CS 4390 - Special Topic in Computer Science: Bio-related Data Structures and Algorithms
Fall 2013
Lab 2
Report due in class, September 12

There are a number of problems, known collectively as “random walk” problems, which have been of longstanding interest to the mathematical community. Some of these problems, although extremely difficult to solve analytically, can be solved by 4390 students (hopefully!) using simulation. One of them is as follows:

A cockroach is placed on a given square in the middle of a tile floor in a rectangular floor of size n by m tiles. The cockroach wanders randomly from tile to tile throughout the room. Assuming that he may move with equal probability to any of the eight tiles surrounding him (unless he is against a wall), how many moves will it take him to touch every tile on the floor at least once?

Your first lab consists of implementing a simulation of this problem. Your program must prompt the user to enter the number of rows and columns in the tile floor and the initial position of the cockroach; it will then simulate the cockroach’s random walk and terminate when every tile has been visited at least once. Your program must then output the initial parameters, the number of moves taken, and a 2-D array showing the number of times each tile was visited. Run the program several times with each combination of values of rows and columns to compute the expected (average) number of moves required to visit each tile.