

1 Instructions

Please save your code for the following exercises to an m-file and send it to me via email (adoran@ucsd.edu). To help you get started, download a file called `lab5start.m` (<http://topex.ucsd.edu/rs/lab5/lab5start.m>). This file has a few lines of code with hints at the solutions.

2 Exercises

2.1 Exercise 1

1) Go to <http://topex.ucsd.edu/rs/lab5/> and download individual files for the 7 bands of a Landsat image of San Diego, acquired in August 1990 (`*.raw` files). The spectral range and other file characteristics are provided in the NLAPS header file (See [Appendix A](#) of image processing notes.) Here is a summary of the spectral bands.

band #	min (μm)	center (μm)	color
1	0.45	0.485	Blue-Green
2	0.52	0.56	Green
3	0.63	0.66	Red
4	0.76	0.83	Near-IR
5	1.55	1.65	Mid-IR
5	10.40	11.45	Thermal-IR
7	2.08	2.255	Mid-IR

Table 2.1: Landsat Spectral Bands

2.2 Exercise 2

Display the thermal infrared band three ways: a) [no contrast enhancement](#); b) [linear stretch](#); c) [histogram equalization](#). Display results as grayscale. [What do you see in the ocean areas?](#) Compare the original image histogram with the equalized image histogram (use `imhist()` to display histograms).

2.3 Exercise 3

Use the appropriate bands and contrast enhancement to make a [natural looking RGB image](#). Without histogram equalization the picture looks blue. [Why?](#) Combine the processed RGB images into a single image using the `cat()` command, then proceed to plot them with `imshow()`, as in [Lab 3](#).

2.4 Exercise 4

Apply the following operations [to band 1](#): a) image smoothing; b) image sharpening; c) southwest illumination (Sobel). Display results as grayscale. Follow pages [285-287](#) in the textbook *Physical Principles of Remote Sensing* by Rees. The convolution is done with `filter2()`.

2.5 Exercise 5

Compute and display the [vegetation index](#). Does it match what you would expect? See page 292 in Rees. You will need to convert the integer bytes to `double()`, then compute the NDVI ratio between -1 and 1 and finally map the numbers back between 0 and 255 with `imagesc()`.

2.6 OPTIONAL: Exercise 6

For extra credit, follow the methods in Rees (374-380) to decompose the 7 bands into their principal components.