ME 711 Computer Project#1 (due Friday, 9/16/2011) (50 Pts)

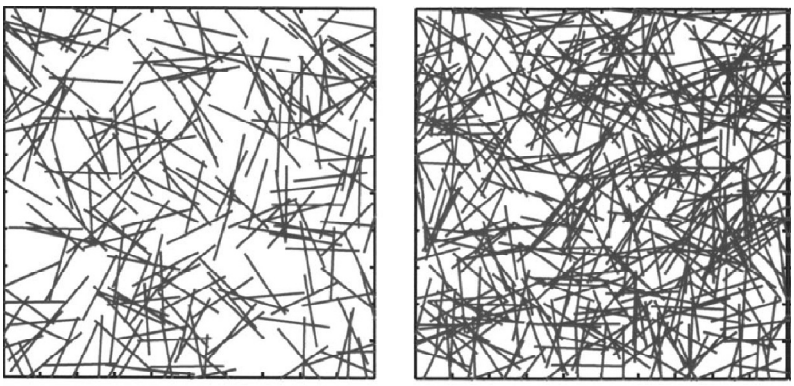
1. Get familiar with computer programming for engineering problems
Design a mini computer code that can generate randomly distributed sticks of unit length within a square (i.e. planar fiber network), which is broadly utilized to study the connectivity of engineered fiber networks mathematically. To program this code, you may assume the side length of the square and the number of total sticks to cast as the model parameters. The coordinates (x,y) of stick mid-points are treated as uniformly distributed random numbers. Try the following tasks:

(1) Given the side length of the square as 20, plot the random fiber networks with the number of sticks as 50, 200, and 500, respectively (see the figure below). The code also carries the function not to plot the partial segments out of the square.
(2) Design an algorithm to calculate the number of stick intersections for a given fiber network generated by your code. This number is a function with respect to the side length of the square and the number of total sticks to cast. Also, learn how to deal with the limiting cases with your mathematical understanding and programming skills.

You are encouraged to use the efficient Matlab to program.

Reference

X.F. Wu and Y.A. Dzenis, "Elasticity of planar fiber network," *Journal of Applied Physics* **98**, 093501(2005).



(*a*) (*b*)

Figure 1: Random fiber networks. (a) Fiber concentration: 10 (in fiber length unit); (*b*) fiber concentration: 20 (in fiber length unit)

Project Submission Requirements

Each computer project assignment should be clearly typed (in MS-Word). One printed hardcopy is requested to turn in at the beginning of the class on the due day (given above), and an electronic copy of the assignment (in MS-Word) as well as the computational code (m-file in the case of Matlab) should be emailed to the Instructor at Xiangfa.wu@ndsu.edu before the class. The name of the electronic file should be

ME 711_Project#(No. of Project)_Last Name Initials of Given and Middle Names.docx
ME 711_Project#(No. of Project)_Last Name Initials of Given and Middle Names.m

For example, after finishing the Computer Project#1, student *John R. Smith* should send the instructor his electronic copy of the assignment using the file name as:

ME 711_Project#1_Smith JR.docx; ME 711_Project#1_Smith JR.m