

INTRODUCTION TO DIGITAL IMAGES AND DIGITAL ANALYSIS TECHNIQUES:

**A Basic Course for the Appreciation of Digital
Analysis of Remotely Sensed Multispectral Data**

**(INSTRUCTIONS)
(EXERCISE FORMS)
EXERCISE SOLUTIONS**

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FIGURE 1
A digitized image, 2 bands, 7 x 7 area, line interleaved.

START

5	3	4	5	4	5	5	5	5	4	6	7	7	7	2	2	3	4	4	4	6	2	4
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

6	5	5	6	5	2	2	3	3	6	6	8	5	3	5	7	6	6	8	2	2	6	6
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

9	8	7	3	4	5	6	8	8	7	3	6	8	8	8	7	4	3	5	8	8	8	7
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

1	3	6	8	7	2	3	2	4	5	8	7	1	0	0	4	6	7	3	3	2	1	3
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

6	7	0	0	0	0
---	---	---	---	---	---

END

FIGURE 2
Digital images arranged in proper geometry.

		PIXELS						
		1	2	3	4	5	6	7
L I N E S	1	5	3	4	5	4	5	5
	2	2	2	3	4	4	4	6
	3	2	2	3	3	6	6	8
	4	2	2	6	6	9	8	7
	5	3	6	8	8	8	7	4
	6	3	6	8	7	2	3	2
	7	4	6	7	3	3	2	1

BAND 'A'

		PIXELS						
		1	2	3	4	5	6	7
L I N E S	1	5	5	4	6	7	7	7
	2	2	4	6	5	5	6	5
	3	5	3	5	7	6	6	8
	4	3	4	5	6	8	8	7
	5	3	5	8	8	8	7	1
	6	4	5	8	7	1	0	0
	7	3	6	7	0	0	0	0

BAND 'B'

FIGURE 3
Grey maps.

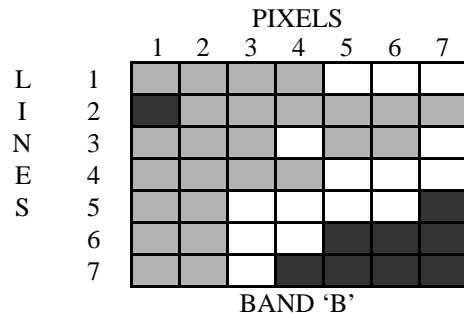
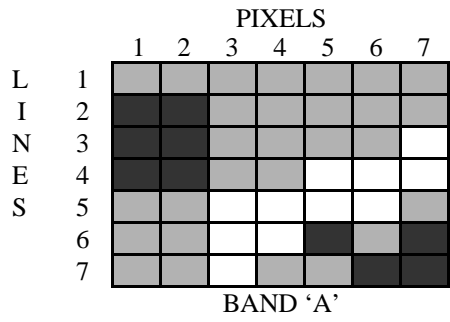


FIGURE 4
Intensity profiles.

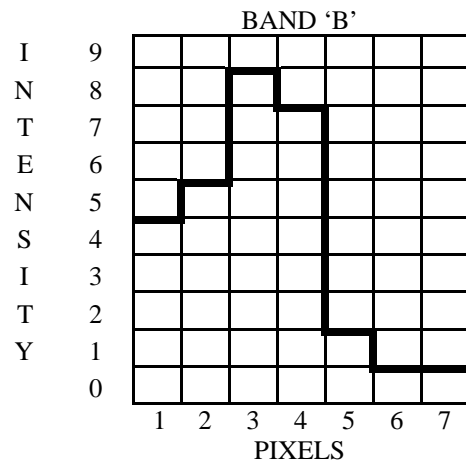
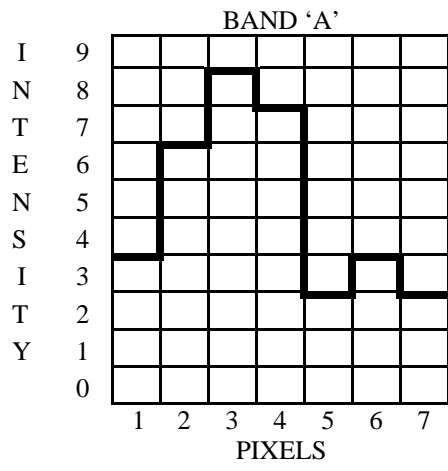
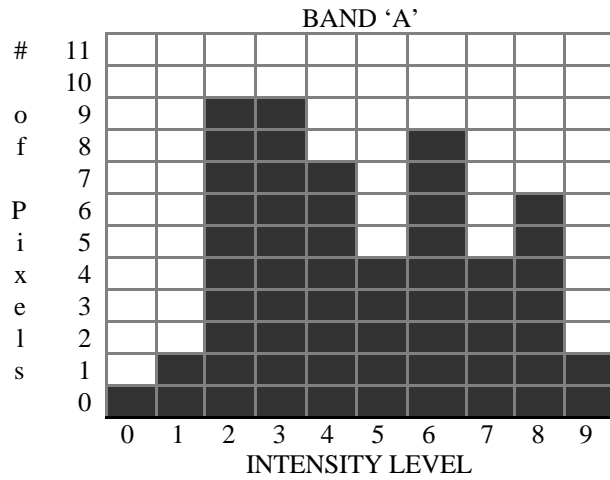
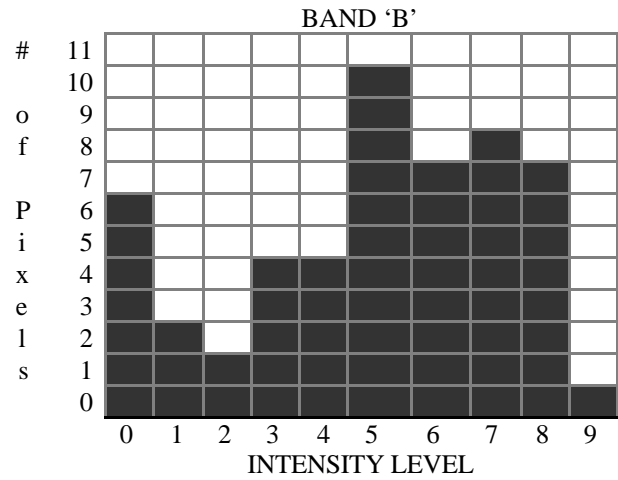


FIGURE 5
One-dimensional histograms.



Number of pixels:

0	1	9	9	7	4	8	4	6	1
Sum = <u>49</u>									



Number of pixels:

6	2	1	4	4	10	7	8	7	0
Sum = <u>49</u>									

Figure 6
Two-dimensional histogram.

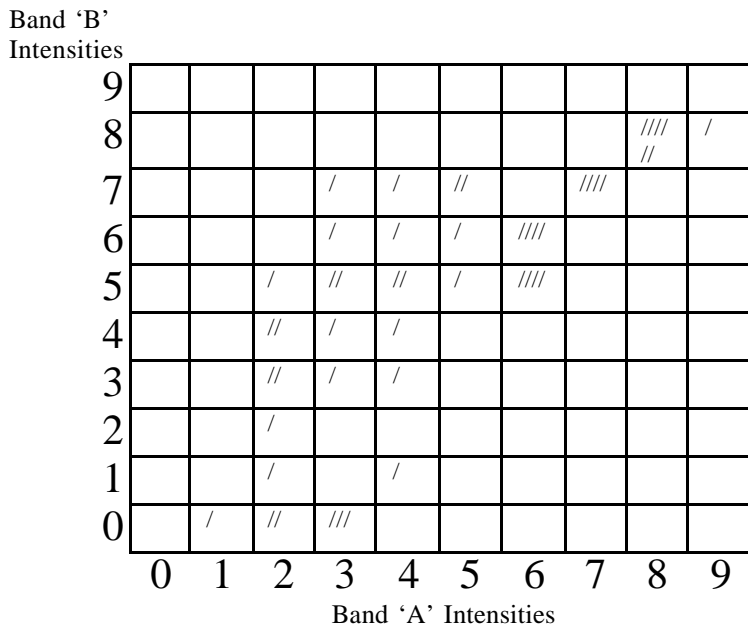


FIGURE 7
Two-dimensional histogram.

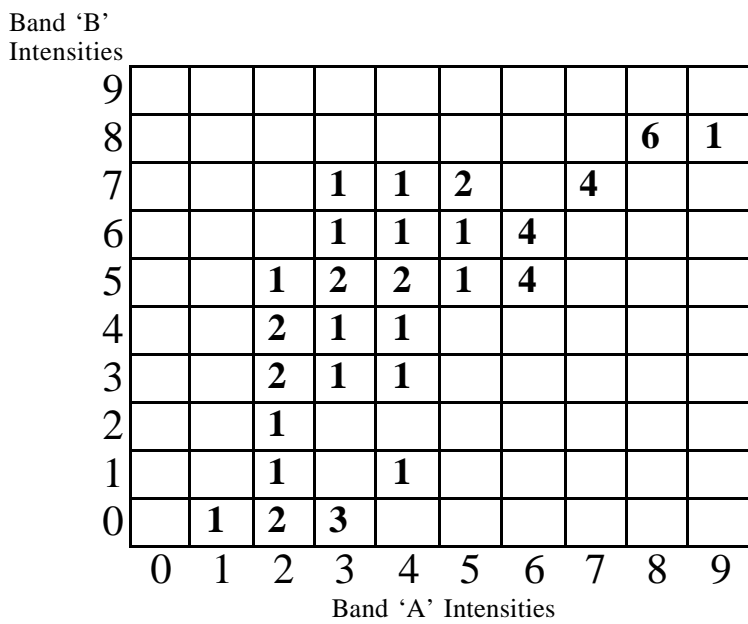


FIGURE 8
Ground verification map: 'Forest'.

		PIXELS						
		1	2	3	4	5	6	7
L	1						F	
I	2					F		
N	3							
E	4	F						
S	5							
	6							
	7							

Band 'A' intensity values: 5 , 4 , 2

Band 'A' intensity range:
minimum: 2
maximum: 5

Band 'B' intensity values: 7 , 5 , 3

Band 'B' intensity range:
minimum: 3
maximum: 7

FIGURE 9A
Forest map from Band 'A'.

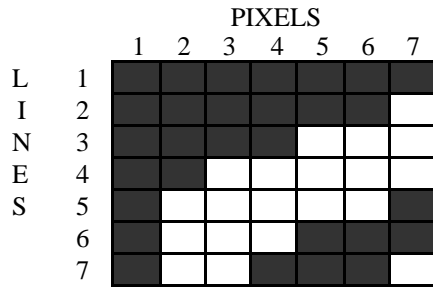


FIGURE 9B
Forest map from Band 'B'.

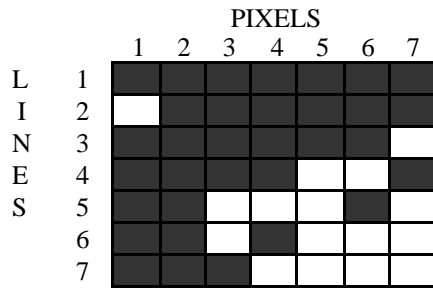


FIGURE 10A
 Feature space portion representing 'Forest'.

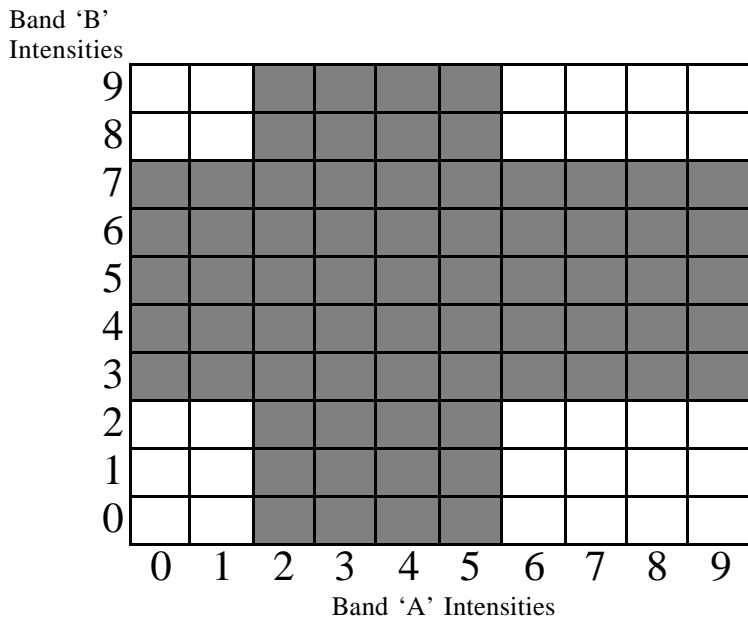


FIGURE 10B
 'Forest' theme from Bands 'A' and 'B'.

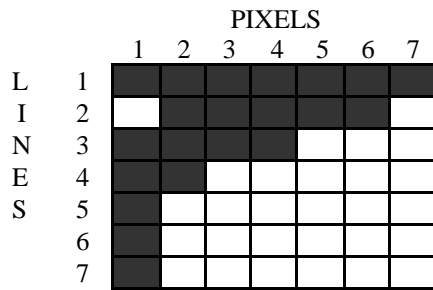


FIGURE 11A
Ground verification map: 'Forest Types'.

		PIXELS						
		1	2	3	4	5	6	7
L	1	D			D	D	D	D
I	2		C				D	
N	3	C	C		D			
E	4	C	C					
S	5	C						
	6	C						
	7	C						

'C' = coniferous
'D' = deciduous

FIGURE 11B
Forest type designation in feature space.

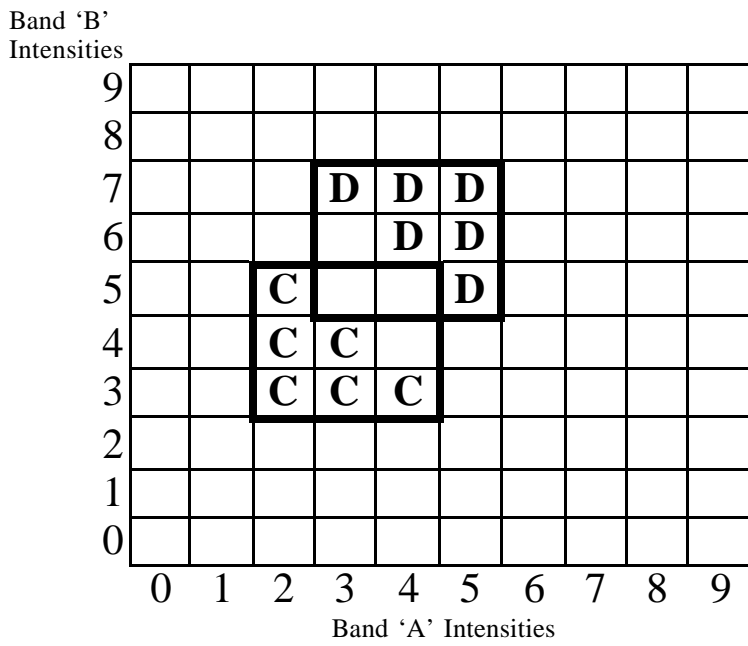


FIGURE 12A
Scene #2, Band 'A'.

		PIXELS						
		1	2	3	4	5	6	7
L	1	3	4	1	1	2	2	2
I	2	4	4	4	2	1	2	2
N	3	3	3	5	2	2	2	2
E	4	5	5	2	2	2	2	2
S	5	4	5	5	2	2	2	2
	6	4	3	3	4	4	5	5
	7	5	5	3	4	4	5	4

FIGURE 12B
Scene #2, Band 'B'.

		PIXELS						
		1	2	3	4	5	6	7
L	1	7	7	0	0	0	3	3
I	2	7	7	6	0	0	3	4
N	3	4	4	7	1	1	3	4
E	4	7	7	4	4	3	4	4
S	5	6	7	7	4	5	5	5
	6	7	5	5	5	7	7	6
	7	7	6	6	7	7	7	7

FIGURE 12C
Scene #2, feature space.

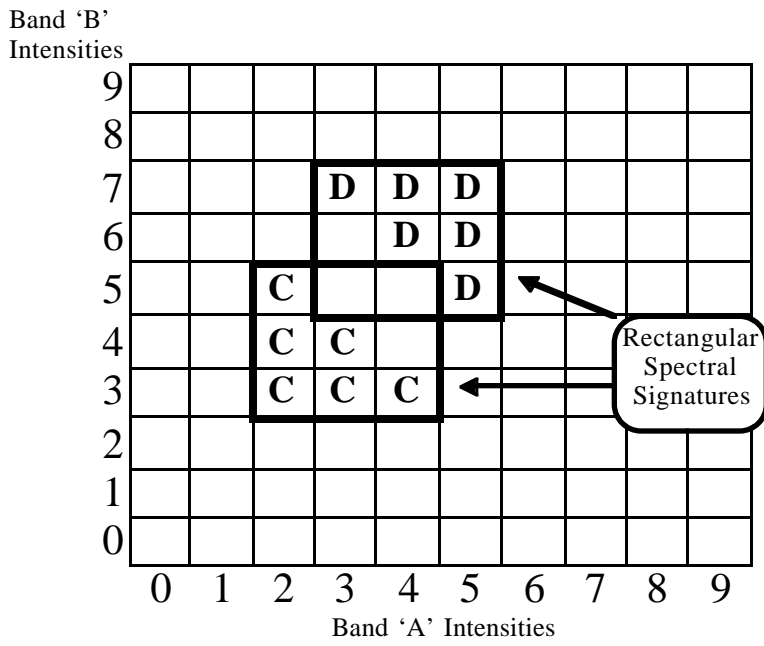


FIGURE 12D
Scene #2, theme map.

		PIXELS						
		1	2	3	4	5	6	7
L	1	D	D	W	W	W	C	C
I	2	D	D	D	W	W	C	C
N	3	C	C	D	W	W	C	C
E	4	D	D	C	C	C	C	C
S	5	D	D	D	C	C	C	C
	6	D	M	M	M	D	D	D
	7	D	D	M	D	D	D	D

'C' = Coniferous Forest
'D' = Deciduous Forest

FIGURE 13A
Scene #2, Band 'B', one-dimensional histogram.

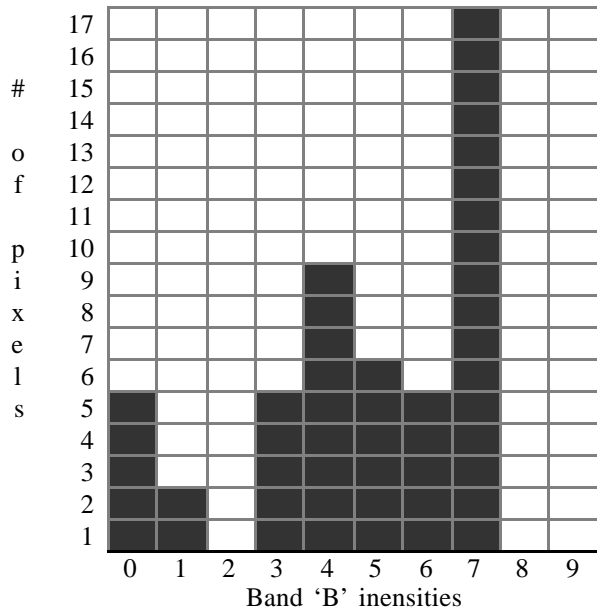


FIGURE 13B
Scene #2, two-dimensional histogram.

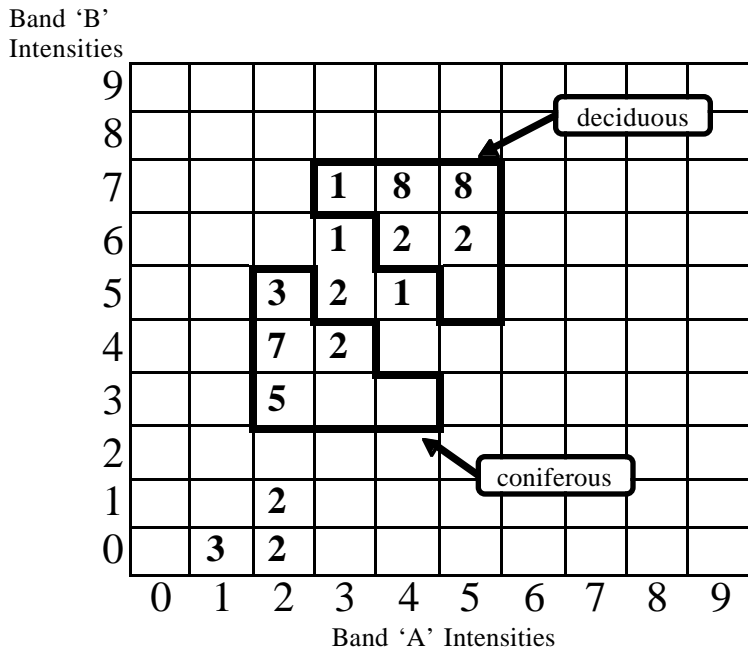


FIGURE 14A
Scene #2, feature space.

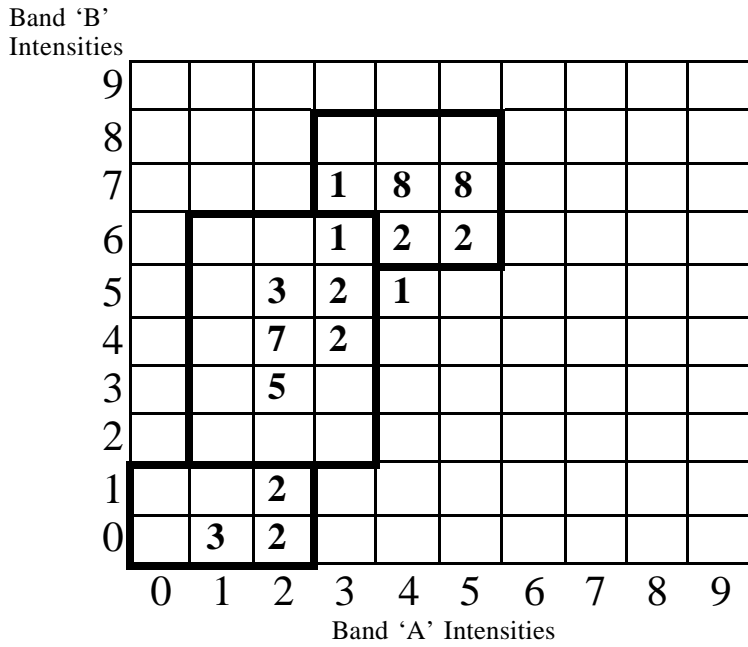


FIGURE 14B
Scene #2, feature space.

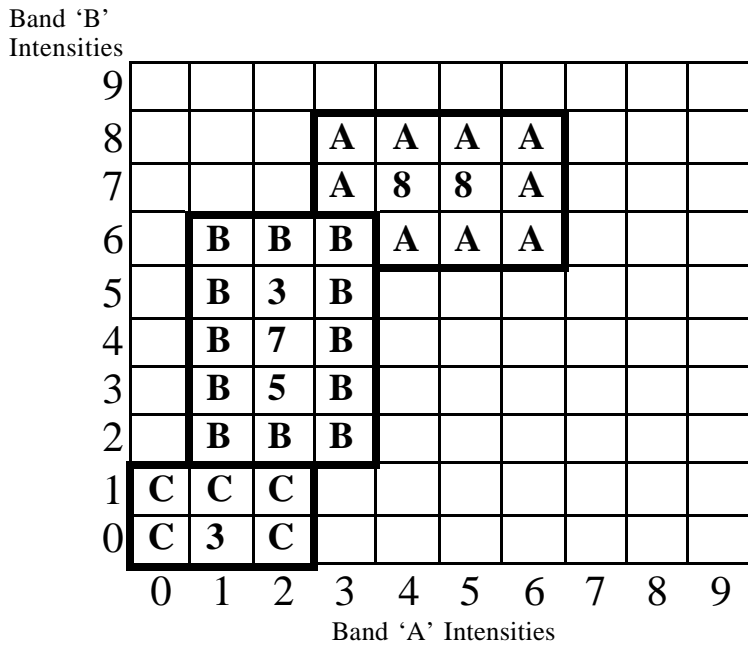


FIGURE 14C
Scene #2, feature space.

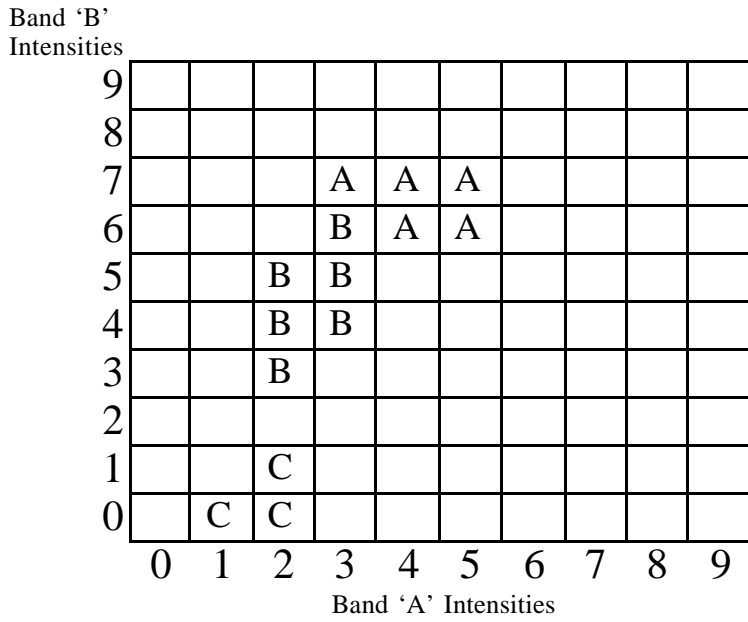


FIGURE 14D
Scene #2, unsupervised classification.

