Physics 782

Hwk #5 ***Due in Class Thurs Apr 22***

1. Lob a rock into a still pond and observe the surface wave created. Estimate the speed of this transvese wave and compare to the speed of longitudinal/pressure waves in water, (c~1500m/s).

2. Do your best to convert the raw VCT measurements into xray transform line integrals. Use the information provided in *_ReadMe1.txt* and the data in files
   image_DarkShort.tif, image_Flat.tif, image_0000.tif
   Read in these files using MATLAB's "imread" command

3. (1D interp/conv) Confirm that doing linear interpolation in the frequency domain to upsample by a factor of two doubles the FOV/time duration of the measured signal.
   a. Compute *analytically* the result and compare to the original signal. How are the new and original signals related?
   b. Confirm numerically on measured time series pressure data. Measure with pulser-receiver and single element transducer of your choice in room #52.

   You should work together to collect the data. However, choose two different transducers with two different center frequencies.

4. (2D interp/conv)
   a. Compute *numerically* the PSF's of MATLAB's gridding routines with linear, nearest and cubic interpolation, where input data is on a polar lattice with N_k=N_θ=2^5, 2^7, 2^9 and interpolation is onto a Cartesian lattice with Δ_k=1, k_{max}=2^4, 2^6, 2^8 respectively. (Modify your code from last week.)
   b. Take IFFT of the resulting PSFs. How does this compare to the theoretical ideal?
   c. How should one correct MRI images obtained from non-Cartesian lattices that are regridded onto a Cartesian lattice?

Class projects to be presented in class ???

as of 2:39 PM on 4/7/10