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 throught 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 dicontinuity 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 $V_{j+1} = W_j \oplus W_{j-1} \oplus W_{j-2} \oplus \cdots \oplus W_{j_0} \oplus V_{j_0}$. 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.*