AMAT 503 – Assignment 1 - Lamoureux

Due Thursday, January 25, 2018

1. a) Download the "Discrete Wavelet Package" for MATLAB, from the website mentioned in the textbook. www.stthomas.edu/wavelets.
b) Select 5 images and 5 sounds from the set in the package, and describe them briefly. (This is to show me you've figured out how to use the package.)
c) Print out two of the images and include with your assignment.

2. a) Suppose U is an orthogonal matrix. Show that any eigenvalue λ of U has (complex) absolute value of one. i.e. $|\lambda| = 1$.
b) Verify this result by finding the eigenvalues of the rotation matrix

$$U = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}.$$

Note the eigenvalues might be complex.

3. a) In MATLAB, Python, Julia or your favourite programming language, create a 10x10 matrix with random entries, compute the eigenvalues, and plot in the complex plane. Show me your code as well.
b) Use Cholesky decomposition to convert this random matrix to an orthogonal matrix. Compute the eigenvalues and plot in the complex plane.

From the textbook:

3.5, 3.15 (images, colours)
3.22, 3.23 (energy)
4.24, 4.28 (Fourier series)