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Spectral _Spatial Classification For Hyper Spectral Images Based On An Effective Extended Random Walker

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ABSTRACT: Hyper spectral image classify by using spectral –spatial classification based on Extended random walker (ERW)s .In this ERW have mainly two steps . First go to pixel wise classification by using support vector machine (SVM) .It is used for classification probability maps for a hyper spectral images. The probabilities of hyper spectral Pixel belongs to different classes .The second approach is obtain pixel wise probability maps are optimized by Extended random walker algorithm. Based on three factors i.e, Pixel wise statistics information by SVM classifier, spatial correlation among adjacent pixels modeled by the weights of graph edges and the connectedness between the training and test samples modeled by random walkers used to the class of the test pixel determined .So these three factors considered in ERW. By using Gaussian mixture model method in the proposed method shows very good classification and high accuracy performs for three widely used real hyper spectral data sets even the number of training samples is relatively small.

KEY WORDS: Extended random walkers ;hyper spectral images; optimization; spectral-spatial classification; Gaussian mixture model(GMM).

1. INTRODUTION

Hyper spectral sensors look at objects using a vast portion of the electro magnetic spectrum, this images like other spectral imaging, collects and processes information from across the electro magnetic spectrum. Hyper spectral images are gives high level understanding remotely sensed images.

High dimensionality of the data sets involves Hughes phenomenon in classification. This phenomenon gives number of training samples are fixed, The classification accuracy may be decrease for some supervised classification methods as the data dimensionality increase .

So deal with this difficulty , to developed some solutions they are

Feature extraction

a. Gaussian mixture model b. Principal component analysis c. Independent component analysis

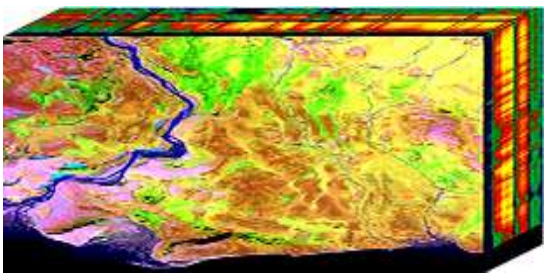


Fig .No :1 2D Hyper spectral image

Support vector machines are supervised learning models with associated learning algorithms that analyze data and recognize patterns, used for classification and regression analysis. Support vector machine constructs a set of hyper planes in a high or infinite-dimensional space, which can be used for classification, regression, or other tasks

2. RELATED WORK

The schematic of the ERW ALGORITHM-based spectral–spatial hyperspectral image classification method which consists of two main steps:

A .Initial Probability Estimation With SVM

B .Probability Optimization With ERW

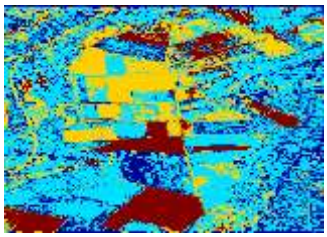
A. SVM is adopted to estimate the initial probability maps which measure the probabilities that each pixel of a hyper spectral image belongs to different classes. Pixel wise SVM classification is used to obtain a set of probability maps which measure the probability that a pixel belongs to a particular class.

B. The ERW algorithm is adopted to calculate a set of optimized probabilities in order for the class of each pixel to be determined based on the maximum probability. In the ERW-based optimization framework, the pixel wise spectral information, the spatial information between adjacent pixels.

The fig no:2 Shows the original image which is hyper spectral image (satellite image) Is subjected to existing preprocessing method PCA and then the fed to ERW algorithm.

Fig No:2 ORIGINAL IMAGE

The following fig no3 is result of PCA based ERW in this fig the classification is obtained and the bi fraction of the different areas in satellite image is difficult ,because of color of one area merged with other area.



FigNo:3PCA BASED ERW OUTPUT IMAGE

3. Proposed Method

In order to improve the classification the preprocessing method is replaced with GMM. Gaussian mixture models are often used for data clustering .Clusters are assigned by selecting the component that maximizes the posterior probability. Like k means clustering ,Gaussian mixture modeling uses an iterative algorithm that converges to optimum .Gaussian mixture modeling may be more appropriate than k means clustering when cluster s have different sizes and correlation With in them. Clustering using Gaussian mixture models is sometimes considered a soft clustering method.

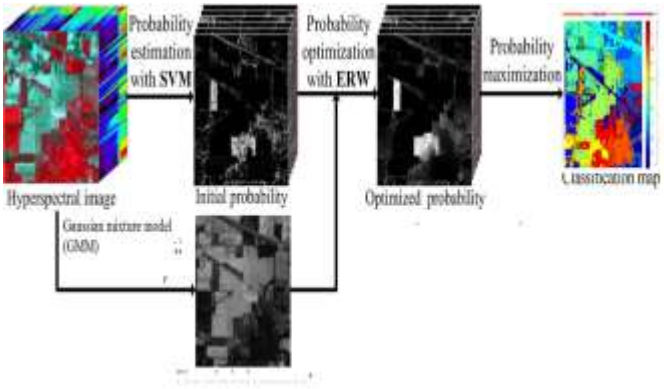


Fig.No 4 Schematic of the proposed ERW-based spectral–spatial classification method.

Maximum a posterior algorithm is used on the obtained classification result of GMM based ERW result in order to avoid the sharpness and to smoothen the edges for easy bi fraction this result is show in fig no4

The block diagram is as show in fig no5 .In this project both existing and proposed preprocessing methods PCA and GMM respectively are used .After pre processing the results ERW subjected to the post processing ERW for classification purpose .Then the obtained classification results are compared for both subjected and objective analysis.

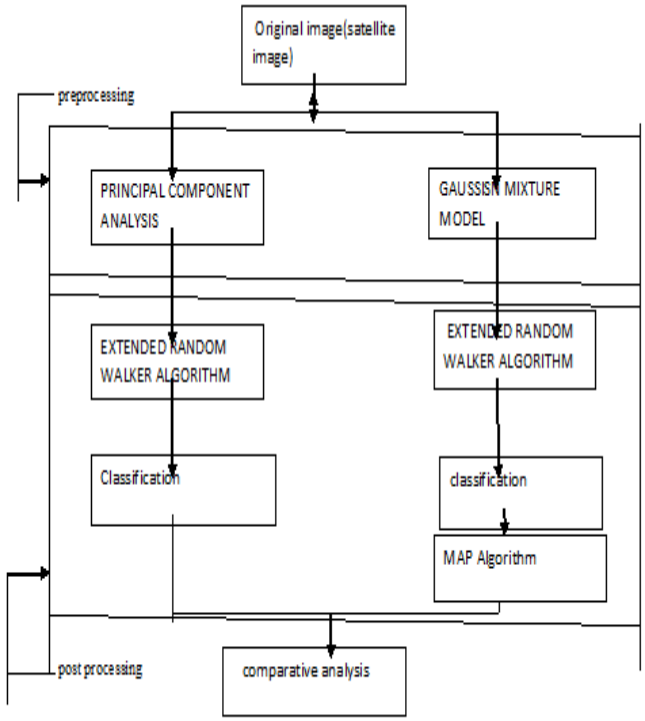


Fig.No5:BLOCK DIAGRAM

I n order to improve the classification the preprocessing method is replaced with GMM

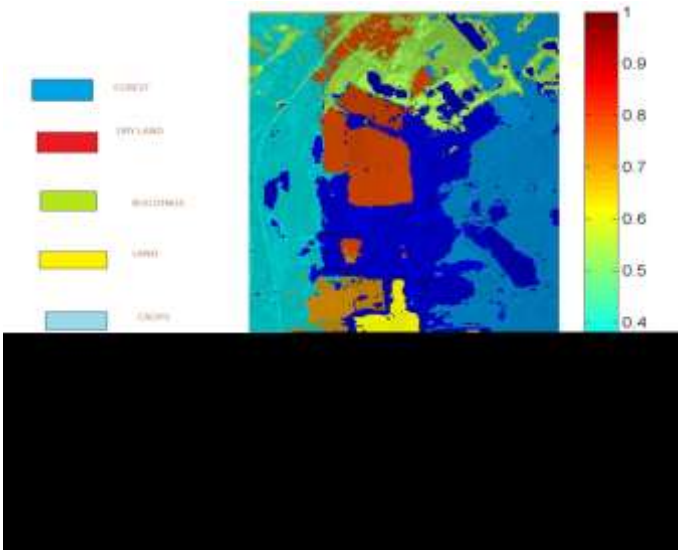


FIG NO:6GMM BASED ERW OUTPUT IMAGE

On comparing both images from figno: 4and fig no:6 it is clear that the GMMbased ERW output gives a good

classification of different areas in the image which are shown with different color square boxex besides the fig no:6

3. Statistical analysis

we calculate parameters by using pca method are

F measure:A measure that combines precision and recall is the harmonic mean of precision and recall, the traditional F-measure.

F= 2. PRECISION*RECALL / (PRECISION+RECALL)

Precision and recall:

Is the fraction of retrieved instances that are relevant. Precision is also referred to positive predictive value . Recall in this context is also referred to as the true positive rate. Recall is the fraction of relevant instances that are retrieved

Precision=tp/(tp+fp)

Recall=tp/(tp+fn)

ACCURACY:

Accuracy=tp+tn/(tp+tn+fp+fn)

For classification the terms true positives (tp),true negatives(tn), false positive(tp), false negative(tf) compare the results of the classifier under test with trusted external judgments.

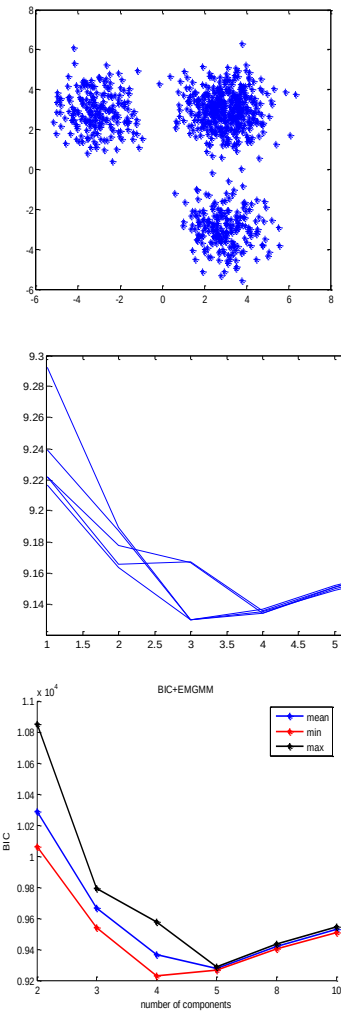
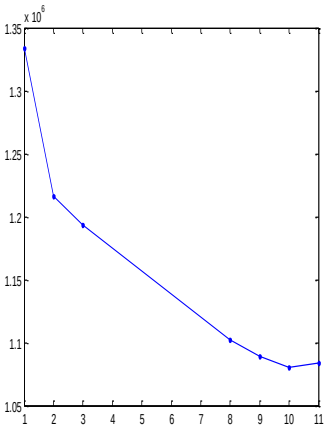


Fig:7 a b

On comparing the statistical analysis for Various parameters the proposed method gives the good ERW results .Accuracy is high and F measure results and recall values are nearing to unity and computational time is less for GMM base result.

Output resultant graphs and images of satellite image by using GMM:

PARAMETERS	PCA+ERW	GMM+ERW
ACCURACY	73.0762	87.6914
F-MEASURE	0.6496	0.9052
RECALL	0.5846	0.9354
COMPUTATIONAL TIME	100.1977 sec	80.9856 sec



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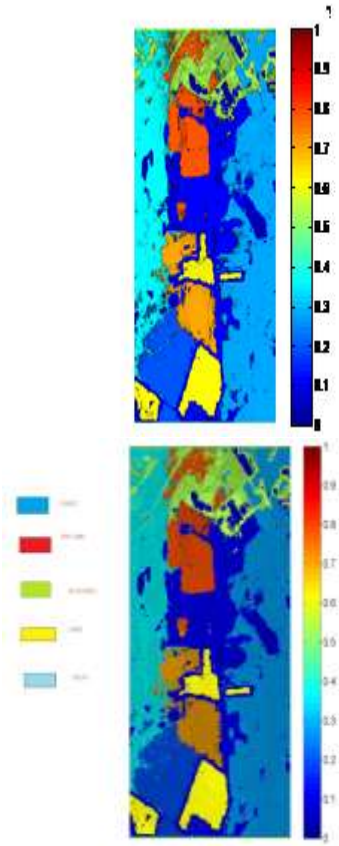

d

e

f

7a)clusters b)no.of methods performance c)BIC+GMM(mean) d)best method graph e)classification satellite image f)by using the map rule on (e) to get output image

APPLICATIOONS:

1.Environment monitoring

2. precision agriculture

3.National defense

4. CONCLUSION

In this paper classify the hyper spectral image by using the ERW with the GMM is introduced.The main advantage isby using GMM based on ERW the classification accuracy is high when the number of traing samples is very small and the time also less compare with the otherfeature extraction methods.

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