International Journal of Reviews in Computing

IJRIC
ISSN: 2076-3328 www.ijric.org E-ISSN: 2076-3336

RSI RANGE DETERMINATION USING CUBICAL DISTANCE CLASSIFICATION

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ABSTRACT

Information processing and decision support system using data mining techniques is in advance drive for huge availability of remote sensing image (RSI). RSI describe inbuilt properties of objects by recording their supernatural reflectance in the electro-magnetic spectral (*ems*) region. Information on such objects could be gathered by their color properties or their spectral values in each *ems* range of pixels Present paper explains a method of such information extraction using cubical distance methods and the results are discussed. This method is one among the simpler in its approach and considers grouping of equal distance of similar from a specified point in the image or selected pixel based on its attributes. The color distance and the occurrence pixel distance are played vital role to determine the similar distance objects in the RSI.

Key works : *Cubical Distance Method, FIS, Color Map*

1.0 INTRODUCTION

The objective of the present research process is to mine the digital values of selected RSI image with possible classification of pixels determining features and predicates the possible integration of applications using cubical distance method.. The classification process is implemented with the processed image digital values distance using classification and clustering algorithm with data mining techniques.

Remote Sensing is the science and art of acquiring information (spectral, spatial, and temporal) about material objects, area, or phenomenon, without coming into physical contact with the objects, or area, or phenomenon under investigation. Without direct contact, some means of transferring information through space must be utilized. In remote sensing, information transfer is accomplished by use of electromagnetic radiation (EMR). EMR is a form of energy that reveals its presence by the observable effects it produces when it strikes the matter. The Electro-Magnetic Radiation (EMR), which is reflected or emitted from an object, is the usual source of Remote Sensing data. However, any medium, such as gravity or magnetic fields, can be used in remote sensing. This represented in the combination of pixels and stored in the digital media for analysis and predications.

2.0 METHODOLOGY

The following procedure is followed in this paper

i. Capture satellite Image
ii. Preprocess the image using RSI tools and extract the RSI to process the image
iii. Convert the integrated multi layer image into two dimensional Digital number (DN) layer values
iv. Convert the multi layer image into two dimensional matrix using micro array
v. Determine the distance of the pixel using cubical distance determination methods
   a. From the origin (0,0,0)\
   b. From the first point of the Region of Interest
   c. From the frequent occurrence point in the ROI
vi. Classification of Pixels according to the cubical distance
vii. Analysis the result

3.0 PREPROCESSING OF RSI

The satellite Image which is captured are not able to process direct with out preprocessing for the analysis process because of its attributes. Preprocessing of the image data is broken down into two sections, we consider geometric registration and radiometric normalization. Preprocessing executed with the help of GIS computing tool. For both geometric registration and radiometric correction, we believed pre processing should be as straightforward as possible. We wish to maintain the characteristics of the data as it arrived from ERDAS IMAGIN 8.7 and use methods that require no special data (i.e. in situ atmospheric measurements). We believe this approach will help make the proposed cubical distance method more generally applicable and accessible to a wider group of possible users by using readily available satellite data and standard preprocessing algorithms.

3.1 Geometric Correction

The generally accepted procedure for geometric registration is to match a set of points on one image to those on the other. The coordinates from this set of points are then used to calculate a transformation function that will change the coordinates of one image so it will more closely match, geometrically, the other image. This is referred to as ground control point (GCP) registration. It is the registration method recommended by the NOAA C-CAP program (Dobson, *et al.*, 1995). Our image-to-image registration was done within Imagine™ software using the "GCP Editor" (ground control point editor).

3.2 Radiometric Correction

In this section, The digital numbers to reflectance values using the sensor bias and gain calibration constants .The basic idea behind a radiometric correction is for differences in image data to represent actual differences in ground cover and not differences in atmospheric conditions and/or differences in the sensor. There are many methods that can be use to conduct radiometric normalization. Two general classes for these methods are 1) correction based on modeling the physical environment and 2) corrections using empirical adjustments based on scene comparisons. Empirical methods use only the image data and normalize one scene to another (Morisette *et al.*, 1996). Corrections based on physical modeling used in the radiative transfer model

4.0 PIXELS TOWARDS OBJECTS

The strong motivation to develop techniques for the extraction of image objects stems from the fact that most image data exhibit characteristic texture which is neglected in common classifications. The texture of an object can be defined in terms of its smoothness or its coarseness. The image objects are constructed with combinational pixel standards of an object. These systems are used to assess characteristics of products by measuring the texture of their surface. In many cases, image analysis leads to meaningful objects only when the image is segmented into 'homogeneous' areas (Gorte 1998, Molenaar 1998, Baatz & Schäpe 2000, Blaschke et al. 2000). Segmentation is not new (see Haralick et al. 1973), but it is yet seldom used in image processing of remotely sensed data. Kartikeyan et al. (1998: 1695) state: "Although there has been a lot of development in segmentation of grey tone images in this field and other fields, like robotic vision, there has been little progress in segmentation of color or multi-band imagery." One reason is that the segmentation of an image into a given number of regions is a problem with a huge number of possible solutions. The pixels are combinational values. How the values are extracted and constructed is presented in the micro array formations process.

5.0 MICRO ARRAY

The image represented in the multi dimensional layer based Digital numbers. The DNs are represented according to the layer such as R.G,B & IR. The Image layers are from 1 to 4. The Image extracted with three layer with possible combination (1,2,3), 1,2,4) etc. This combinational array are represented in the same cubical array . this array are converted into to equaling array in two dimension with following attribute procedure (X,Y, layer1 value , layer2 value, layer3 value) . The size of the array is equal to number of total pixels into 5 columns.

Layer 1

125	134	143	146
144	145	148	147
134	126	126	125
127	139	145	144
144	137	146	140
127	128	131	122

Layer 2

134	141	147	128
141	139	146	138
141	135	126	111
140	139	135	126
138	139	148	145
143	139	116	106

Layer 3

137	132	139	139
141	141	153	151
145	129	120	130
123	125	139	137
131	148	153	143
139	133	134	132

Constructed macro array

[1,1, 125 ,134,137; 1,2,134,141,132; 1,3, 143,147,139; 1,4, 146,128,139;….]

6.0 PROCEDURE FOR CUBICAL DISTANCE METHOD

i. Collect the pre processed RSI with the process able Image.
ii. Convert the multilayer integrated image into the Digital values.
iii. convert the cubical values into two dimensional array (Number of Pixel ,5)
   Each row represents (X,Y,R,G,B) values
iv. Calculate the distance from the following options

a. From the origin o(X,Y,Z)
   Cubical Dis O = sqrt ($(0-X_0)^2 +(0-Y_0)^2 +(0-Z_0)^2$)

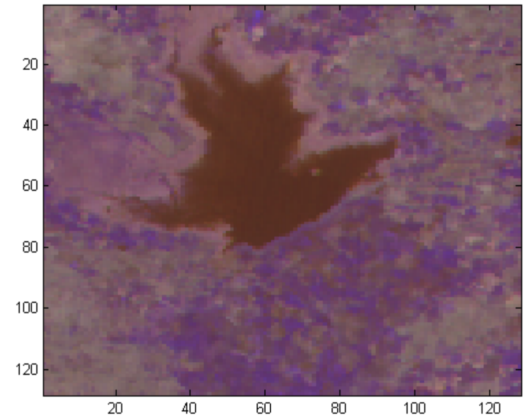
b. From the First Position of the Region of Interest FP(X,Y,Z)
   Cubical Dis FP = sqrt ($(0-X_{FP})^2 +(0-Y_{FP})^2 +(0-Z_{FP})^2$)

c. From the Frequent Item set of the Region of Interest FIS(X,Y,Z)
   Cubical Dis FIS = sqrt ($(0-X_{FIS})^2 +(0-Y_{FIS})^2 +(0-Z_{FIS})^2$)
   { Different possible distance for each item is determined using above specified formula)

v. Collect the number of classification(NC) aimed to process
vi. determine the minimum (Min) and maximum(Max) cubical distance among the pixels in each method
vii. Determine the difference dx = Max – Min
viii. The Range R = dx / NC
ix. Fix the starting pixel value and End pixel vales for each classification based on the cubical distance
x. Process all cubical distance rage. According to the individual and referral position of the pixel distance construct the classification data and sub image .
xi. Repeat the step 9 until all the classification to be processed for all the three methods . Display the result .

7.0 EXPERIMENT

The preprocessed converted talk image selected for classification. The original.tif image selected for the process from (400,400) with the area of 381747 Sq.$M^{2.}$ The pixel value is equal to 23.3 meters. This classification approach is manipulated based on the DNs of each layer together and each layer separately. The classified image and its range values of pixel based on cubical distance programme and executed using mat lab 7.0 are presented below



Original Tif image

From the adopted ROI , the [400 x 400 , 5] pixel micro array constructed for the cubical distance calculated. The Frequent Item Set pixel determined using Integrated Development Algorithm[IDA] FIS algorithm. The cubical distance values are calculated suing above mentioned procedure. Based on the determined distance , the range values for each classification determined in each algorithm and determined the occurred pixel starting and end range vales. They are presented below with the percentage of occurred pixel in each classification. The execution done using matlab7.1a.

Analysis of Remote Sense Image	
Name of the Image	Original.tif
ROI Starting Points (X,Y)	400,400
Number of Pixels (X,Y)	128,128
Pixel: RSI Ratio	1:23.3 meters
Total Number of Pixel	16384
Total Area (Sq.M)	381747.2
Number of Cluster	8

Table : ROI Information

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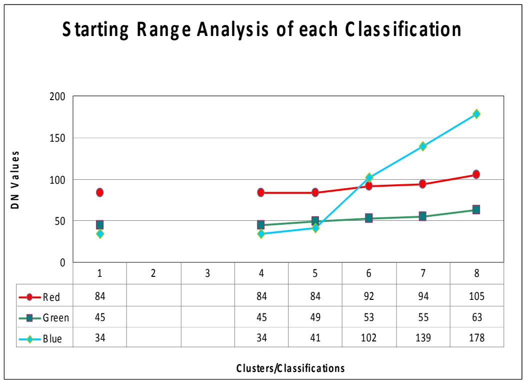
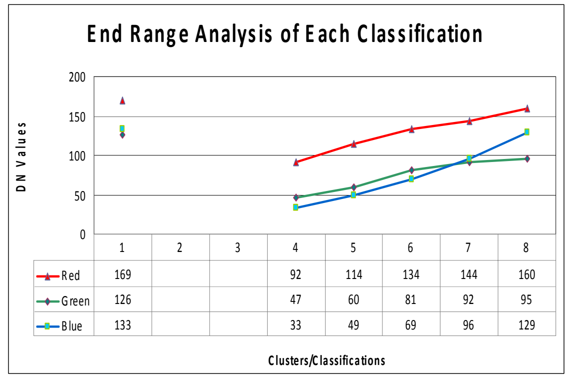
		Starting Range			End Range				
	Classification	Red	Green	Blue	Red	Green	Blue	# of Pixel	% of Pixels
From Origin (0,0,0)	1	84	45	34	169	126	133	4290	26.18
	2	No Classification							
	3	No Classification							
	4	84	45	34	92	47	33	129	0.79
	5	84	49	41	114	60	49	641	3.91
	6	92	53	102	134	81	69	4023	24.55
	7	94	55	139	144	92	96	6196	37.82
	8	105	63	178	160	95	129	1082	6.60
From the First Pixel of ROI	1	84	45	34	169	126	133	4904	29.93
	2	109	95	106	143	104	108	3853	23.52
	3	101	82	107	153	105	115	3001	18.32
	4	95	74	111	160	95	129	2401	14.65
	5	92	57	96	163	121	133	1388	8.47
	6	92	53	102	161	134	133	213	1.30
	7	91	72	40	114	60	49	218	1.33
	8	87	49	37	105	63	178	301	1.84
From FIS of ROI	1	84	45	34	169	126	133	4290	26.18
	2	No Classification							
	3	92	53	102	107	67	85	896	5.47
	4	84	45	34	122	70	79	4560	27.83
	5	89	46	33	136	81	90	3725	22.74
	6	103	63	154	145	91	113	2239	13.67
	7	105	63	178	159	90	119	584	3.56
	8	143	125	120	161	118	129	82	0.50

The range value of cubical distance and classification represented in a form of graph

The range value of cubical distance and classification represented in a form of graph

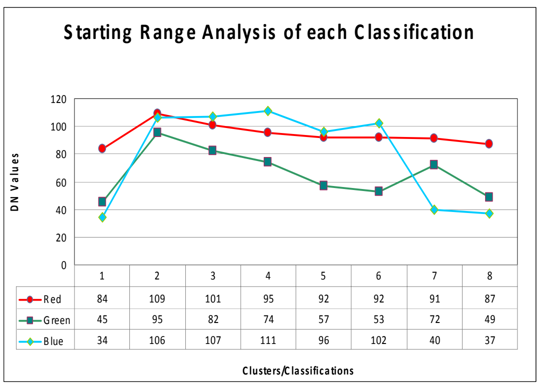
i) The classified images results of Starting Range and End Range for cubical distance from the origin(0,0,0) are presented below

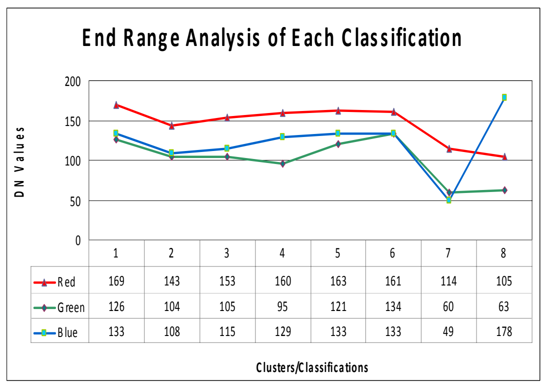




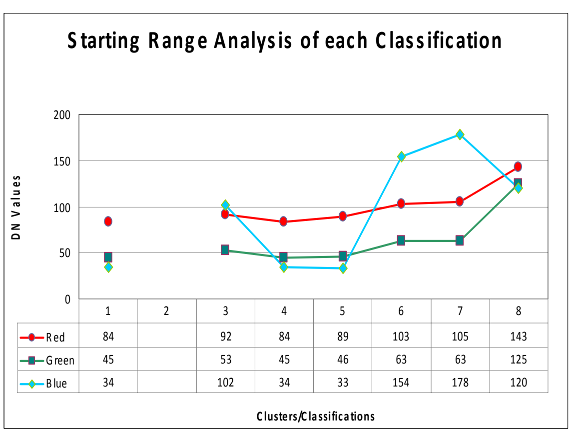
ii) The classified images results of Starting Range and End Range for the First Pixel of ROI FP(X,Y,Z)

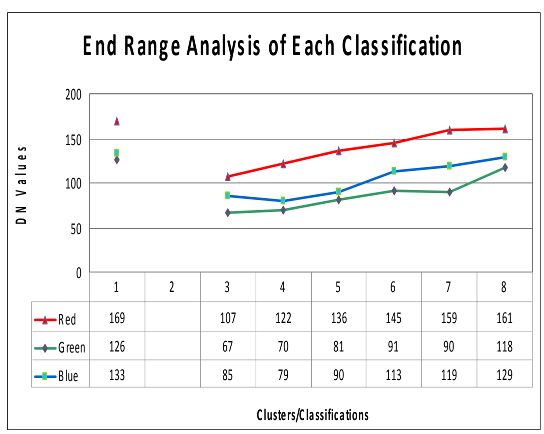
are presented below





iii) The classified images results of Starting Range and End Range for the Frequent Item Set of ROI FIS(X,Y,Z) are presented below





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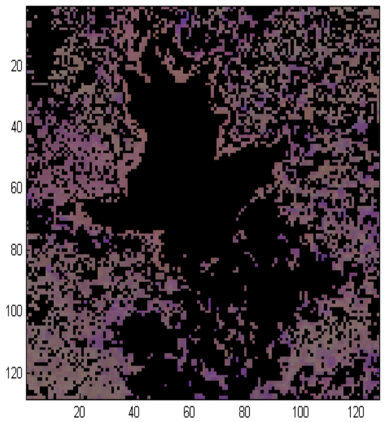
a. Result of sub images based on cubical distance from the origin(0,0,0)



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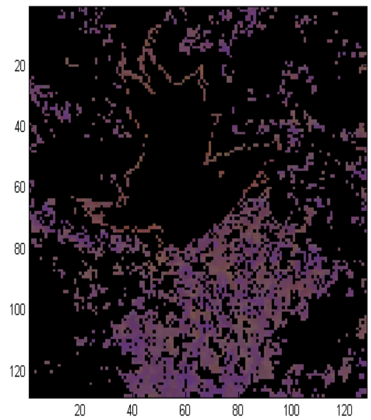

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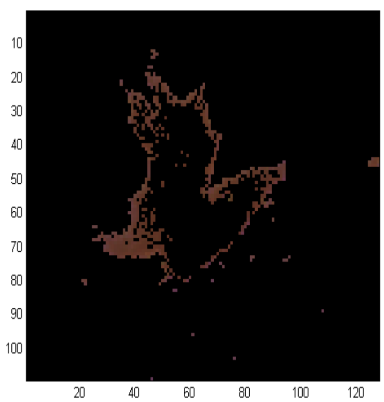

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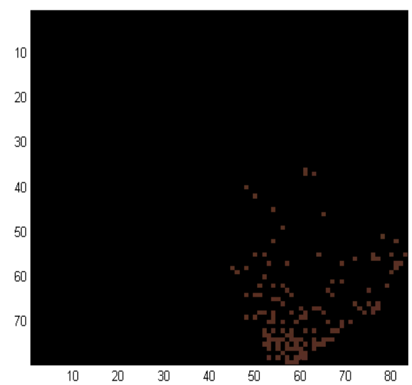

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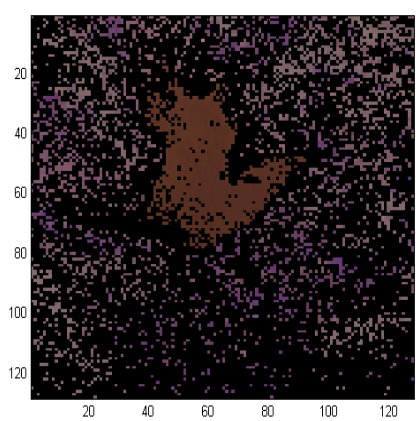

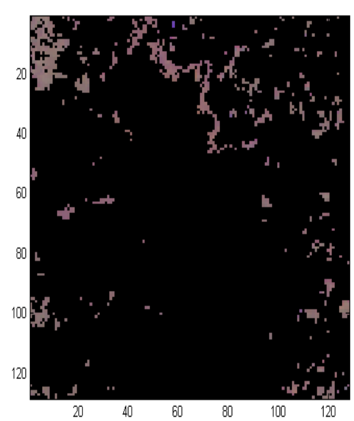

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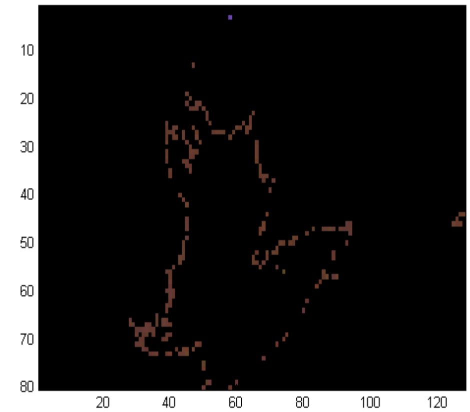
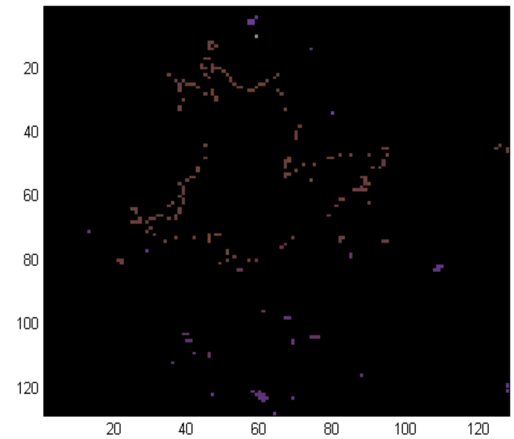
b. Result of sub images based on cubical distance from the First Pixel of ROI FP(X,Y,Z)





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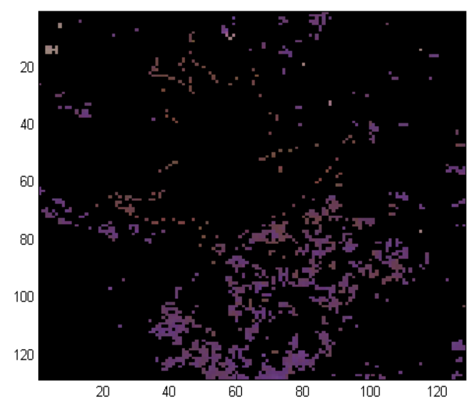

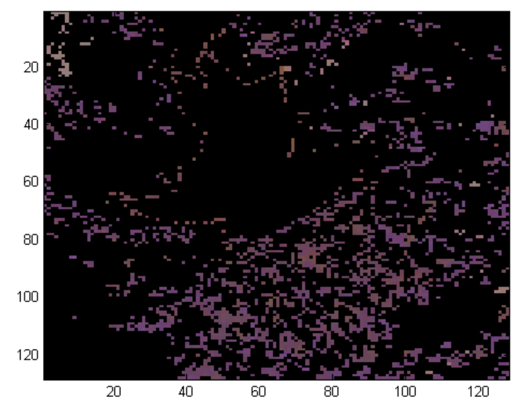

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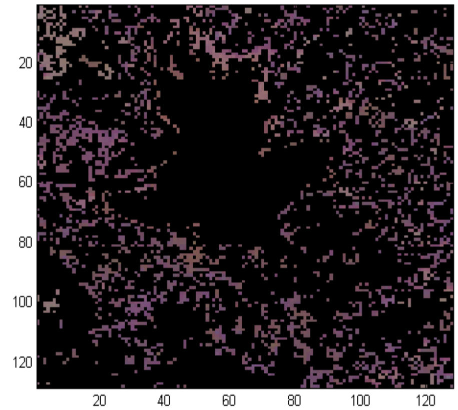

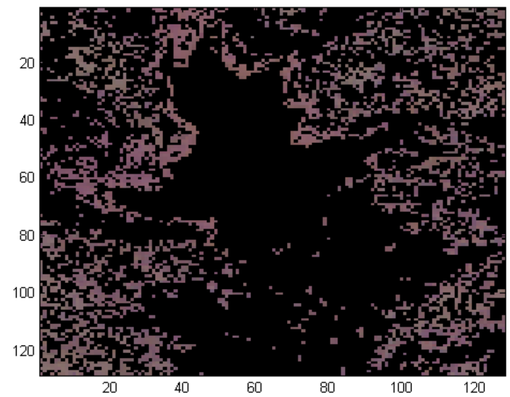

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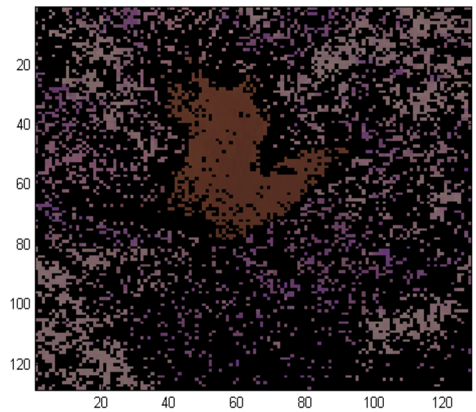

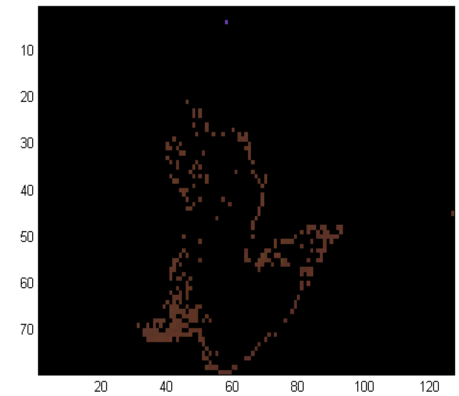

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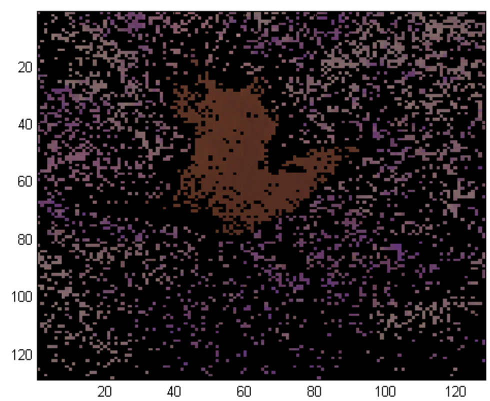
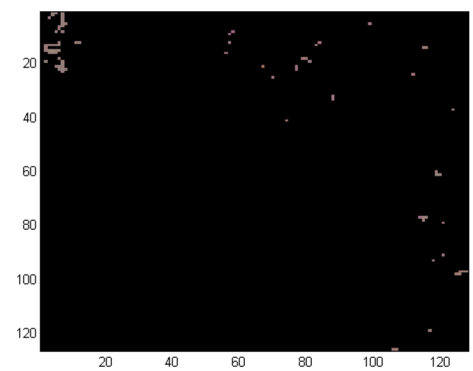
c. Result of sub images based on cubical distance from the Frequent Item Set of ROI FIS(X,Y,Z)





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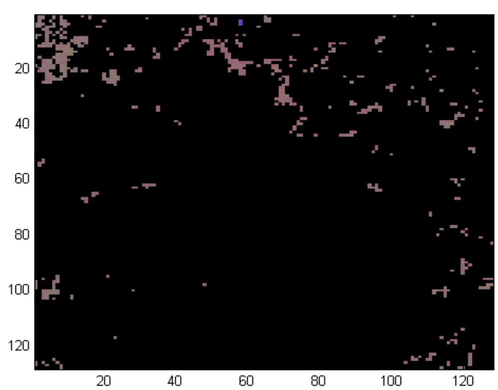

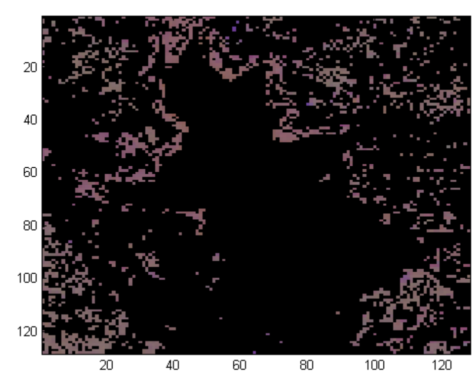

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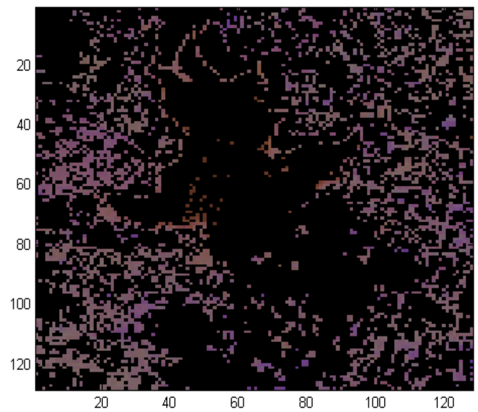
ISSN: 2076-3328 www.ijric.org E-ISSN: 2076-3336



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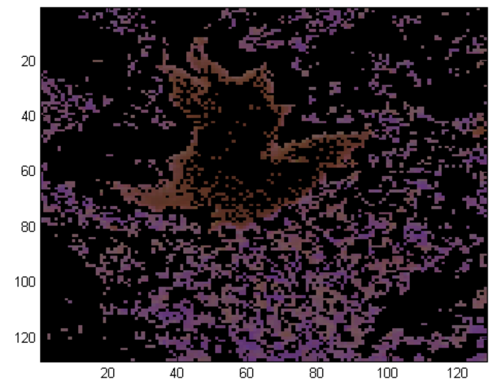

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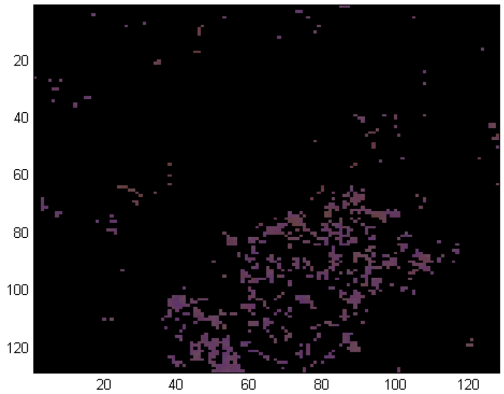

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8.0 INTERPRETATION

The above depicted images have represented the classified subimages of the cubical distance based on the distance from the origin (0,0,0), First point of the pixel of ROI and FIS of the Pixel of the selected ROI. In each layer, the object is identified in different class range. In each metod the classification occurrence, number of pixel and range varies one with another This is due to the varied distance values of the identified object in different spectral region of *ems* due to its inherent reflection and emission of the object in the particular area.

The following interpretations are derived from the observation of the analysis.

- In the cubical distance and the range values are not synchronized
- The object and the classification are not similar one with another for each method
- Classification level, number of pixels and the range differs *i.e* the starting range and end range values vary with one another, which has been clearly brought out by the algorithm.

9.0 CONCLUSION

The cubical distance method presented in this paper is a simple method to determine the range values of pixels in the RSI enabling data mining. Though this method may not be appropriate to determine the features of the specified objects but useful in determining the density level of pixels of an object. This method can further be improved by integrating with other classification algorithm for RSI.

ISSN: 2076-3328 www.ijric.org E-ISSN: 2076-3336

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