Improvement in SAR Image Matching Features using Computational Intelligence Techniques

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***Abstract*—Synthetic Aperture Radar (SAR) imaging which is used to create image of objects such as landscapes, remote sensing and mappings. The problem of various methods for improvement in SAR image matching features such as noise interference and deviated edges can be improved by using proposed technique. Particle swarm optimization is the nature inspired computational search and optimization approach which was developed on the basis of behavior of swarm. Recently each and every field of research is utilizing the properties of PSO. One of the popular fields of research is image segmentation and matching features which is also fastest growing field. Taking the advantages of combining PSO with different image segmentation technique many researchers has proposed various research papers with enhancement of various parameters. In this paper we surveyed some paper and try to provide recent trends and techniques involved in improvement in SAR imaging matching features with PSO a computational intelligence technique.**

Keywords: **Synthetic aperture radar, Particle swarm optimization, soft computing**

I. INTRODUCTION:

Synthetic aperture radar (SAR) is radar based system used to obtain high resolution images from wide area of terrain. SAR was introduced since 1950's ,Carl Wiley first observed that area of image processing he belongs to Goodyear Aircraft Cooperation .SAR is capable of operating under different weather condition ,day and night .Processing of SAR is required to extract relevant features ,such as objects or building. Detection of such objects is based on detection on locally bright pixel, followed by clustering of neighborhood of pixels.

SAR is form of radar which is used to create images of objects such as landscapes, these images can be either 2D or 3D.SAR system illuminate s a terrain with microwave and record both the amplitude and phase of the back scattered radiation making it a coherent imaging process. The intensity of SAR image especially the pixels based calculation done in which pixels depends on the transmitted energy from the surface of the earth and received energy in the form of echo signal which is returned back to radar where an appropriate coherent combination of number of pulse lead to formation of synthetically enlarged antenna so called "synthetic aperture" .In which maximum synthetic aperture is the maximum distance travelled while target is illuminated as strong radar responses the bright pixels and so on.

The factor which affect the image features are, wavelength of radar, Incident angle of radar ,Orientation and the nature of earth surface. In order to get the improved SAR images on basis of matching features, so that various techniques are utilized.

This technique involves:

1. Adaptive spatial domain filter
2. Frequency transform
3. Clustering techniques
4. Hybrid methods
5. Soft computing methods

SOFT COMPUTING METHODS: It is hybridization of neural network and evolutionary computational methods .Soft computing methods includes

1. Back propagation method
2. Evolutionary algorithm
3. Generic algorithm
4. PSO method.

PSO METHOD: A new methodology using PSO for evolving neural network weight and network architecture is introduced .Classification of normalized and un-normalized data sets gives good result by evolving weights and architecture of neural network using particle swarm optimization.

In this paper, the PSO technique will be used for SAR image improvement on the basis of matching feature using this new approach of computational intelligence techniques.

APPLICATION OF SAR IMAGES:

1. In remote sensing and mapping
2. Mineral exploration
3. Ice hazards maps to navigators

4. Target information to military operation.

II. LITERATURE REVIEW: The past review on SAR image matching feature are observed by analyzing various papers .In [1] proposed approach a set of algorithm to construct SAR matching suitable features are firstly based on evolutionary method for selecting matching of ortho images i.e. SMFS with high effiency.The paper [2] shows the matching probability of best matching area which decreases geometric distortion and optimizes image features .This paper[3] shows comparison of matching mode on SIFT with traditional method which provide sub region information results reduction of incorrect matches. Then papers [4] propose multistage registration techniques using robust SIFT features steerable domain in better performance for large scale variation, rotation and intensity. The paper [5] introduce ground base SAR (GBSAR) interferometer for deformation measurement used in various application like structure monitoring g lacier and snow. This paper [6] has investigated the edge-aware region growing and merging algorithm for effective segmentation of SAR and optical data. The potential of the fusion of multitemporal multiage ENVISAT ASAR and HJ-1B CCD data has also been explored for detailed urban land-cover mapping. The paper [7] has proposed technique is achieved by coherently combining the Galileo E5a-Q andE5b-Q signals, followed by spectral adjustment to the combined signal. Current results indicate that range resolution can be improved by more than three times compared with the single E5b-Q band at the expense of maximum detection range Passive GNSS-Based The paper[8] shows state-of-the-art estimators of PS and DS phase history parameters. Based on a simulation with 40% of its images being random-phase contaminated, the robust loss function increases the efficiency of the estimator by a factor of 7–35 compared with standard version estimators. The papers [8] conclude the SAR image segmentation using particle swarm optimization.
From the above papers and various methods of SAR imaging on different basis some problems introduced which may leads noise interference in image ,correct edges of image and some angle and deviation features of radar image is not clearly visible ,Which was proposed to be improved by using new approach based on particle swarm optimization i.e. PSO

III. PROPOSED METHODOLOGY: In this paper particle swarm optimization is one of the soft computing techniques. In other words the problem in improvement in SAR imaging on matching feature basis is followed as

PARTICLE SWARM OPTIMIZATION: Actually there is supervised and an unsupervised technique the PSO is unsupervised method.PSO is population based search technique .it is new approach based on evolutionary technique; depend on interaction between independent agents used to find the global maximum of generic function. In PSO the swarm intelligence is used which is the experience accumulated during evolution is used to search the best approach parameter t describe the image feature for matching which improve the SAR imaging
.
The feature of SAR image is general highly application dependent ,which represent the outcome of the event that is condition on some test here ,unsupervised testing is processed by PSO, and the term matching feature understand as the process in imaging type of search there are many unknown type of search there are many unknown factor governing the appearance of image in a given SAR image .The whole process followed that SAR image obtained by Google are optimized to reduce error ,improve the SAR imaging on matching features.

Recently, swarm intelligence (SI) is new emerging area in various fields including optimization. One of very popular SI methods is particle swarm optimization (PSO) for finding optimized solution. PSO is a stochastic search method that was developed in 1995 [1] by Kennedy and Eberhard. PSO was based on the sociological behavior of bird flocking.

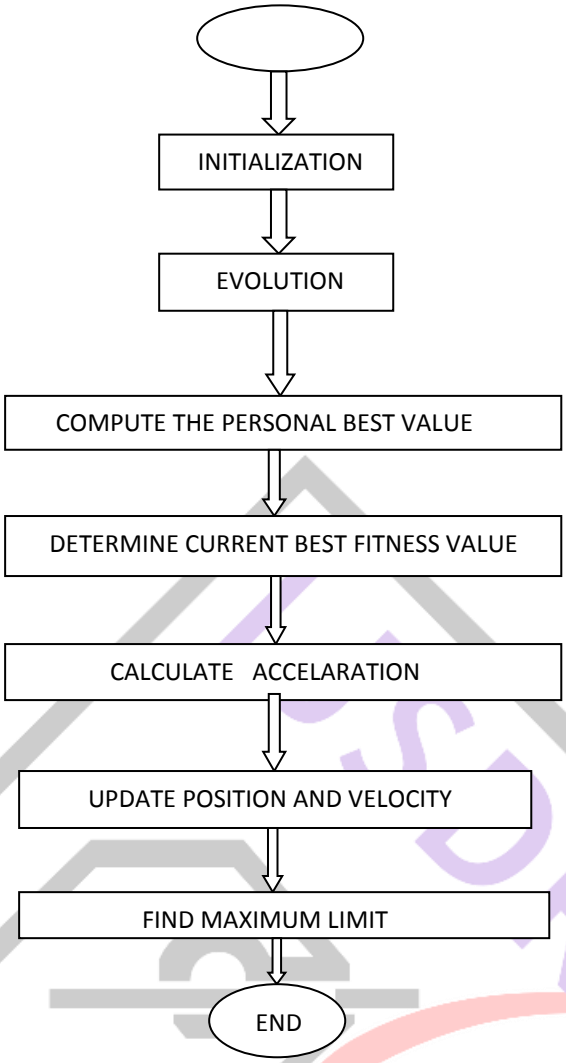
.PSO techniques are classified as:

1.MPSO : In PSO , random values are chosen for the initial population but in proposed MPSO the range for initial values are given .The initial value are selected from the given so that the speed of search operation is increased. It is counter transform is also known as second generation wavelet transform .It optimize gain function.

2. BPSO: Bandelet transform are used and constructed by anisotropic wavelength .In first generation band let transform, the vector field used to determine image irregularities and regularities. But in first generation, multi resolution is not possible so that second generation is introduced in which the image is subdivided into wavelet sub bands it is effective in noise removal from SAR imaging.

PSO technique include algorithm which is initialization of position and associate velocity to all particle and evaluate the fitness value of all particle. Then compare the personal best possible value that is global searching in terms of position and velocity and as a result a maximum limit is observed and calculated on this basis the image matching features of SAR imaging process is improved .

IV. PSO ALGORITHM FLOW CHART:



V. CONCLUSION AND FUTURE WORK: In this paper, we observe the matching feature of SAR image and the improvement in image quality is done with the help of soft computing under computational intelligence techniques i.e. PSO .The advantages of PSO algorithmic initial condition are not required and it perform a globalized searching for solution where as other clustering procedures performs a localized searching according to overall accuracy. PSO has high classification precision and can be used in SAR images classification efficiently.

The PSO methodology can be further enhanced by introducing ACO technique designed for SAR image matching feature for improvement in the images obtained by satellites and more efficiently used in various applications.

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