Satellite Image Classification Using Artificial Neural Network

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Abstract- Satellite images are used to multiple applications and management. Artificial neural network is a popular tool to analysis and collection of remotely sensed data. Artificial neural Network is used to develop satellite image classification algorithms. The main advantage of ANN is used to extract correct results from incomplete underhand input. The input of an ANN is topographic anatomy of earth surface allocate with a confidential information and a position of image taken by a satellite. The trained ANN is re produce the result by using algorithm. Image classification act as an important role in remote sensing used to extract most important spatial information. Satellite images are used in various important fields by a weather forecaster. This study is used to explore the facilities of Artificial Neural Network for satellite image classification.
Keywords: ANN, Classification, Remote sensing, Classes

1. INTRODUCTION

Remote sensing is a more than one continuous actions of discover and observe the physical attributes of an area by estimates it's reflected and release radiation at a distance from the goal of the data. Remote sensing is used in multiple fields such as land survey and geography. Commonly remote sensing refers to the use of space station based sensor activities to classify and detect objects on earth.

Satellite image classification act as an important role in remote sensing. A group of pixel (class) are divided into a single pixel based on their data value is called as a classification. The pixel is allocated to a specific class if it fulfils the definite set of rules to put in a particular class. The classes can be familier or unfamiliar. The classes are able to separate based on the training data it is called familier class otherwise it is unfamiliar class.

The image classification has two types of classification techniques which are supervised classification and unsupervised classification.

In supervised classification the analyst requires an input from an analyst. The input is called a training data. The training data is act as a most important role in supervised classification methods. The overall accuracy of supervised classification is based on the training data taken by the analyst. Two types of training samples are available, one is used for classification another one is used for accuracy of classification.

The clustering mechanism is used in unsupervised classification to group of pixels divided into unlabelled classes.

2. REMOTE SENSING

Remote sensing is the art and science of get data about the earth's location without directly contact with it. The sensors have two techniques which is active sensor and passive sensor. Active sensor use internal stimuli to collect information about earth. Examples for active sensors are Radar and Lidar. The passive sensors respond to external stimuli. It record natural energy that is reflected from the earth's surface. The most common source of common source of radiation detected by passive sensor is reflected sunlight.

Commonly the satellite images are gathered through multispectral technology, which record data abnormal human perception range; including x-ray and radar. The data is denoted in visual form. The dimensionality is reduced when the data having more than three bands.

3. LITERATURE SURVEY

Already several numbers of papers proposed on classification of satellite image and neural network concept. Some approaches are produced for gaining new effective techniques to perform a separate application. Some of the most significant literatures are mentioned below:

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Table 1: Types of classes

Classes	Types of classes
2	(i) Developed Area, (ii) Undeveloped
4	(i) Agriculture (ii) Industrial (iii) Road (iv) Water bodies
5	(i) Open space (ii) Agriculture (iii) Industrial (iv) Road (v) Water bodies

In satellite image segmentation the feed forward neural networks introduced by Mayank Toshniway in 2005.In standard concept the new and creative ideas have been added. The architecture of neural network has been produced with high accuracy. Here constant efficiency and accuracy in terms of parameters to achieve image segmentation. The insufficient training set problems are overcome and timelines of segmentation are improved.

The high resolution multispectral satellite images of urban areas are classified and extraction of spatial feature concept was proposed by S. Gandhimathi in 2013.

In this method compulsory the pre-processing was done by Gaussian filter to remove the noise. Then the Grey Level Co-occurrence matrix was used to extract the features from the filtered image. Finally Back propagation artificial neural network algorithm was applied to classified and analyse the performance based on its accuracy to the filtered image.

The feed forward and hybrid clustering algorithm was produced for land based mapping of road, trees and buildings by S.Praveena in 2014. Here use only single pre-processing step for segmentation. The hybrid genetic artificial bee colony algorithm was used to segment the pre-processed image. The artificial bee colony algorithm is used to create effective segmentation in remote sensing by feed-forward artificial neural network classifier. The result was produced with high resolution.

4. IMAGE CLASSIFICATION USING ARTIFICIAL NEURAL NETWORK

The Artificial Neural Network is implemented using electronic components such as analog or digital. It enrols enormous interconnection of simple evaluate cells called neurons or processing elements. It favours the brain in two ways;

(i) The network was acquired the knowledge through learning process.

(ii) Synaptic weights that means inter neuron connection strengths are responsible for recording knowledge.

4.1 working of neuron:

The external stimulus sends input to the neuron. The external stimulus is defined as large number of neurons. Non-linear activation functions are supported by weighted sum of inputs. The result of the last function is distributed connections to other neurons. The flows of information in the networks are defined by the topology of the neuron connections.

In this way the weights are adjusted in the network represent the learning process.

Architecture, activation function and the learning applications are various ANN structures these are explored for various ANN computational systems.

5. IMAGE CLASSIFICATION USING ANN

Image classification is a very important concept for particular applications. This paper highlights the analysis and usage of different neural network algorithm.

5.1 Image Classification using Back-Propagation Algorithm

Image classification will be conducted by back propagation algorithm, which is under supervised classification it is called feed forward neural network.
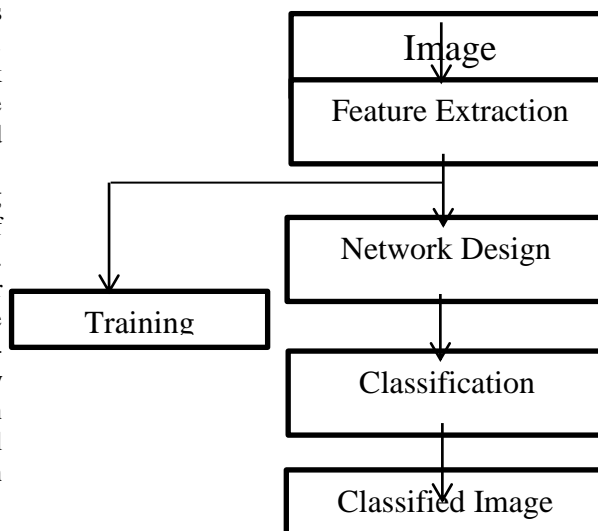

Figure 1: Classification Using ANN

In back propagation algorithm the normalized process of training samples has been performed before training and classifies land use

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and land cover of satellite images. The normalized equation formula is mentioned below

$$X' = \frac{X - X_{min}}{X_{max} - X_{min}}$$

X'   - Mean value for normalized input
X   - Original value
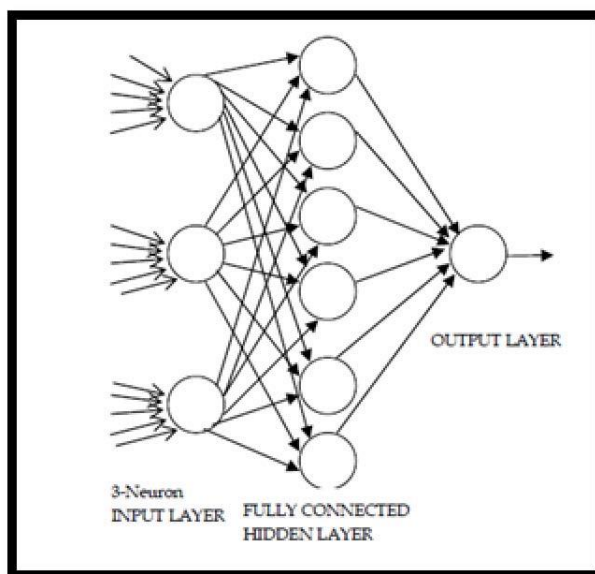X_{min} X_{max} - Original training sample sets for minimum and   maximum values

Figure 2: Architecture of back propagation algorithm

In back propagation neural network process more than one hidden layers are used feed forward will be used, and based on the discretion the number of hidden layers can be changed. The number of classes (N) and the number of neurons in output layer will be equal, which is based on coding followed the output. The number of hidden neurons will be in the range between the size of the output layer and size of the input layer. The number of hidden layer proposed by the following formula;

$Nh = Np(r (Ni+No))$
Np – Number of training samples
Ni – Number of input neurons
N0 – number of output neurons
The back propagation program is used to create the model of network and to teach the networks. Conjugate gradient method and the Lavenberg-Marquardt method are used to train the data and these methods are having their own advantage and it is faster. The training data set selection is very

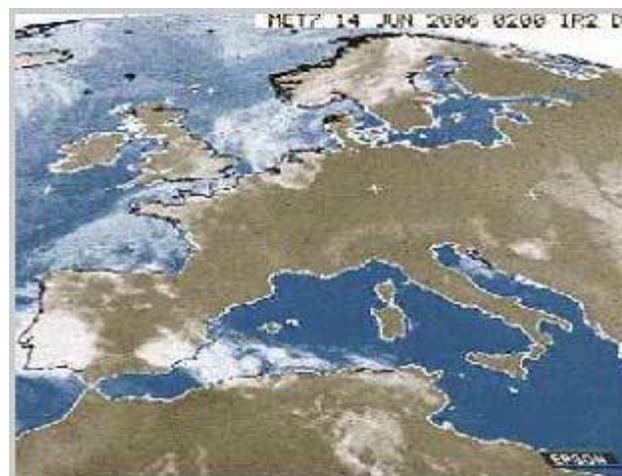important stage, which give the best result of classification.
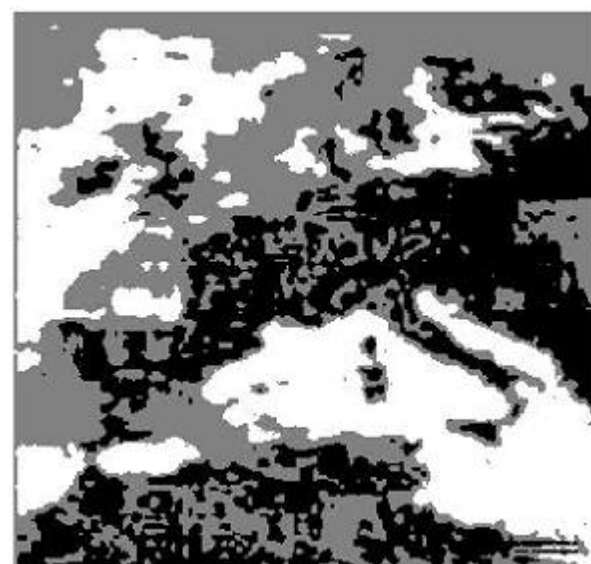

Figure 3: Original Image

Figure 4: Classified image using Back propagation of ANN classifier

6. CONCLUSION

Artificial neural network is a popular tool to analysis and collection of remotely sensed data. Artificial neural Network is used to develop satellite image classification algorithms. The main advantage of ANN is used to extract correct results from incomplete underhand input. This study reviews the capability of the artificial neural network to classify the image using back propagation algorithm. In this type of classification the algorithm take different time to produce the result because the counting of training data is depends on the number of class and neural network model.

This paper reviews the concept of artificial neural network and how to work the neurons in

classification algorithm. The back propagation algorithm provides the best result through the artificial neural network.

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