CE 598 – Peridynamics
October 13, 2015
Assignment #7
Due in One Week

Read Chapters 6 and 7 in "Practical Peridynamics".

(1) Compile and run the MatLab function *beamExample.m*. Use the MatLab editor and debugger to step through the function and learn about how the program works. Turn in hard copies of the final frame of the movie and the time history plot. To three significant digits, what is the final displacement of the central particle in the beam? How does this compare with the Bernoulli beam theory prediction?

(2) The FORTRAN program *beam.f90* in the SimplyFortran project *beamExample.prj* has ten missing source code lines, so it will not run. Using the MatLab program *beamExample.m* as a guide, fill in the missing lines in *beam.f90*. Use *makeMovie.m*, *plotDefShape.m*, and *plotTimeHist.m* to visualize the results of the FORTRAN simulation. Create hard copies of the final frame of the movie and the time history plot. To three significant digits, what is the final displacement of the central particle in the beam? Does it match the result of Problem (1)?

(3) We wish to study the center-point vertical displacement component of the beam in Problem (1) as a function of angle of lattice rotation. Complete the provided but incomplete function *differenceVersusLatticeRotation.m*. Provide a plot of percent difference in mid-point deflection (between peridynamic lattice and Bernoulli predictions) versus lattice rotation angle.

(4) Using *beamExample.m*, change the BCcodes of the right hand support to (0,0), thus removing the roller support. Adjust the plot window axis as necessary to display the entire deformed beam. Do the simulation results seem reasonable?

(5) Repeat Problem 4, this time using *beamExample.prj* and *makeMovie.m*, *plotDefShape.m*, and *plotTimeHist.m* to visualize the results of the FORTRAN simulation.

(6) Write a one-page essay explaining your ideas on the advantages and disadvantages of the of the bond-based peridynamic lattice model compared to a finite element model (say, ABAQUS or SAP2000).