**Data Processing: Strain Estimation (FEM)**

***Summary:***

This data set is from a Finite Element Modeling (FEM) simulation. The simulation has 4 inclusions in an otherwise homogeneous background. The inclusions are 10-, 20-, 30-, and 40-dB stiffer than the background.

***File and Naming Formats:***

Twenty five (25) sets were simulated to calculate statistics such as SNRe, CNRe, MSSIM, etc. (25 sets are adequate to get a reliable measure of statistics.)

Each set includes files **PhnDyn12\_x-00.eye**, **PhnDyn12\_x-01.eye**, **PhnDyn12\_x-02.eye**, **PhnDyn12\_x-04.eye**, **PhnDyn12\_x-06.eye**, **PhnDyn12\_x-08.eye**, **PhnDyn12\_x-12.eye**, and **PhnDyn12\_x-16.eye**. **x** is the simulation number and can have a value of **1** through **25**.

Accordingly, the files for simulation **1** are:

1. **PhnDyn12\_1-00.eye**: pre compression file
2. **PhnDyn12\_1-01.eye**: post compression file (1% strain)
3. **PhnDyn12\_1-02.eye**: post compression file (2% strain)
4. **PhnDyn12\_1-04.eye**: post compression file (4% strain)
5. **PhnDyn12\_1-06.eye**: post compression file (6% strain)
6. **PhnDyn12\_1-08.eye**: post compression file (8% strain)
7. **PhnDyn12\_1-12.eye**: post compression file (12% strain)and
8. **PhnDyn12\_1-16.eye**: post compression file (16% strain)

The files in \*.eye format can be read using the **ReadEye.m** file.

***Processing:***

Strain can be estimated using any “standard” strain estimation routine. The straightforward processing is as follows (only using the simulation number **1**). Feel free to customize as needed.

% APPLIED STRAIN = 1%

rf1 = ReadEye('PhnDyn12\_1-00.eye'); % PRE COMPRESSION

rf2 = ReadEye('PhnDyn12\_1-01.eye'); % POST COMPRESSION

% COMPUTE STRAIN MAPS USING THE COMMON ROUTINES

helpwin EstStrn

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.01,0,0.02,'g'); % GRADIENT

figure(1), imagesc(s), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.01,0,0.02,'ls'); % LSQ

figure(2), imagesc(s), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.01,0,0.02,'us'); % UNIFORM STRETCHING

figure(3), imagesc(s), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.01,0,0.02,'lsus'); % UNIFORM STRETCHING + LEAST SQUARES

figure(4), imagesc(s), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.01,0,0.02,'a'); % ADAPTIVE STRETCHING

figure(5), imagesc(s), colorbar

% APPLIED STRAIN = 2%

rf1 = ReadEye('PhnDyn12\_1-00.eye'); % PRE COMPRESSION

rf2 = ReadEye('PhnDyn12\_1-02.eye'); % POST COMPRESSION

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.02,0,0.04,'ls'); % NOTE STRAIN VALUES

figure(1), imagesc(s), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.02,0,0.04,'us');

figure(2), imagesc(s), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.02,0,0.04,'lsus');

figure(3), imagesc(s), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.02,0,0.04,'a');

figure(4), imagesc(s), colorbar

% APPLIED STRAIN = 4%

rf1 = ReadEye('PhnDyn12\_1-00.eye'); % PRE COMPRESSION

rf2 = ReadEye('PhnDyn12\_1-04.eye'); % POST COMPRESSION

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.04,0,0.08,'ls'); % NOTE STRAIN VALUES

figure(1), imagesc(s,[0 0.08]), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.04,0,0.08,'us');

figure(2), imagesc(s,[0 0.08]), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.04,0,0.08,'lsus');

figure(3), imagesc(s,[0 0.08]), colorbar

[s,d,c] = EstStrn(rf1,rf2,192,128,64,0.04,0,0.08,'a');

figure(4), imagesc(s,[0 0.08]), colorbar

% WE CAN ALSO PROCESS FOR 6, 8, 12, AND 16 PERCENT