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A Survey of Remote Sensing Image Classification Techniques Using AI Techniques

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Abstract: ***Subsequently Terrain Classification is one of the most liberal aspects of Remote Sensing in the field of Artificial Intelligence. Remote sensing image classification is the wide range area which first sense the part of image that is going to be classified afterwards classification takes place. The purpose of remote sensing is to get information out from the object without being coming in a direct contact with the object. The purpose of the classification process is the categorization of all the pixels in an image into several land cover classes, as well as the themes. The data that is to be categorized is then used to produce maps that are thematic of the land cover present in an image. Image classification enables the grouping of pixels to represent the coverage features of land (can be urban, forested, and agricultural and may also include other varieties of Terrain features). Image classification make use the reflectance statistics for determining the pixels and responds to Terrain features as well. There are several classification techniques which would use to manipulate the persistence for uncertainty, imprecision and cost effective solutions.***

Keywords: Terrain Classification, Intelligent Water Drops, Artifical Intelligence, Soft Computing, Classification, Remote Sensing.

I. INTRODUCTION

Terrain Classification is one of the most liberal aspects of Remote Sensing in the field of Artificial Intelligence. Remote sensing image classification is the wide range area which first sense the part of image that is going to be classified afterwards classification takes place. The purpose of remote sensing is to get information out from the object without being coming in a direct contact with the object. The purpose of the classification process is the categorization of all the pixels in an image into several land cover classes, as well as the themes. The data that is to be categorized is then used to produce maps that are thematic of the land cover present in an image. Image classification enables the grouping of pixels to represent the coverage features of land (can be urban, forested, and agricultural and may also include other varieties of Terrain features). Image classification make use the reflectance statistics for determining the pixels and responds to Terrain features as well. There are several classification techniques which is used to manipulate the persistence for uncertainty, imprecision and cost effective solutions.

Soft Computing is the study of perceptive research area which is capable of understanding how to deal with the intelligent deeds of the software used. This computing also helps to make intelligent machines which further make the complex tasks easier. Human intelligence is one of the important aspects to perform. This research is regarded to be exceedingly technical and specialized, and is partitioned into various subfields that often fail to communicate with each other. The most basic part of soft computing include learning, planning, knowledgebase, reasoning, NLP (natural language processing) etc.

Wide-ranging soft computing are still seen among the field of long-term goals. The most standard approaches consist of computational intelligence, numerical methods and traditional symbolic AI. There are number of tools used in soft computing, including versions of mathematical optimization techniques, methods based on the prospect to occur, logic and lots of others. This field is interdisciplinary in which sciences and professions converge, including computer science, mathematics, psychology, linguistics, philosophy and neuroscience, as well as other specialized fields such as artificial psychology. The directive objective of soft computing is to manipulate the persistence for uncertainty, imprecision, and constrained truth to attain tractability, cost effective solutions and sturdiness. Fuzzy, Neural Network, control theory, classifiers etc. are some of the approaches which are most commonly used in the field of intelligence.

II. IMAGE CLASSIFICATION TECHNIQUES

Image classification enables the grouping of pixels to represent the coverage features of land. The land that is covered can be urban and forested, agricultural and also include other types of features. The smallest unit that is represented in an image is known as Pixel. Image classification also uses the reflectance statistics for determining the pixels.Image classification is important in the field of Remote Sensing for acknowledging different Terrain features as well.

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The purpose of the classification process is the categorization of all the pixels in the digital image into several land cover classes, as well as the themes. The satellite data that is to be categorized or processed is then used to produce maps that are thematic of the land cover present in an image. Basically, the satellite data that is to be multispectral may be used to perform the classification as well as, the spectral pattern that is present within the data containing each pixel is also used as the numerical basis for the categorization. Multi-spectral images, at the same time can hold several terrain topographies comparable to water, urban, vegetation and rocky that are specially being categorized for further requirement of image analysis. Therefore remote sensing and image classification work together very effectively. In fact the processing of satellite data is the way to classify the objects on the earth without getting into a touch with. Highly actuated sensors work on the propagated signals which gets reflected by the ground objects like water, rock, vegetation's soil in the sort of spectrum which further turned into DN values or Digital Number. The image classification techniques in remote sensing are divided into three parts:

- Supervised image classification.
- Unsupervised image classification.
- Object-based image analysis.

A. Supervised Classification

The two most common approaches of image classification techniques are Supervised and Unsupervised. But the classification technique that is object based is basically not being used.The user chooses representative samples for every land cover class in the digital image area. These sample land cover classes which are given to compare with the whole land cover image are called training sites. The image classification software uses the training sites to represent the land sample cover classes in the overall image. The classification of land cover image is depends on the spectral signature displayed in the training set. The digital image classification software determines each class on what it resembles most in the training set. This resemblance of sample images with overall land image is being done by supervised classification.

B. Unsupervised Classification

When pixels are grouped, based on the reflectance properties of pixels. These combinations of pixels are known as "clusters". The user classifies the amount of clusters and bands to generate. With this information, the image classification software generates clusters. The different image clustering algorithms are K-means and ISODATA.

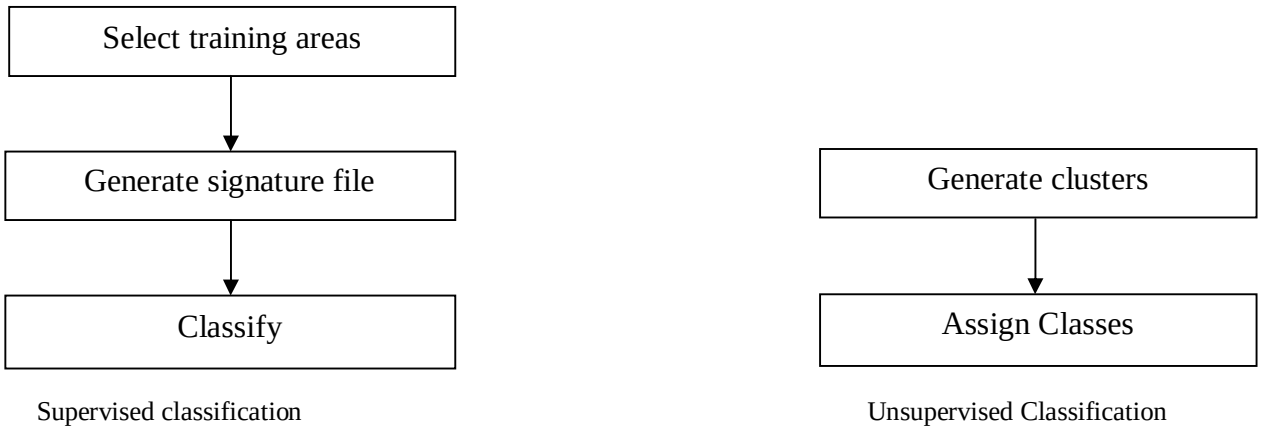


Fig. 1 Depiction of Supervised and Unsupervised Classification

C. Object-Based (or Object-Oriented) Image Analysis Classification

Object-based image classification is different from predefined classification techniques in that way: it generates objects of different shape and scale. This process is called multi-resolution segmentation. Multiresolution segmentation groups homogenous image objects by grouping pixels. Objects are created with different scales in an image all together. These objects are more meaningful than the traditional pixel-based segmentation because they can be classified based on texture, context and geometric specifications.

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D. Object-Based Nearest Neighbor Classification Steps

The supervised classification includes following steps in order to complete its classification process. Object based classification includes ordered steps that carries multiresolution segmentation which segments pixels in terms of objects. Training areas are selected and define number of statics in order to perform classification. Here are the steps:

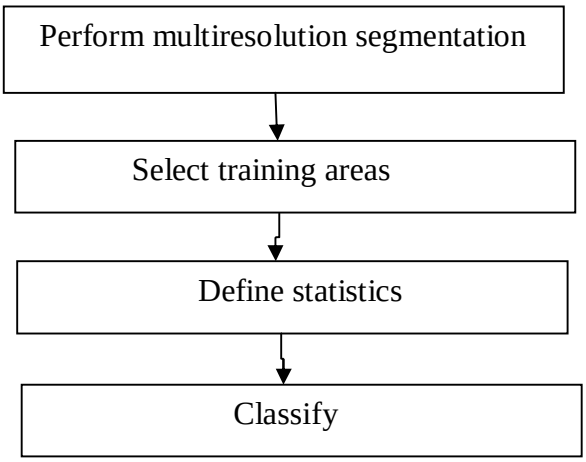


Figure 1.2 depicts object based Image Classification

III.LITERATURE SURVEY

A survey of Remote sensing Image Classification Techniques using Artificial Intelligence Techniques are summarized below in the given section.

A natural river often finds good paths among lots of possible paths in its ways from the source to destination. These near optimal or optimal paths are obtained by the actions and reactions that occur among the water drops and the water drops with the riverbeds. The intelligent water drops (IWD) algorithm is a new swarm-based optimization algorithm inspired from observing natural water drops that flow in rivers. In H. Shah Hosseini (2009) , the IWD algorithm is tested to find solutions of the n-queen puzzle with a simple local heuristic. The travelling salesman problem (TSP) is also solved with a modified IWD algorithm. Moreover, the IWD algorithm is tested with some more multiple knapsack problems (MKP) in which near-optimal or optimal solutions are obtained [7].

H S Hosseini et al. (2012) In this paper work [1] several methods are considered to improve the quality of a given sample pictures using Intelligent Water Drops (IWD). This algorithm is implemented here with a mutation-based local search to find the optimum values for numerical functions. Flowing water drops are observed mostly in rivers or lakes where they form huge moving swarms. The paths that a natural river follows have been created by a swarm of water drops as they are carrying small amount soil with them. This paper consolidates various measures of IWD algo which improves the quality of images generated by early techniques for image classification.

A.Bhardwaj et al. (2012) presented particle Swarm Optimization technique in order to look at the transparency in the satellite images. When this technique is combined with traditional clustering algorithms then the problems such as local optima and sensitivity to initialization are reduced. So exploring a greater area became promising using global search. Kappa coefficient's the parameter which further calculates the efficiency of segmented image[2].

A. Kumar et al. (2015) This paper[3] studies the classification of satellite based data on spectrally distinct objects though which they belong to the same class. Traditional swarm intelligence technique blows the classification in addition to that the urban landscapes composed of features remote sensed data with traditional statistical classification that is slighter than the spatial resolution of the sensors. Classifier scrutinizes only the spectral variance and ignoring the spatial methods for remote-sensing classification. Artificial bee algorithms used in the training process to parametric and non-colony to expand the performance of classification of data, parametric classifiers based on swarm intelligence to characterize, spatial variations theoretical modelling considering the type of distribution of within imagery as a means of extracting information forms on data.

G. Alimjan et al. (2018) proposed that for remote sensing image classification, distance measurements and classification criteria are equally important; and less accuracy of either would affect classification accuracy. Remote sensing image classification was performed by combining support vector machine (SVM) and kk-nearest neighbor (KNN). This was based on the separability of classes using SVM and the spatial and spectral characteristics of remote sensing data. Moreover, a distance formula is proposed as the measure criterion that considers both luminance and direction of the vectors [4].

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M. Salah (2017) reviewed the major advanced classification approaches such as Artificial Neural Network (ANN), Classification Trees (CTs) and Support Vector machines (SVMs) and the work compared the performance of conventionally classification techniques on satellite data. In addition, there are several issues requiring consideration in respect of the classification of remotely sensed data i.e. how to select the proper size of training samples, how to set up the classifier parameters? and how to combine classifiers in an efficient way [5].

P.Dharani et al. (2020) proposed a method to identify the aircraft from the remote sensing images by using deep learning and image processing techniques. The process consists of two stages training stages and test stages. The proposed system could identify and classify the aircraft from the remote sensing images by using the convolutional neural network and deep learning technique [6].

V. Kumar et al. (2013) categorize the pictures using swarm intelligence that turns out to be the largely accessible occurrence via the research scholars since it is of very important quality with tremendous amount of flexibility concerning for the work. In this research, a fresh approach is offered in the direction of classifying an image using the probability perception function of honey bees. This paper primarily emphases upon the probability occurrence of honeybee in the route or direction of choosing their specific nectar quality. As per this predefined information, it could become easy for bees to classify their picture objects though. In this paper, they have given a probability centered honey bee method as proficient classifier used for high resolution multi-spectral satellite picture of Alwar region. The specific kappa coefficient is 0.941 as well chains their algorithm's competence with the specific amount of time. ABC mechanisms on the other hand focusing on complete image captivating and later can identify the heterogeneous portions in an image and then able to classify each portion seamlessly. Heterogeneous regions are the areas in angiven that could not easy to identify as a mixture of features are present.

V. Singh et al (2015) made comparison of various computational techniques and these were described in the major categories where Artificial Bee Colony optimization, Cuckoo Search, Fuzzy Set, Membrane Computing, Minimum Distance Classifier and Maximum Likelihood Classifier is implemented. Here Kappa coefficient is used as performance acceptance estimation parameter. User's accuracy is being measured by measuring the accuracy of a solitary land feature. Finally, it was scrutinized that which computational Intelligence based classifiers give appropriate results under same circumstances to optimize this land features.

A. Kumar et al. (2015) studied the classification of satellite based data on spectrally distinct objects though which they belong to the same class. Traditional swarm intelligence technique blows the classification in addition to that the urban landscapes composed of features remote sensed data with traditional statistical classification that is slighter than the spatial resolution of the sensors. Classifier scrutinizes only the spectral variance and ignoring the spatial methods for remote-sensing classification. Artificial bee algorithms used in the training process to parametric and non-colony to expand the performance of classification of data, parametric classifiers based on swarm intelligence to characterize, spatial variations theoretical modelling considering the type of distribution of within imagery as a means of extracting information forms on data.

Luis A. Moncayo–Martınezm et al. (2016) presented a paper to enhance the current body of knowledge of expert and intelligent systems by providing a new, effective and efficient IWD-based optimization method for the design and configuration of supply chain and logistics networks taking into account multiple objectives simantenously.

IV.CONCLUSION

Terrain Classification is one of the most substantial aspect of Remote Sensing in the field of Artificial Intelligence. The classification process categorized all the pixels of an image into several land cover classes, as well as the themes. The data that is to be categorized is then used to produce maps that are thematic of the land cover present in an image. Image classification enables the grouping of pixels to represent the coverage features of land (can be urban, forested, and agricultural and may also include other varieties of Terrain features. There exist several approaches of classification would use to manipulate the persistence for uncertainty, imprecision and cost effective solutions. This analysis predict that the Intelligent water drops (new approach to AI) which might be able to stand up better against prior existing techniques with its results. Kappa coefficient and overall accuracy are the parameters which will find the efficiency of these approaches for classification. Through error matrix various regions can be found classified in order to generate sustainability.

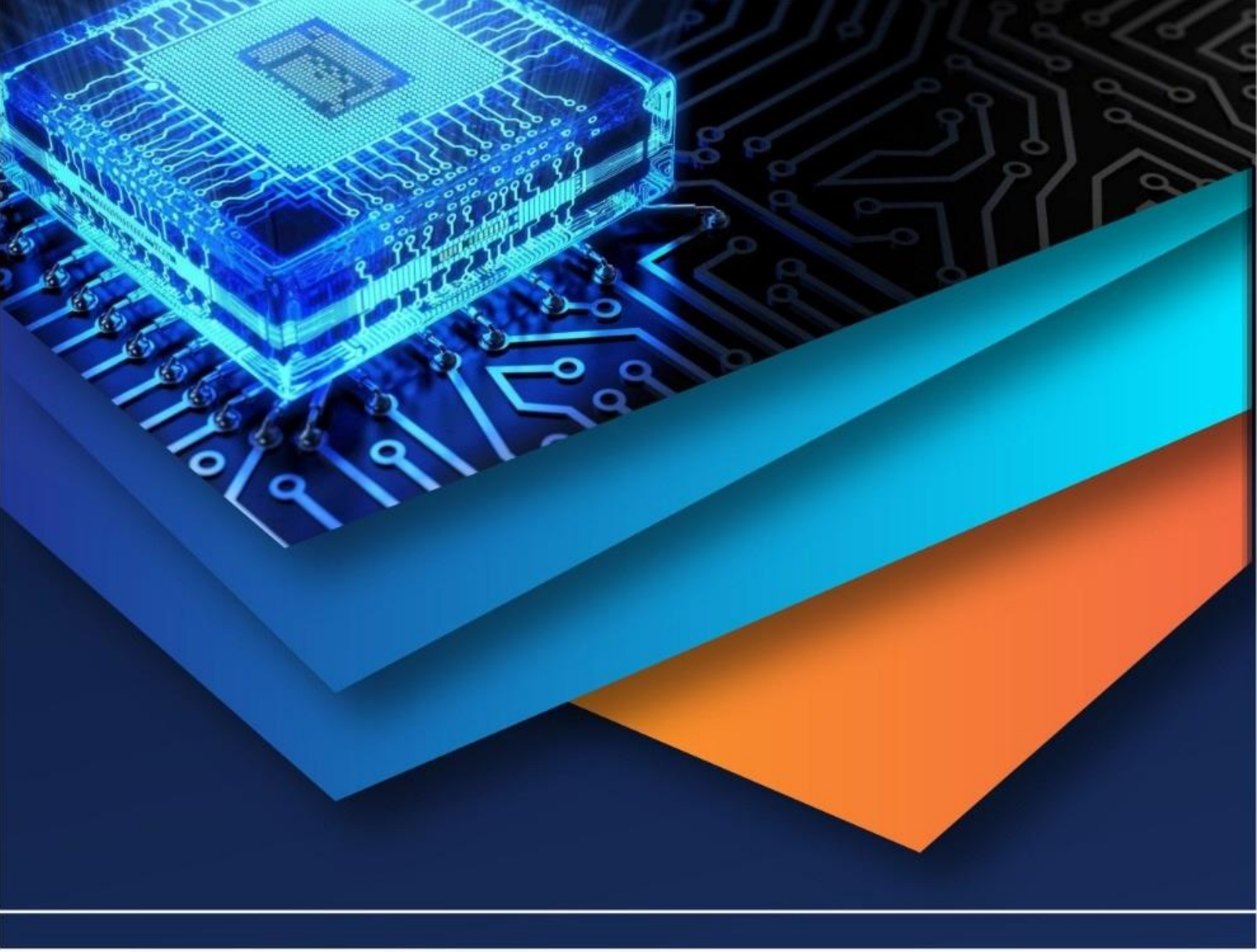
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