundra, Pbbo: A New hybrid algorithm for satellite image classification, International Journal of Computer Science and Communication Vol. 3, No. 1, January-June 2012, pp. 73-76.

**[8]** Sood(2010)," Cross-Country Path Finding using Hybrid approach of PSO and BBO", International Journal of Computer Applications, vol. 7 no.6, pp.3-5.

## AUTHOR'S PROFILE.

AnikaRana has done B-Tech in Computer Science &Engineering & scored 75.04% marks from BCET, Ludhiana, (India) in 2011 and pursing Master's Degree in Computer Science and Engineering from Rayat Institute of Engineering & IT, Railmajra, Punjab, India. She has presented one of her paper on Artificial Intelligence in International Conferences held in Pattaya, Thailand.

Harish Kundra is an Assistant Professor and Head of Department in the Computer Science and IT Department of Rayat Institute of Engineering & IT, Railmajra, Punjab, India. He graduated from Baba Banda Singh Bahadur Engineering College , Fatehgarh sahib in Computer Science & Engineering in 2000 and received Master's Degree in Computer Science and Engineering from Vinayka Mission Research Foundation ( Deemed University), Tamil naidu in 2007 . He has presented 15 papers in International/National Journals and 50 papers in International/National Conferences. He is a lifetime member of Indian Society of Technical Education. He guided more than 100 projects at graduate and master's level and also 4 dissertations at Master's level 273.