

Pattern Analysis Spring 2004

Problem Set Two

Due Thursday, March 4, 2004

1 Theory

Solve all the following problems:

1. Text problem 3.10
2. Text problem 3.11
3. Text problem 3.21
4. Text problem 3.23
5. Text problem 3.24
6. Text problem 3.30

2 Computing

1. Text problem 3.32. What is the rank of this data set? Comment on the periodicity of the coefficients in the expansion. Do you think the data is periodic? If so, how do you interpret the rank of the data matrix?
2. Text problem 4.21.

The data for problem 3.32 may be downloaded at:

<http://www.math.colostate.edu/~kirby/teaching/pattern/2004/faces1.mat> The data file faces1.mat contains 109 images whose dimensions are 120 x 160. It is a single matrix, where each of the 109 columns has length 19,200 (which is 120 x 160). The format of the data is "uint8", which stands for unsigned integer, 8 bits. Before you use the data for KL, change it to "double" format:

```
load faces1
Y=double(Y1); %Y1 is the stored array name
```

To visualize a column as a picture, use the program "vectopic", like the following:

```
A=vectopic(Y(:,1))';  
imagesc(A');           %Little bug:  the matrices are transposed.  
colormap(gray);
```

To download the faces data, right click on the [FACES DATA](#) link, and choose **SAVE LINK AS..** Otherwise, the binary file will be read as text by your browser.