Homework Problem Set #5: MatLab and WaveLab

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These are interactive demos and scripts that you can use to familiarize yourself with the wavelet capabilities of MatLab.

Exercise 1 Only one user at a time can access the MatLab Wavelet Toolbox on the School of Mathematics linux machines. However MatLab itself is available to all users. Once you login on a Math Department computer type `matlab` to open MatLab. Then type `wavemenu` to open the wavelet toolbox. If the wavelet toolbox is available the toolbox menu will open. The following interactive demos are directly relevant to this part of the course:

1. Wavelet 1-D. Press the Wavelet 1-D option. Under the File menu option, Demo Analysis you can select various sample signals for analysis. Run through the 1-D wavelet exercise on page 455 of your text.

2. Wavelet Display. Press the Wavelet Display option. Run through the wavelet display exercise on page 454 of your text.

3. Denoising in 1-D. Press the Wavelet 1-D option. Under the File menu option, Demo Analysis you can select various sample signals for denoising. Run through the denoising exercise on page 474 of your text.

4. Discontinuity Detection. Press the Wavelet 1-D option. Under the File menu option, Demo Analysis you can select various sample signals for discontinuity detection. Run through the discontinuity detection exercise on page 474 of your text.
Exercise 2 If you are in Matlab and the Wavelet Toolbox is not available, WaveLab is an alternative that is always available. Type WavePath at the Matlab prompt.

1. The 1-D Signal browser. This will allow you to select some canned signals and perform their wavelet transforms using several different wavelet families. Type WLBROWSER at the Matlab prompt. From Figure 1 select a signal to process from either the Data menu or the Signals menu. Then from the Actions menu you can analyse or process the signal in various ways. The decompositions are usually of the general form $V_{j+1} = W_j \oplus W_{j-1} \oplus W_{j-2} \oplus \cdots \oplus W_3 \oplus V_3$. There is some interactivity; you can modify the parameters in some of the routines.

2. Toons. The Workouts/Toons directory contains scripts that illustrate various features of WaveLab. To see the directory, type help Workouts/Toons at the Matlab prompt. Locate in the directory a toon that interests you. Run the script by typing its name, e.g., toon0131 to get a toon that depicts wavelets at various scales. You can interact with the tunes to some extend by modifying the parameters in the underlying code.

3. Demos. The subdirectory WaveLab/papers contains subdirectories with scripts that were used to produce figures for papers published by the developers. To see the directory with a list of papers and demos, type help Papers at the Matlab prompt. To run a demo, type its name at the Matlab prompt, e.g., SCDemo to get the illustrations from a short course.